

From Singular to Plural: Exploring Organisational Complexities and Circular Business Model Design

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Abstract

Purpose: The aim of this paper is to discuss how organisational complexities influence the design of circular business models, which have recently been introduced as a new panacea for aligning the interests of business with the needs of the environment. *Design/methodology/approach:* The Service Shirt, a new garment concept, is used as an illustrative case example for demonstrating some of the organisational complexities of making circular business models operable. The shirt was developed through a series of design workshops for the fashion brand *Fashion Alpha*. *Findings:* The analysis highlights multiple challenges emerging when a fashion product with a significantly extended lifecycle passes through different users, organisations, and business models. It is concluded that it is difficult to talk about a circular business model (singular) as circular economy solutions depend on the contributions of multiple stakeholders with business models. *Practical implications:* The findings illustrate how fashion companies interested in the circular economy fundamentally have to rethink conventional approaches to value, organisational boundaries, and temporality. *Originality/value:* Drawing on a case example from the fashion industry, the paper demonstrates the organisational complexities linked to the design of new business models based on circular economy thinking, as these require the coordination of actions between autonomous actors driven by different logics regarding value creation, value delivery, and value capture.

Key words: Circular Economy, Business Models, Sustainability, Service Shirt, Speculative Design

1. Introduction

In recent decades, there has been a surge of interest in business models, which is essentially about how an organisation creates, delivers and captures value (Evans *et al.*, 2017; Osterwalder and Pigneur, 2010; Teece, 2010). The business model language has also been integrated into the sustainability debates where scholars and practitioners now talk about green business models, inclusive business models, shared value business models, sustainability business models, and triple bottom line business models (Pedersen *et al.*, 2018). Business models for sustainability extends conventional business model thinking by adopting a broader and more holistic perspective of value (economic, social, environmental) and stakeholders (beyond direct customers) (Bocken *et al.*, 2015; Joyce and Paquin, 2016; Stubbs and Cocklin, 2008). New business models for sustainability have also been explored and discussed within the fashion sector, which is well-known for having a significant environmental impact

throughout the entire product lifecycle (Fletcher, 2008; Pedersen and Netter, 2015; Pedersen *et al.*, 2018).

The literature on business models for sustainability has emerged in parallel with the new discussions of the circular economy. Even though the components underpinning the concept are not necessarily new, the circular economy movement has become one of the key sustainability trends in business, academia and policymaking over the last decade (Charter, 2019; Urbinati *et al.*, 2017). In this context, it is important to highlight the work of the Ellen MacArthur Foundation, which has published a range of reports on the topic and which acts as a collaborative hub for businesses, policymakers, and academics. It is, therefore, probably no surprise that multiple attempts have been made to merge the two discourses into the concept of 'circular business models' and related terms (Accenture, 2014; Antikainen and Valkokari, 2016; Guldmann, 2016; Hopkinson *et al.*, 2018; Lewandowski, 2016; Linder and Williander, 2017; Planing, 2018, Zero Waste Scotland, 2018).

The aim of this paper is to discuss how organisational complexities influence the design of circular business models in the fashion industry context. It is generally recognized that the design phase accounts for a substantial part of a product's environmental impact (Graedel *et al.*, 1995; Ghisellini *et al.*, 2015; MacArthur and IDEO, 2017). If circularity is not considered at this stage, there will be little opportunity for change (Charter, 2019). However, the positive impacts of circular design will remain aspirational unless they are aligned with the competitive dynamics and production and distribution features of the client organisation and its stakeholders. This paper argues that the current incompatibility between the organisation of fashion companies and circular economy thinking may help explain the slow adoption of circular business models despite their claimed benefits (lower costs, higher margins, improved customer relationships, etc.) (Kirchherr *et al.*, 2018; Linder and Williander, 2017; Pal and Gander, 2018; Stål and Corvellec, 2018; Visser, 2010). Moreover, this paper questions whether it is a misnomer to talk about a circular business model when circular economy solutions often require collaboration between multiple autonomous actors with interconnected strategies and business models. This paper suggests that research and practice ought to instead give more emphasis to the design of different combinations of business models and their potentials for bringing the circular economy to life.

The Service Shirt concept serves as a case to explore the multiple complexities, contingencies, challenges and opportunities associated with circular business models in a fashion context. The shirt was originally designed as a creative concept for an international fashion brand (hereinafter called *Fashion Alpha*). The intention was to see if the fashion *product* could last as long as the *material* it was made from. Polyester is commonly used for clothing at the low end of the market – *fast* fashion – yet it has inherent durable and malleable properties, as well as its slow decomposition qualities (Li *et al.*, 2010). The polyester Service Shirt was designed as a 'deliberate extreme' to have a total lifecycle of 50 years. This *slow* lifecycle includes five manufacture/remanufacture processes and eight sharing

cycles, after which the shirt ends as a piece of costume jewellery before being recycled (via fibre regeneration) to be used again as polyester material by the brand. The shirt was created by author2 with the intention of stimulating discussion around issues that emerge when companies attempt to make circular business models operable and scalable in the fashion industry.

This paper contributes to the discussions of the circular economy and affiliated business models within management and organisation literature. In general, there remains a lack of exploration through academic design research and practice on the ways in which design can contribute to circular business models (Ghisellini et al., 2015; Pieroni, Pigosso and McAlloone, 2018). Moreover, little research exists on how circular business model designs are developed, scaled and discussed within an organisation. For instance, Urbinati *et al.* (2017) and Ghisellini et al. (2015) explicitly highlight the lack of research contributions that address how companies adopt the circular economy paradigm from a business model perspective. Moreover, while the existing literature often depicts business models in isolation (sharing, leasing, recycling etc.), the real potential of the circular economy may lie in the combination of business models throughout the product lifecycle. Based on an analysis of the Service Shirt, this paper demonstrates how multiple business models come into play during the entire, deliberately-extended product lifecycle and discusses the various implications of designing for the circular economy within the fashion industry.

The remainder of this paper is structured as follows: We begin with a short introduction to the business model literature with emphasis on the rapidly growing research on sustainable business models and circular business models. The review is followed by an introduction to the methods used, and a description of the Service Shirt concept. The description provides a detailed account of the product concept and the multiple business models envisioned to extend the productive life of the garment. The paper concludes with a summary of the findings and perspectives on how to move the discussions on circular business models forward in both research and practice.

2. Towards an understanding of circular business models

The business model concept emerged in the 1990s as a metaphor for describing various e-businesses that challenged conventional bricks-and-mortar businesses with new technological solutions (Boons and Lüdeke-Freund, 2013; Zott *et al.*, 2011). Business model thinking was popularized by Osterwalder & Pigneur (2010) whose “business model canvas” in particular became subject to extensive discussion, application and use in academia and practice. While the exact meaning of a business model remains debatable, there seems to be a consensus that “value” is at the heart of the business model construct (Chesbrough, 2007; Johnson *et al.*, 2008; Morris *et al.*, 2005; Teece, 2010). In this paper, a business model is defined broadly as “the rationale of how an organization creates, delivers, and captures value” (Osterwalder and Pigneur, 2010, p. 14).

In the beginning, the business model literature paid only limited attention to social and environmental issues (Pedersen *et al.*, 2018). However, in the last decade, mainstream business model thinking has been criticised by scholars who have, for example, emphasized the need for a broader understanding of value (social, environmental, and economic) and the inclusion of additional stakeholders (beyond customers) (*ibid.*). The study of Stubbs & Cocklin (2008) is often highlighted as one of the earliest contributions that explicitly talks about sustainability and business models. Since then, the literature on business models highlighting sustainability issues has grown exponentially under headings such as inclusive business models, triple layered business models, and social business models (Michellini and Fiorentino, 2012; Joyce and Paquin, 2016; Yunus *et al.*, 2010). Business models for sustainability have also been discussed within the field of fashion, e.g. in relation to sharing (Pedersen and Netter, 2015), recycling (Morgan, 2015), and second-hand retailing (Hvass, 2015).

Recently, the literature on business models for sustainability has been mixed with the visions of a circular economy, which has become a popular antonym to the linear economy and the predominant take-make-dispose industrial system (Bocken *et al.*, 2016; Ghisellini *et al.*, 2015; Murray *et al.*, 2017). Within this literature, the circular economy is seen as a new business model expected to lead to more sustainable development (Ghisellini *et al.*, 2015). Examples of business models with elements of circularity include recycling, upcycling, sharing, repair and remanufacturing, which are also well-known phenomena in the fashion industry. For instance, the Ellen MacArthur Foundation's (EMF) recent report entitled "A new textiles economy: Redesigning fashion's future" outlines a circular vision for the fashion industry, where "clothes, fabric, and fibres are kept at their highest value during use, and re-enter the economy after use, never ending up as waste" (EMF, 2017, p. 22).

Circular business models can be understood broadly as "a business model in which the conceptual logic for value creation is based on utilizing economic value retained in products after use in the production of new offerings" (Linder and Williander, 2017, p. 183). While the exact meaning of circular business models remains subject to scholarly debate, the discussions are often centered around the principles of reduction, reuse (including repair and remanufacture) and recycling (Ghisellini *et al.*, 2015; Murrey *et al.*, 2017; Stahel, 2019). *Reduction* concerns actions to minimize the input of primary energy, raw materials and waste through the improvement of the efficiency of production and consumption processes. *Reuse* is understood as cases in which products or parts that are not waste are used again for the same purpose for which they were created (EU, 2008). This is a very appealing approach in terms of environmental benefits as it requires fewer resources, less energy, and less labour compared with the production of new products from virgin materials (Ghisellini *et al.*, 2015; Stahel, 2018). Lastly, *recycling* is defined as those instances where waste material is reprocessed into products, materials or substances for original or other purposes (EU, 2008).

Reduction, reuse and recycling all have the potential to make business models more sustainable. However, scholars have also pointed to the limitations and/or challenges associated with some of

these principles. For example, Bocken *et al.* (2016) argue that slowing resource loops (extending product life) and closing resource loops (recycling) are central components of circular business model strategies whereas narrowing loops (reduction) can also be integrated into conventional linear business models. Moreover, although recycling is central to circular economy thinking, this may in fact be the least sustainable solution in terms of resource efficiency and profitability (Murray *et al.*, 2017; Stahel, 2013; 2014). For example, some waste materials are only recyclable until a certain point, or are even unrecyclable (Ghisellini *et al.* 2015). Moreover, while approaches such as reuse and remanufacture have a potential at local or regional scale and the possibility to avoid or reduce packaging, transport and transaction costs through the maintenance of ownership, recycling is often a global business based on the "principles of industrial production, such as economies of scale, specialization and employing the cheapest labor" (Stahel, 2013, p. 4). At the operational level, research shows a number of interconnected challenges for implementing circular business models. Broadly speaking, they can be categorized into *cultural, technological, regulatory* and *market* challenges (Kirchherr *et al.*, 2018). Thus, while we see companies that experiment with and apply sustainable practices, the scalability of these examples is questionable when placed in the current system of value creation and capture that operates in the global fashion industry, (Pal and Gander, 2018; Visser 2010). Clearly, taking circularity into consideration presents organizations with a set of completely different challenges than designing for the traditional linear model (Becker-Leifhold & Iran, 2018; MacArthur and IDEO, 2017; Pieroni *et al.*, 2018). Table 1 below outlines the main challenges identified in the literature.

3. Context and methods

The circular economy movement has also inspired designers to explore the potentials of circular design in the textile and fashion industry (Becker-Leifhold and Iran, 2018). For example, based on a series of interviews, Ræbild and Bang (2017) explore the fashion collection as a design framework towards a strategic driver for longevity within circular fashion design. The key insights gleaned include the important role of gaining 'feedback from users, manufacturers and the garments themselves' and how incorporating this insight into a collection differs from a traditionally linear collection.

In Smith, Ballie and McHattie (2017), textile waste reuse is examined within the context of the design of circular fashion textile products in a specific geographic location. The authors propose a more holistic approach for designing and manufacturing within these sectors, and embracing 'open design'. These ideas are useful for advancing the agenda for agency and for helping fashion users create textiles, clothes and accessories when accessing Fab Labs and Maker Spaces, for example.

Table 1: Challenges to circular business models

Category	Challenge	Reference
Cultural	Stakeholders: A broad and proactive approach towards shareholders, but also to other internal and external stakeholders.	Becker-Leifhold and Iran (2018); Geissdoerfer <i>et al.</i> (2018); Ghisellini <i>et al.</i> , (2015).
Cultural	Communication: Need to develop a consumer market, e.g. actively promoting awareness of the environmental and/or social value that an organization aims to create and deliver. Promoting a culture of remanufactured goods.	Becker-Leifhold and Iran (2018); Geissdoerfer <i>et al.</i> (2018); Vehmas <i>et al.</i> (2018).
Cultural	Consumer behaviour: The need for social innovations (e.g. in terms of changes in consumer behaviour). For example, within reuse, consumer concerns include the provider's reputation and issues such as hygiene, product abuse and lack of information on the use and treatment of materials. Today, there is also a lack of consumers who are interested in renting inexpensive everyday clothing.	Armstrong <i>et al.</i> (2015); Becker-Leifhold and Iran (2018); Geissdoerfer <i>et al.</i> (2018); Ghisellini <i>et al.</i> , (2015); Hu <i>et al.</i> (2014); Kirchherr <i>et al.</i> (2018); Linder and Williander (2017); Smith, Ballie and McHattie (2017); Vehmas <i>et al.</i> (2018); Winans, Kendall and Deng (2017).
Cultural	Infrastructure: Lack of suitable infrastructure. For example, challenges to develop a closed-loop supply chain network and a reverse logistics environment. Need to establish new ways of customer engagement as customers turn into suppliers.	Armstrong <i>et al.</i> (2015); Ghisellini <i>et al.</i> , (2015); Kant Hvass (2015); Kirchherr <i>et al.</i> (2018); Linder and Williander (2017); Pal and Gander, 2018; Ritzén and Sandström, (2017).
Cultural	Risk of Cannibalization: Introduction of circular business models may lead to decreased sales if the new, longer-lasting products reduce sales of the previous products.	Linder and Williander (2017); Michaud and Llerena (2011).
Cultural	Long-term perspective: Long-term perspectives to complement short-termed ones	Bansal and DesJardine (2014); Kirchherr <i>et al.</i> (2018); Ritzén and Sandström (2017); Slawinski and Bansal (2015).
Market	Price: Price continues to be one of the determining factors over sustainability. Low cost of virgin materials.	Kirchherr <i>et al.</i> (2018); Henninger and Singh (2017); Pal and Gander, 2018; Ritzén and Sandström, 2017; Vehmas <i>et al.</i> (2018).
Market	Cost: High investments (organization)	Becker-Leifhold and Iran (2018); Linder and Williander (2017).
Technological	Skill sets & expertise: Lack of in-house skill sets to repair and remanufacture. Need to design for the circular economy (e.g. repair and remanufacture) instead of a linear economy.	Ghisellini <i>et al.</i> , (2015); Linder and Williander (2017); Pal (2016); Pal and Gander, 2018; Ritzén and Sandström, 2017; Ræbild and Bang (2017).
Regulatory	Lack of supporting regulations: Lack of supporting regulations is a major barrier to implementing circular business models.	Kirchherr <i>et al.</i> (2018); Linder and Williander (2017); Pal and Gander, 2018; Stahel (2010).

One other notable approach to translating and extending circular economy thinking into fashion practice is by Ina Budde and her team at *Circular.Design* in Berlin who have evolved a systems design and communication-based model. This platform is based on Budde's 'Extended Closed Loop' tool

which supports the creation of products with recyclable materials and modular pattern constructions specifically designed for both reuse and closed-loop recycling. It seeks to extend the product lifespan in circular retail models and to enable material-specific recovery for fibre-to-fibre recycling. The platform aims to establish a traceable closed-loop material flow for textiles by creating connections between material innovators, designers, retailers, customers, textile sorters and recyclers. They use QR-Codes in each garment, leading to a product website that supports transparency and enables recyclability by providing material identification.

3.1. The Service Shirt Design

The Service Shirt concept was developed in 2017-2018 by author² during the 'Design Researchers in Residence' programme at an international brand, as part of a Swedish design-science research programme, with the intention of producing circular design guidelines. The fashion brand, Fashion Alpha, has around 350 employees¹. The original motivation of the Service Shirt was to design a product where the length of use approximated the expected lifetime of the material. This idea is not without precedents as designers have previously explored the possibilities of developing products with a long timeframe (Earley and Dodd, 2014; Earley and Spurgin, 2015).

The Service Shirt concept emerged out of several years of previous practice² and experimentation during which the question of the decomposition of materials at a much later stage was eventually addressed. Author²'s research with polyester shirts began in 1999 and has since explored multiple questions relating to the sustainability of the fashion industry. Through this 'longitudinal practice' approach (Walker, 2017), the shirt revealed itself as a garment that is both ubiquitous and popular: a mainstay item for a woman's wardrobe with a wide variety of uses varying according to color, cut and print design. Author²'s portfolio of upcycled, long-life garments made the shirt an ideal product to be used in the experiment with Fashion Alpha.

3.2. A Workshop Approach

Through workshops with industry designers in New York, Scotland and Sweden (2015 – 2016) questions began to surface about lifecycle time-frame targets that were given to designers to aim for: fast targets ranged from one day to two years while slow targets ranged from three to 200 years. During these workshops, whenever the 100- or 200-year cards were played, the industry designers struggled to understand how the company, their role at the company and their design approach could facilitate such a lifespan. In some instances, the cards were defaced with the workshop participants crossing out the number of years and drawing in a time frame they felt was more workable for them. In general, 50 years was the longest period of time that any of the participants could envision as workable.

¹ *The case has been anonymized*

² *www.upcyclingtextiles.net*

This 18-month period of conducting ‘fast and slow design’ workshops enabled the development and testing of new tools before the Design Researchers in Residence (DRR) project began at Fashion Alpha in March 2017. The aim of the DRR project was to explore design for fast and slow circular products, supporting Fashion Alpha to produce new items for sale. The academic design researchers were to produce new prototypes as research outcomes that considered parallel ideas that might be too far from market for the brand to invest in. Key activities during the DRR project are outlined in Table 2.

Table 2: Action research structure at Fashion Alpha, the Design Researchers in Residence workshop structure and timings; and author2’s subsequent reflective practice periods

	March 2017		May 2017		June 2017		September 2017	
Part 1	Meet & Greet Workshop	Author2 reflective practice period	Thinking Slow Workshop	Author2 reflective practice period	Thinking Fast Workshop	Author2 reflective practice period	Checking in Workshop	Author2 reflective practice period
	October 2017		November 2017 – September 2018		November 2018		December 2018 – May 2019	
Part 2	Review & Refine Workshop	Author2 reflective practice period	Prototyping Phase	Author2 Prototyping Phase	Public Presentations Workshop		Reflection & Evaluation Workshop	Author2 final reflection & writing

It was clear from the outset that users would be key in keeping the Service Shirt in circulation. Input from the shop floor manager was important here; she regularly attended workshops to reflect on how the workshop ideas would be received by customers. In addition to working with the Fashion Alpha design team, author2 also spent time with a user and her daughter in London to find out how their wardrobes function for them, across the two generations and within a shared space. Author2 then imagined their future behaviors by writing a series of fictional use stories (summarised in Table 3).

The workshop tasks included expertise mapping of individuals attending the workshop and a review of their individual wardrobe habits – which own-brand clothing they wore frequently and which they wore rarely. Tasks used lifecycle diagrams to see how garments of any type can be better understood when viewed as a series of individual decisions within a framework of circular quadrants – materials, production, use and recovery. Workshop tools were developed to support the participants in designing fast and slow product speeds and to locate the most appropriate pace for each part of the lifecycle. The Service Shirt concept was developed in the periods between the workshops by author2.

Between workshop sessions, author2 developed the Service Shirt idea by using a series of simple, written table formats to organise the potential cycles within which a Fashion Alpha product could function and which the brand (or another partner company) could facilitate. For example, Fashion Alpha has its own second-hand outlet, so information gathered in workshops about how this might

work and what the limitations were fed directly into the table, which then prompted author2 to note the opportunities for innovation through design. Author2 then translated these opportunities into material ideas through textile sampling in the studio. If, for example, the second-hand outlet had a problem that stock was not changing often enough to keep customers coming back, then author2 explored textile over-printing finishes that could be applied to transform stock in a more systematic, regular way. By drawing upon tacit knowledge of the handling and remanufacturing of polyester (Igoe, 2013), and through reflective practice approaches, author2 was able to deliberately build the Service Shirt concept basing it on the existing Fashion Alpha business model and the second-hand outlet.

The process of developing the Service Shirt can be seen then as a combination of several complementary activities and methods. Primarily a classic reflective practice approach (Schön, 1992) towards a speculative design outcome (Dunne and Raby, 2013) with design decisions based on insights gained from the experience of learning (Kolb, 1984) and the action research process (*Reason & Bradbury, 2001; Stringer, 1999*) of the Design Researchers in Residency period at the company (Dochy *et al*, 2011). Ideas for the Service Shirt cycles of use and remanufacture were then informed by time spent discussing and photographing user wardrobes (Fletcher 2016) as well as - most crucially of all - solo time spent in the studio translating these ideas into new practice outcomes in the form of textile samples, which were then photographed to form a PowerPoint slide portfolio to enable author2 to use annotated portfolio methods (Gaver and Bowers, 2012; Sauerwein, Bakker and Balkenende, 2018) to draw out key insights.

4. The Service Shirt Concept

The Service Shirt is a speculative design prototype that explores how a polyester shirt can be kept in use for as long as possible by the fashion brand that produces it. In recognition of the reluctance of consumers to make and adapt clothing themselves (*Updated T-Shirt, 5Ways* project, Earley & Fletcher 2003; *Fast reFashion* project, Author2 2012-2014), the Service Shirt scenario suggests that the brand provide the majority of material state changes as well as host various user interactions in their stores.

The concept envisages a new aspect to the business – Fashion Alpha ReFashioned (FARF), which is a bolt-on business that operates within stores in large cities, with an in-house digital printer and heat transfer press, and with access to a range of small recycling through remaking facilities. The FARF business operates a rental service and overprints garments to extend their life, as well as send some items for recycling or ‘upcycling’ (‘adding value through design’ (Earley, 2011)). Certain pieces are designed at the outset to be made into high-value collectable items, which, after a period of private use, go into the FARF Vintage / luxury rental section of the business.

Figure 1 shows the original purchase by user 1 (1) and the first sharing moment between mother and daughter (a); the first overprint (2) and then handing on to a friend (user 3) after a period of wear (b);

the friend trades in the garment to a rental store, where it goes on loan (c) and later gets the second overprint (3). The reprinted garment goes back out on loan (d) before the next recycling process occurs (4). The jacket goes out for private use (perhaps even back to user 1) (e), and then to rental service (f). The next recycling is into an item of jewellery (5) for private use (user 2) (g) and then out for rental (h); before the polyester item gets chemically recycled to reclaim the fiber (6) and the fiber gets used to make new fabric for Fashion Alpha.

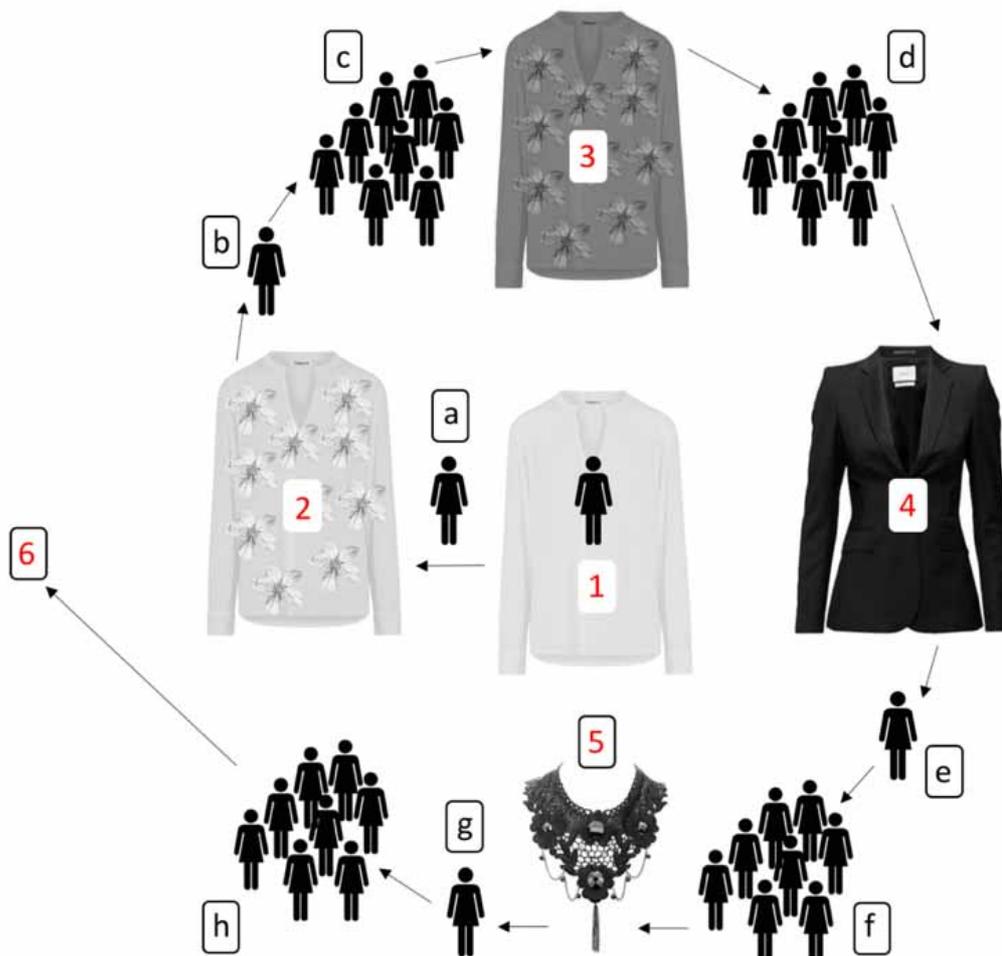


Figure 1: The Service Shirt and its user cycles

4.1. Design and business model considerations

Introducing the Service Shirt concept in Fashion Alpha is not a trivial affair. Although it is an achievable vision in terms of design, the concept comes with huge challenges linked to the organisation and the business model. Table 4 summarizes the main stages of the 50-year cycle, which all have consequences for Fashion Alpha and its partners. Figure 2 shows samples and prototyping work from the development the Service Shirt. In the following sections, some of these design and business model issues will be briefly summarized.

Table 3: The journey of the Service Shirt through users and remanufacturing stages

Years	User & Remanufacture Journey
1-5	The first user is a 'typical' Fashion Alpha customer (a). She is 47 years of age and is married with two children. She buys the shirt for herself and is intrigued by the name and concept she sees in store and in the press. At the point of sale (POS) she reads about polyester, oil, the lifecycle, and the product speeds. She is not sure what all of it means, but the shirt is pretty, suits her, and she likes the idea of doing something more sustainable with her wardrobe. She takes the garment home and keeps it for 5 years after which she does not feel it's 'fresh' anymore. The label says she can either hand it to someone within her family and friendship circles, bring the shirt in to the store on her next shopping trip to town to have it updated with a new print, or simply drop it off at the collection desk in store for it to be used in the fashion library service.
6-11	She decides to hand it down to her daughter (user 2, (b) who is 14 years of age). She likes the shirt as is and wears it twice a month for 3 years before growing bored of it. From the label, she knows that she can take it to any FARF store to get it 'over-printed'. She uses the online booking system to make a date for a trip to the store the next time she goes to town. The basis of this first product recycling is a simple over-print using digitally printed transfer paper. The design colour-way options are kept light to ensure the option of having a coordinating overprint placed on top at a later stage. User 2 takes the item to the FARF store and is thrilled with the 'new' shirt. She feels inspired by the whole experience. She keeps it for another two years before handing it on to a friend.
12-17	User 3 keeps this overprinted shirt for one year before deciding it's not really her look anymore, and she donates it to FARF. At this stage, the garment is checked for missing buttons and loose threads and is professionally cleaned before being retagged and put on the loan rail. The shirt is rented out to users on a monthly basis (c). As users only have the shirt for a month, they wear it often. At the end of the 2-year period, FARF needs to recycle the item. The original shirt had been created in anticipation of this overprint. The shirt is overprinted again by FARF using their in-store printer and press. This new piece will then go on the loan rail for two years and be borrowed on a monthly basis (d).
18-33	At the end of the 2-year period, FARF needs to send the item off to be recycled again; the shirt will be used as the lining for a new Alcantara polyester jacket. The shirt is laser 'slit and locked' to the jacket fabric to create a warmer, more formal garment with new detailing. At this stage, User 1 has not seen the item for 10 years, and it has travelled through the lives of 53 other people. User 1 is now 60 years of age and welcomes being offered first use of this new piece (e). The user keeps the jacket for another 10 years. At the end of this cycle, she can choose to keep it longer, or it can be passed back to FARF where it is assessed for its eligibility to become a FARF Luxury Loan piece. The item may be in need of minor repairs and will undergo specialist cleaning and repair at this stage. The jacket will go on the rail in the FARF space and will be rented out over a 5-year period (e). The users borrow this item on a 6-month loan basis.
34-50	At the end of the 5-year period, FARF needs to send the piece to the jewellery designer. The original item is transformed into this piece by cutting it into strips and hand rolling, folding and stitching it into a series of unique, one-off jewellery products. At this stage, user 1 is 75 years old, and user 2, her daughter, is 42. The anticipated use now could be up to 20 years, with the jewellery items being worn twice a year. The jewellery can also go back into service at FARF Luxury Loan (h). At the end of this cycle, the jewellery piece – perhaps quite tattered and no longer wearable at this stage – can be returned to FARF who will put it into one of its polyester fiber-2-fiber recycling programmes.

Table 4: The main stages of the Service Shirt's 50-year cycle

Material Cycles	Use Cycles	Description	Business Model
1. Original Product	a. Sharing (Family Circle)	The original Fashion Alpha shirt made from rPET bought by user 1 & given to user 2.	A. Existing Fashion Alpha business with an extended user platform and POS information & care labels
2. Product Recycling (Overprint 1)	b. Sharing (Friend Circle)	The shirt gets overprinted by user 2 at FARF and then is given to user 3.	B. Digital Dye Sublimation Printing. The first remaking of the shirt requires the user to use an online booking system to make an appointment to bring the garment into a Fashion Alpha store with a FARF facility. This process requires a digital printer, a heat-transfer press, and rolls of pre-printed papers.
	c. Sharing (Rental / Everyday)	User 3 exchanges the shirt at FARF & they put it out for rental. Multiple users access the shirt at this stage.	
3. Product Recycling (Overprint 2)	d. Sharing (Rental / Everyday)	FARF overprints the shirt a second time to extend the life within the rental system for multiple users.	
4. Product Recycling (Jacket)	e. Sharing (Family Circle)	FARF gets the shirt remade into a jacket and user 1 gets the first, private use of the item.	C. Laser/Sonic Remanufacturing. This would require Fashion Alpha to work with small maker/manufacturing businesses to remake the shirts into jackets.
	f. Sharing (Rental / Luxury)	User 1 gives the jacket to FARF Vintage and they rent it out to multiple users.	
5. Product Recycling (Jewellery)	g. Sharing (Family Circle)	FARF get the jacket made into a piece of jewellery and user 2 gets the first, private use of the item.	D. Artisanal/Craft Product Recycling. This would require Fashion Alpha to work with small craft businesses to remake the jackets into jewellery pieces.
	h. Sharing (Rental / Luxury)	User 2 gives the jewellery to FARF Vintage and they rent it out to multiple users.	
6. Reclaim of Resources		FARF passes the piece on to be chemically reprocessed. The polyester can be used again.	E. Polyester Digester Resource Reclaim. This would require Fashion Alpha to work with a polyester regeneration facility to transform the old polyester material – 50 years old at this stage – into a new material resource.

The creation of the Service Shirt included a number of technical and aesthetic design challenges including material selection, garment shaping, print design and laser finishing. While designing for the linear economy presents similar challenges within the same areas, designing for a 50-year lifespan and multiple cycles brings about extreme complexity that has to do with the product as well as with the business model. These challenges mean that traditional ways of working need to be questioned throughout the whole process.

While the business model is fairly traditional at the *original purchase stage*, it is necessary to include some forward planning around how the long-life service will work so that the messaging is in place at the point of sale (POS) and online. The business would need to commit to offering a range of product recycling processes, and communicate the Service Shirt concept clearly at the outset. The exact nature of the product recycling need not be specified at the outset; this can change as new supply chain relationships emerge and new technologies become available. The challenge would actually be for the brand to know enough about the potential future routes for the product whilst maintaining the ability to adapt as new opportunities are explored. The first user would need to be aware to some extent

that the piece they are buying has the potential to last 50 years and that they are a key part of the process in terms of how they keep and pass on the product when ready.



Figure 2: Samples and prototypes from the development stage of the Service Shirt. Top left: The original first shirt made in rPET polysilk. Top right: The four stages of the over-printing process. Bottom left: The Alcantara jacket with the shirt attached as a lining. Bottom right: Jewellery pieces made from the jacket and lining by fusing materials together and cutting and stitching.

The digital dye sublimation overprint involves the biggest business model change in the 50-year cycle. In designing the Service Shirt, the print design needed to be created in such a way as to allow for subsequent layers to be added on at the different over-printing stages. This meant working with a build-up of tones from light to dark with imagery that worked together but did not need to be lined up in an exact or accurate manner, and that did not age through trends in color or patterning. Moreover, the vision includes investment in a service counter space in stores, with a small number of machines. The business model at this stage requires a bolt-on Fashion Alpha business for small remanufacturing runs, which can also take in work from other brands, as well as offer educational events and services. Whilst to date, some stores have introduced garment customisation or mending (e.g. Nudie, Levi's) and café areas in store (Topshop and Arket), and out of store (H&M), this concept takes this further by designing original products at the outset. Spaces within stores could offer service areas where users can see their garments getting overprinted. The business would need to operate a regularly-updated online information space where the users of the Service Shirt can log in and see what cycle options are available to them at any time. The setup and maintenance of this would require significant investment by the brand.

This *laser remanufacturing* is the most dramatic of the changes in the product sense and requires the most technical support. This phase of the business model needs to be built into the design from the outset. Thus, the shape of the shirt and the jacket needs to be 'timeless' and able to transcend the years. This is a kind of classic design approach that is difficult to achieve, especially as the shirt and jacket were made using zero-waste templates (Rissanen and McQuillan, 2015). Moreover, the FARF business would need to partner with a small production business who could use laser technology to shape and fix the shirt to a heavier-weight polyester material to create a jacket. Getting the production business model right at this stage in the Service Shirt would be key to its success. An option is to look at the Fab Lab (Fabrication Laboratories) and Maker Space movements across Europe, USA, Japan and emerging economies (Osunyomi and Redlich, 2015). These are small-scale production units where digital technologies are made available to anyone who pays to access them.

After being used for a long period of time as a special occasion piece in private- and rental-use contexts, the jacket will be recycled into a jewellery item through craft processes. This cycle extends the FARF business model again to include partnerships or commissions with a range of independent craft makers. The financial cost of crafting this piece is high, so the way in which it works within the FARF business would need careful consideration, i.e. it must be genuinely 'upcycled', adding value through design and craftsmanship.

The *resource/reclaim* process takes place at the end of the 50-year cycle. Today, there are already plenty of options available for recycling polyester. As the technologies are in constant development, it is difficult to know what will be the best technological solutions in 50 years' time. However, it is most likely that Fashion Alpha will continue to collaborate with an external regeneration facility (as

they currently do) to transform old polyester material into a new material resource. While this stage of the product lifecycle does not require significant business model changes, it is still associated with costs for the parties involved. However, expected increases in the future prices of raw materials are likely to make resource/reclaim options increasingly attractive.

5. Discussion: the organisational complexities of circular business models

As seen in the previous sections, the Service Shirt design concept is an attempt to operationalize the circular economy by designing a product that is able to go through a number of business models during its 50-year product lifecycle. The design concept was realised through a partnership between an academic researcher and a team of industrial design researchers resulting in a physical prototype for exhibition. The design and manufacturing process has been conducted both within the brand using company practices, and without the brand through periods of solo manufacturing and reflection.

Some of the business model considerations that emerged during the design of the Service Shirt resonate with existing work on circular business models (see Table 1). However, exploring possibilities to keep products and materials in circularity through multiple cycles, the Service Shirt example also demonstrates that the challenges linked to circular business models are not only tied to the functional attributes of the product (Stål and Corvellec, 2018). The implementation of circular business models will also depend on collaboration across professions, departments and organizations (Ritzén and Sandström, 2017). While startups have the opportunity to build a circular infrastructure and customer base from scratch, circular business models will be adopted by organisations already deeply embedded in preexisting logic and legacy business models, which are not always *in sync* with circular economy thinking. For instance, evidence from the fashion industry indicates that the adoption of sustainability and new business models alike are dependent on fundamental organisational values (Pedersen *et al.*, 2018).

Designed as a deliberate extreme, the Service Shirt uncovers a number of organisational factors, which seem to shape the adoption of circular business models in the fashion industry. As an example, the Service Shirt shows that the design of circular business models comes with a set of new *technical* requirements. While the recent study by Kirchherr *et al.* (2018) does not find technological barriers (including circular design) to be a major barrier, most studies within the field highlight new requirements for *knowledge and expertise* within and between organisations. For instance, it is well known that the design decisions have important implications for the total environmental footprint of a new product (Graedel *et al.*, 1995; Ghisellini *et al.*, 2015; Kozlowski *et al.*, 2016). Thus, in-house knowledge or external expertise in circular design are important preconditions for bringing about changes and making a shift toward sustainability.

The Service Shirt also shows the difficulties in combining conventional strategy-making with a product intended to minimize the gap between the lifecycle of the material and its actual use. When moving from products to business models, knowledge requirements increase as the latter concept comes with knowledge requirements for sustainable value creation, value delivery, and value capture throughout the product lifecycle. In the case of the Service Shirt, Fashion Alpha has to build up remanufacturing skills and competencies of their staff to operate the FARF facility. Thus, while design decisions play a central role, the case of the Service Shirt highlights the fact that the total footprint of a circular product does not lie in design exclusively. Rather, the sustainability of a product necessitates collaboration with internal and external stakeholders (e.g. fab labs, artisans, and recyclers) which is not always an easy endeavor. For instance, Hvass (2014) observed that fashion brands had limited knowledge of second-hand markets which inevitably had an impact on their ability to co-create circular business models with them. Therefore, fashion brands interested in looking beyond their own business model will have to gather knowledge about other business models in circular loops.

The example of the Service Shirt also demonstrates that circular business models build on a number of *assumptions* about the behaviors of the actors taking part in the loops. For instance, fashion sharing and recycling are dependent on consumers actually returning the product rather than storing it in their wardrobe or throwing it out. Here, calls have been made for a shift in consumer culture, which remains focused on asset (ownership) rather than access (Bardhi and Eckhardt, 2012). In the case of the Service Shirt, the proposed 50-year cycle is dependent on consumers who are reasonably committed to circularity and who are willing to pass on the product from one stage to another. However, it is well-documented that social and environmental issues are not always high on the agenda of the fashion consumers (Joergens, 2006). Therefore, circular business models require the careful consideration of mechanisms that will allow circular loops to materialize. Otherwise, corporate rhetoric about the circular economy will be aspirational talk at best (Christensen *et al.*, 2013) and greenwashing at worst (Delmas and Burbano, 2011). Indeed, in a study of seven Swedish fashion companies, Stål and Corvellec (2018) observed a decoupling between the introduction of circular business models (take-back systems) and the predominant, linear business models.

Time is also a factor worth highlighting in the context of circular business models. Designing, organizing and managing for circularity requires a holistic, long-term mindset which fundamentally breaks the short-termism permeating today's business environment (Bansal and DesJardine, 2014; Slawinski and Bansal, 2015). In today's fashion industry, the consequences of short-termism are highly evident in discussions of 'fast fashion' where brands focusing on low costs and short cycle times have been accused of contributing to over-consumption downstream and race-to-the-bottom upstream in their supply chain. Brainstorming on circular concepts, participants in author2's workshops also struggled to accommodate the long-term perspective included in circular economy thinking, as fashion with a 50-, 100-, and 200-year lifespan are close to impossible to imagine within a fashion context.

The Service Shirt example also shows that organisations struggle to create an economically viable model. Current, low virgin material prices constitute a major challenge, as the low cost of virgin materials results in circular companies producing products more expensive than those by traditional players (Kirchherr *et al.*, 2018; Ritzén and Sandström, 2017). Moreover, the different phases of the circular business model (sharing, recycling, remanufacturing, etc.) are associated with costs. Therefore, the organization is dependent on the product being reasonably good at retaining value over time if the circular business is to be profitable: something that runs contrary to the short-termism described above. Moreover, if consumers fail to recognize the value of the product, they will not bring it to the next phase of the extended lifecycle. Lastly, if the marginal value of time for the product turns out to be different than expected, the organizational setup surrounding the circular business model may become inefficient and expensive (Blackburn *et al.*, 2004).

The concept of *value* is a core component of business model thinking (value proposition, value creation, value delivery, value capture, etc.) (Bocken *et al.*, 2014; Laasch, 2018). According to Kornberger (2017), value is typically assumed rather than analysed in strategy research, and almost exclusively linked to financial profit and consumer perceptions. While the limitations of the commercial value logic have been addressed in the literature on business models for sustainability, the tendency to adopt an organisation-centric view of the value have received less scholarly attention. Fashion brands generally have neither an interest in nor a tradition of designing products that create value for *other* organisations, even though collaboration seems to be an important factor for ensuring the future success of circular business models. The organisation-centric view of (mainly) commercial value may help to explain the relatively slow adoption of circular business models despite their claimed collective benefits (Kirchherr *et al.*, 2018).

The question of scaling has often been highlighted as a major challenge to sustainability. According to Visser businesses' attempts at transforming practices towards sustainability has up till now: "completely failed to avert – or even substantially moderate – the negative impacts of economic growth and business activity." (2010, p. 34). The question also arising from the case of The Service Shirt is the extent to which such a model is operationable, at product level, but even more so at firm level. To what extent might such a model create value for customers, the environment as well as the firm (Amit and Zott, 2012; Pal and Gander, 2018). As noted by Pal and Gander (2018), unless these experiments with more sustainable products offers are accompanied by fundamental business model innovations, they risk becoming a set of positive initiatives that give the appearance of a sustainable future, but are ill-equipped to replace dominant unsustainable business models in fashion.

In summary, combining circular economy thinking with a conventional business model logic is not an easy endeavor. The circular economy necessitates a move away from the focus on a single business model to the recognition of multiple, complementary business models (plural), which, in combination, create value for business and society through the prolonged use of products and materials. The Service

Shirt brings to light the necessity to take sustainability issues to a strategic level (Ritzén and Sandström, 2017). Value creation, value delivery, and value capture are spread, adapted, and transformed as the products and materials travel through different stages and different organisations. For instance, a t-shirt from an in-store recycling bin is rarely returned to a first-tier supplier or anyone else in the upstream supply chain. Instead, the t-shirt is made circular through the intervention of private recycling companies, charity organisations, or clothing libraries, for example – each of which has their own, unique business model. Unless value creation, value delivery, and value capture are somehow aligned, agreed upon and coordinated throughout the entire product lifecycle, circular business models are likely to result in tensions, which will stop the anticipated loops from happening. Therefore, circular business models require that organisations look beyond a firm-centric perspective of value and take into account the multiple business models of all stakeholders in the loops.

6. Conclusion

The purpose of this paper has been to examine the complexities of designing for circular business models in the fashion industry – an industry notoriously known for its investment in linear (and fast) business models. Circularity operating with time spans quite different from current linear business models, the designerly and practice-based approach represented by the Service Shirt brings about new opportunities to explore and discuss the future of circular business models. In the words of Ritzén and Sandström: “The ability to perform radical innovations is strongly connected to an explorative way of working, deeply connected to how knowledge is gained. In exploration, knowledge is looked for outside the company, and experiments are made for learning purposes in invention activities.” (2017, p. 11).

The Service Shirt example shows that circularity is difficult to accommodate in the current business environment, ultimately requiring a shift in the predominant, firm-centric view and the myopic focus on short-term economic value. In a sense, circularity is often a misguided concept as products are rarely returned to the original source but are reused, recycled, shared, and upcycled elsewhere with the involvement of new actors. The complexity of the various cycles also highlights the extent to which companies have to: i) onboard new skill sets to enable and qualify value creation, delivery, and capture and ii) invest in partnerships, e.g. partner with local production units to enable circularity (Ellen MacArthur Foundation, 2017). Finally, the Service Shirt highlights the paramount role of consumers in the value-creation process (Stahel, 1986), indicating the need for companies to invest in long-term relationships with customers.

From a design perspective, the Service Shirt highlights the central role of the designer. In contrast to the current business model, circularity asks designers to design for multiple business models and uses as opposed to a singular function and use. This is a daunting task that necessitates designers to think differently about “fashion”, style, materials, and more. However, the Service Shirt also highlights the

urgent need to collaborate across professions, departments and organizations. Taking a circular approach, sustainability can no longer be restricted to a single unit, department or profession.

This paper has limitations. It discusses the complexities of circular business models from a management perspective, but it does not delve into the discussions of, e.g. the net environmental impacts of circular loops and longevity more generally (Murray *et al.*, 2017). Additionally, the Service Shirt is somewhat limited as a tool for discussing the future of circular fashion business models, since it is difficult to predict customer uptake and practice – not least due to ongoing “fashion cycles”, changing technologies and possible future regulations. Further exploration of the consumer-business interaction in bringing about circularity is thus suggested – in particular, research that adopts a designerly, practice-based approach that will offer the opportunity for more tangible explorations and discussion.

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