

New product development and testing strategies for clothing longevity: an overview of a UK research study

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Abstract

Many garments have short life-spans, contributing to excessive carbon emissions, water consumption and waste. This paper reports on a research project which aimed to identify expectations of clothing longevity, examine the NPD process within the supply chain and identify opportunities for change, evaluate the potential for innovative technologies and improved product testing, and explore business practices aimed at more sustainable approaches to NPD. The paper provides an overview of the two-year project, presenting key findings from data collection that included interviews with 31 industry practitioners, three consumer focus groups, three industry and consumer round tables, an expert workshop, and four pilot actions undertaken with UK clothing retailers to evaluate key issues. The research identified and undertook themes relating to NPD that could enable increased garment lifetimes, which were consolidated into six areas: the adoption of advanced textile processes and finishing techniques, action to overcome constraints on appropriate product testing, the potential for retailers to influence consumer behaviour, a loss of technical expertise and lack of multi-disciplinary collaboration, failure to embed good practice early in the NPD process, and evidence to encourage retailers and brands to adopt new business models. Industry and government policy recommendations were proposed to improve knowledge-sharing, strengthen the business case and influence consumer behaviour, while further research may be needed on the adoption of new garment and textile technologies, the business case and the global context of the clothing industry.

Introduction

The short life-span of many items of clothing is problematic, contributing to excessive carbon emissions, water consumption (notably in cotton production) and waste (WRAP, 2017). Our past research in this area (WRAP, 2012; Cooper et al., 2013; Cooper et al., 2014) has suggested that among the many factors that determine the longevity of garments are new product development (NPD) processes and associated behaviours across the supply chain.

This paper reports on a research project funded by Defra (the Department for Food, Environment and Rural Affairs) which aimed to identify expectations of clothing longevity, examine the NPD process within the supply chain and identify opportunities for change, evaluate the potential for innovative technologies and improved product testing, and explore business practices aimed at more sustainable behaviour within NPD. This consolidated approach was considered necessary to understand how to overcome the complex barriers to increased clothing longevity. An overview of the findings is presented below; future papers will analyse specific research themes and present the primary data in more detail than is possible here.

The recommendations presented are intended to address technical and commercial limitations and facilitate a more pro-active approach to design for longevity. While it is evident that, in principle, garments can be made to last longer, how the necessary change should be co-ordinated across the supply chain and commercialised, and by whom, is less clear. The issues are embedded in a context in which cost and aesthetics dominate design decisions. Conflicting priorities are persistent and systemic, and contribute to business strategies that often appear resistant to increased longevity.

State of Knowledge

A literature review confirmed that current knowledge on clothing longevity has latterly seen significant growth, notably in the UK and Scandinavia, but remains limited in scale. Previous research in the field has addressed the technical durability of garments (Annis, 2012; Cooper et al., 2015) and, specifically garment testing and wearer trials (Annis, 2012; Cooper et al., 2014), consumer perspectives (Fisher et al., 2008; Fletcher, 2012; WRAP, 2012) and emotional durability (Niinimäki and Armstrong, 2013), design strategies (Niinimäki and Hassi 2011; Cooper et al., 2013), retail and brand responses to extending clothing

lifetimes (Goworek et al., 2012), supply chain and critical path issues (Abecassis-Moedas, 2006; Caniato et al., 2012; Curwen et al., 2012) and business model innovation (Buttle et al., 2013; Armstrong et al., 2015).

In key areas relevant to the project, however, such as brand perspectives on sustainability (Miller and Merrilees, 2013) and green NPD (Gmelin and Seuring, 2014), the clothing sector has received relatively little attention. Similarly, despite recent advances (WRAP, 2012, 2017; Kaitala and Boks, 2012; Laitala, 2014; McLaren et al., 2015), current understanding of how consumers maintain and retain garments is inadequate.

Research Methods

Drawing upon action research (Reason and Bradbury, 2001) the methodology was structured around PDSA (plan-do-study-act) cycles (Lodgaard et al., 2013 cf. Langley et al., 2009) as a means of reviewing the potential to change current systems and business practices. A qualitative approach was adopted and data collection comprised interviews with 31 industry practitioners, four consumer focus groups (totaling 29 participants), three expert round tables (on testing, pilling and consumer behaviour) and a workshop attended by 22 academic specialists. The data from this phase, undertaken between March 2014 and December 2015, was subjected to (manual) content analysis.

Four pilot actions were subsequently undertaken with UK clothing retailers to evaluate issues raising concerns: (i) durability testing to support a clothing lifetime guarantee marketing campaign, (ii) a review of customers' views on clothing longevity to understand how retailers can influence consumer behaviour, (iii) development of a testing regime for colour fastness representative of consumer laundering practices, and (iv) investigation of a quality problem in the supply chain to identify upstream causes of garment failure. These utilised a range of methods, including product tests, an online consumer survey, and interviews. Finally, a tool kit was developed as a resource to generate discussion and ideas within NPD teams, aimed at overcoming commercial and technical barriers to the design and production of longer lasting clothes.

Key Findings

It is clearly technically possible to produce garments that last longer than the current norm. The research confirmed this and added to extant knowledge by identifying and exploring themes relating to NPD that could enable increased garment lifetimes. These are consolidated below into six areas: (i) the adoption of advanced textile processes and finishing techniques that could enhance product longevity, (ii) time, cost and technical constraints on the type and effectiveness of product testing carried out during the NPD process, (iii) the impact that retailers could have by influencing consumer behaviour and enhancing their approach to user-centred design and clarity in garment care labelling, (iv) the loss of technical skills and knowledge within retail NPD teams and

across the supply chain and the need to enhance multi-disciplinary collaboration in order to promote better design practices, (v) A failure to embed good practice early in the NPD process and, finally, (vi) a continuing lack of evidence to encourage retailers and brands to pilot and adopt new business models that would support clothing longevity. Key findings from the data follow.

The adoption of advanced textile processes and finishing techniques

Textile and yarn finishes and garment production techniques that could support increased longevity are available: these include anti-pill finishes, treatments that can reduce wash frequency requirement, and fused seams, hems and buttons that enhance garment durability. Not all are readily accepted by buyers and consumers in the UK, however, in part because the underlying technical complexity gives variable results and this, combined with cost, time and market limitations, constrains their use. Lack of collaboration between various actors within the supply chain means that these issues are unresolved, while their impact on product cycles, aesthetics, cost and the environment are inadequately understood. Technical innovations could increase garment longevity, including improvements in laundry and care products and fabric finishes that support durability or reduce the need to wash, dry and iron garments. New communication tools, including RFID and traceability systems, apps and social media could improve co-ordination and knowledge-sharing across the supply chain and the quality, clarity and consistency of information provided to consumers. Scope exists for new technologies to be used in product testing processes and for new tests to be developed.

Time, cost and technical constraints on product testing carried out during NPD

Extended product tests and wearer trials for durability are not routinely carried out. Obstacles include substantial resource implications and critical path pressures. Standard tests only assess fitness for purpose early in the garment lifetime, and there is variation across the industry in the interpretation of test results and pass criteria. New or revised tests are needed that represent consumer behaviour and prolonged clothing usage while meeting commercial needs. Establishing new tests is a complex task: there is a need to develop suitable metrics and objective measurement techniques and to ensure consistency of application and relevance to real-life consumer behaviour. Historic data may be used to inform future garment ranges, although it may have limitations.

The impact of retailers on consumer behaviour, user-centred design and care labelling

Retailers and brands could do much more to encourage consumers to care, repair and reuse clothes, thereby prolonging lifetimes. They could, for example, adopt user-centred design as a means to develop products that consumers want to use for longer. Emotional attachment is an under-explored aspect of clothing longevity. Care instructions and labelling could be standardised and

simplified, providing clearer and better guidance that would enable consumers to make informed decisions about garment care. In particular care instructions could be standardised across garment and fabric types and labelling could be made easier to read. Care instructions may need to be modified to take account of prevailing behaviour rather than expect consumers to change unilaterally.

The loss of technical skills and knowledge within retail NPD teams and across the supply chain and the need to enhance multi-disciplinary collaboration

There is a lack of NPD knowledge and skills within some retail and brand teams and across the supply chain. The problem is exacerbated by globalisation of production and, in some cases, an absence of trusting buyer-supplier relationships and confidence in the valuable knowledge and experience that suppliers can provide. Improvement is needed in skills training and in the acquisition and retention of technically skilled staff; more specifically, practical training, problem-solving and experiential learning and CPD is needed within the retail sector. There is a need to acknowledge the value of technologists' skills and experience, recognise the wealth of technical knowledge within manufacturing, and create opportunities for knowledge exchange. Developing systems and applied technologies to capture historical knowledge could improve decision-making.

A failure to embed good practice early in the NPD process

Design decisions early in the NPD process have an impact on clothing durability, as do the materials and processes deployed along the supply chain at the fibre, yarn, fabric, finishing and garment production stages. Responsibility for design is not always clear, while opportunities exist to embed better working practices that identify potential problems at an earlier stage in the NPD process. Retailers and brands should adopt WRAP's Clothing Longevity Protocol checklist and ensure that materials, components and garments have appropriate durability.

A lack of evidence to encourage retailers and brands to adopt new business models

The major constraint to designing and producing longer lasting clothing is the challenge that it poses to established commercial interests. Business model innovations are needed to provide viable ways to commercialise and scale-up production of longer lasting garments, but there are persistent doubts over the commercial viability of such alternatives to the current norm. Concern about cost, in particular, is an inhibitor to change.

Policy Recommendations

The research findings suggested various policy recommendations for industry and government, which may be summarised as follows. First, there is a need for direct, short-term initiatives that promote the longevity agenda within business and consumer contexts. Scope exists to improve promotional messages for different target

groups and to use marketing, celebrity endorsement, social media and new technologies more effectively to engage consumers.

Second, resources and infrastructure are required to support education, training, knowledge-sharing and collaboration within and between organisations in the supply chain. This could enable the exchange of knowledge across the sector and between clothing and other sectors. Intervention to influence how consumers buy, care for and dispose of clothing could help to overcome potential conflict with commercial interests. Third, support for commercialisation of the business case through the adoption of new technologies, processes and product testing is needed in the form of longer, proof of concept trials, while further work is needed to increase understanding of users, alongside the business case. Finally, either industry support or legislation is needed to improve the clarity and reduce the complexity of garment labelling. Measures are needed to encourage retailers and brands to take more responsibility for discarded products within the circular economy.

Further Research

The project uncovered various areas that merit further research, notably the potential for adopting new technologies, the business case for increased clothing longevity and the global context. First, given a rapidly changing technology landscape, there is a need to increase understanding of garment and textile technology and the potential benefits of adopting a range of new technologies suited to the design and production of longer lasting clothes. For example, new finishes and treatments exist that could lengthen garment life but research is needed to understand their sustainability impacts, design and aesthetic implications, and the business case.

Second, there is a need to develop conceptual models and extend the short pilot actions undertaken in this project into wider scale demonstrator projects that implement and evaluate change over a prolonged period in a commercial context. The objective would be to establish the business case, assess the environmental impacts and develop strategies to resolve any trade-offs between commercial, consumer and sustainability requirements.

Third, NPD needs to be explored within an international context in order to understand potentially important cultural and behavioural issues; this would reveal the transferability (or otherwise) of past UK and Scandinavian research findings. Extending the research is important because of the global context of the supply chain, the power of global brands and the ever-increasing importance of international markets.

Summary

This research project set out to resolve some key questions faced by industry concerning how to increase clothing longevity. In exploring how existing NPD processes and associated behaviour impact on current supply chain

performance, it was evident that cost is a dominant factor. Design decisions are predicated upon cost, with time a key secondary concern in some markets (notably fast fashion). There are, however, signs of increasing attempts in NPD to address product longevity, often to support brand values or demonstrate competitive value.

A range of technological innovations could be incorporated into the NPD process to address issues such as the lack of reliable data on materials performance (e.g. pilling caused by short fibre composition in yarns). Obstacles include a lack of priority placed on clothing longevity, uncertainty regarding the overall benefits for certain products and markets and, in some cases, cost.

Innovations in the testing process could be adopted to improve garment durability but these, too, face limitations, not least the requirement for a commercial case to be made before the complex and resource-intensive process of establishing and accrediting new test methods can be undertaken. Clarification of existing test protocols and standards is more readily achievable.

Better co-ordination of NPD initiatives throughout the supply chain could support the communications,

knowledge and skills necessary to design and produce longer lasting garments. Such initiatives need to be inclusive across multi-functional teams (commercial, design and technical) and applied across the supply chain (including fibre, yarn and materials supply). Their effectiveness will be contingent on improved governance structures that enable more effective utilisation of skills and knowledge and a more clearly articulated commercial case.

Finally, effective solutions require recognition of shared responsibility between suppliers, retailers, brands and consumers. Consumers' decisions concerning clothing care and disposal could be positively influenced by relatively straightforward developments in communication such as improved labelling. Enhancing emotional durability, enticing consumers to keep clothing in active use for longer, is more complex and will require more considered design and marketing approaches.

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