ASOS JOURNAL
The Journal of Academic Social Science

Akademik Sosyal Araştırmalar Dergisi, Yıl: 14, Sayı: 172, Ocak 2026, s. 255-273

ISSN: 2148-2489 Doi Number: http://dx.doi.org/10.29228/ASOS.88397

Yayın Geliş Tarihi / Article Arrival Date *17.11.2025*

Yayımlanma Tarihi / The Publication Date *29.01.2026*

Arş. Gör. Dr. Elif KURTULDU DÖNMEZ
Dokuz Eylül Üniversitesi, Güzel Sanatlar Fakültesi
Tekstil ve Moda Tasarımı Bölümü
elif.kurtuldu@deu.edu.tr
Orcid: 0000-0001-7118-9574

DO IT YOURSELF MOVEMENT IN ZERO-WASTE FASHION: CUSTOMIZABLE, OPEN-SOURCE-ACCESSIBLE GARMENTS IN DIGITAL DATABASE AND PLATFORMS

Abstract

This study examines the relationship between the Do-It-Yourself (DIY) movement and zero-waste (ZW) fashion, focusing on open-source, user-modifiable garment practices facilitated by digital platforms. Rather than addressing digital fashion technologies in general, the article focuses specifically on how DIY-based pattern systems, open-access resources, and participatory design cultures contribute to zero-waste garment design and production. This study, conducted through a qualitative research design based on systematic literature review and visual content analysis, investigates how consumer-producer practices are reshaping design, production workflows, and waste reduction efforts in fashion. The research emphasizes that the producer-consumer approach is becoming increasingly widespread in the design and production of printable, customizable, open-access, zero-waste clothing, supported by digital technologies. Thus, the producer movement, open-access platforms, and user-centric design culture encourage participatory production in terms of sustainable fashion and zero waste. This study critically examines contemporary zero-waste DIY initiatives, garment pattern-sharing communities, and their compliance with zero-waste principles. By analyzing designer and consumer-focused zero-waste practices through the contributions of DIY culture and open-access platforms, the work contributes to the literature by framing the zero-waste concept as both an environmental strategy and

a design methodology compatible with digital culture. Through examples, it examines the reciprocal relationship between sustainability, digitalization, and user-centered design and production, highlighting the importance of interdisciplinary studies and digitalization in design for future work in textile and fashion design.

Keywords: Zero-Waste Fashion, Do-It-Yourself (DIY), Prosumer, Open-Source Fashion, Participatory Design.

SIFIR ATIK MODADA KENDİN-YAP HAREKETİ: DİJİTAL VERİTABANI VE PLATFORMLARDAKİ KİŞİSELLEŞTİRİLEBİLİR, AÇIK-KAYNAK ERİŞİMLİ GİYSİLER

Öz

Bu çalışma; dijital platformlar tarafından daha kolay bir biçimde erişilebilen açık kaynaklı ve kullanıcılar tarafından kişiselleştirilebilir giysi uygulamalarına odaklanarak Kendin-Yap Hareketi (DIY) ile sıfır atık (ZW) modası arasındaki ilişkiyi incelemektedir. Çalışma, genel olarak dijital moda teknolojilerini ele almak yerine, özellikle DIY tabanlı giysi kalıp tasarım sistemlerinin, açık erişimli kaynakların ve katılımcı tasarım kültürlerinin sıfır atık giysi tasarım ve üretimlerine nasıl katkıda bulunduğuna odaklanmıştır. Sistematik literatür incelemesi ve görsel içerik analizine dayalı nitel bir araştırma tasarımıyla gerçekleşen çalışma, tüketici-üretici uygulamalarının modada tasarımın, üretim iş akışlarının ve atık azaltma çalışmalarının yeniden nasıl şekillendiğini araştırmaktadır. Araştırmada, dijital teknolojilerin de desteklediği yazdırılabilir, kişiselleştirilebilir, açık-erişimli kaynaklı atıksız giysilerin tasarım ve üretiminde üreten-tüketici anlayışı gün geçtikçe yaygınlaştığı vurgulanmaktadır. Böylece üretici hareketi, açık erişim platformlar, kullanıcı odaklı tasarım kültürü; sürdürülebilir moda ve sıfır atık açısından da katılımcı odaklı üretimlere teşvik etmektedir. Çağdaş sıfır atık DIY çalışmaları, giysi kalıp paylaşım toplulukları, sıfır atık prensiplerine uyumlulukları gibi açılardan da eleştirel bir biçimde incelemektedir. Çalışma, tasarımcı ve tüketici odaklı sıfır atık çalışmalarını DIY kültürü ve açık erişim platformlarının katkıları üzerinden inceleyerek, sıfır atık kavramının hem çevresel bir strateji hem de dijital kültüre uyumlu bir tasarım metedolojisi olarak yeni bir çerçeve çizerek alana katkıda bulunmaktadır. Sürdürülebilirlik, dijitalleşme ve kullanıcı odaklı tasarım ve üretimin karşılıklı ilişkisini örnekler üzerinden inceleyerek, tekstil ve moda tasarımı alanındaki gelecek çalışmalar için disiplinlerarası çalışmaların ve tasarımda dijitalleşmenin önemini vurgulamaktadır. Kendin-yap Hareketi'nin (DIY) sürdürülebilir moda ve sıfır atık yaklaşımı açısından sunduğu yeniliklerin tekstil ve moda tasarımı alanına olan katkılarının incelenmesine dayanmaktadır. Araştırmada, dijital teknolojilerin de desteklediği yazdırılabilir, kişiselleştirilebilir, açık-erişimli kaynaklı atıksız giysilerin tasarım ve üretiminde üreten-tüketici anlayışı gün geçtikçe yaygınlaştığı vurgulanmaktadır. Böylece üretici hareketi, açık erişim platformlar, kullanıcı odaklı tasarım kültürü; sürdürülebilir moda ve sıfır atık açısından da katılımcı odaklı üretimlere teşvik etmektedir. Çalışma; tekstil ve moda tasarımında üretici ve tüketici rollerinin yeniden tanımlanmasına, bireysel üretimlerin küresel sürdürülebilirlik hedefleriyle nasıl bütünleştiğine, tasarımın

erişilebilirliğine ve çevresel farkındalığa dair katkılar sunmaktadır. Çalışma ayrıca bu üretim biçimlerini şematize ederek de alana ayrı bir katkı sunmaktadır. Diğer araştırmalardan farklı olarak, sıfır atık kavramı sadece çevresel bir strateji olarak değil aynı zamanda üreten-tüketici modelini güçlendiren bir dijital üretim modeli olarak ele almaktadır. Sürdürülebilirlik, dijitalleşme, kullanıcı odaklı tasarım ve üretim ilişkisini bütüncül bir biçimde güncel örnekler üzerinden inceleyerek disiplinler arası bir bakış sunmaktadır.

Anahtar kelimeler: Sıfır Atık Moda, Kendin-Yap, (DIY), Üreten-tüketici, Açık Kaynaklı Moda, Katılımcı Odaklı Tasarım.

INTRODUCTION

Changes in the supply-demand balance along with industrial production processes and consumption habits such as fast fashion, have caused environmental pollution that needs to be controlled on a global scale. In this regard, sustainable development, which came to the fore as a method of control especially in 1970 and after, began to be adopted on a wide scale from large industries to small local businesses over time. The environmental consequences of industrial fashion production, particularly those associated with fast fashion, have intensified scholarly and practical interest in alternative design and production models. Among these, zero-waste (ZW) fashion has emerged as a critical design methodology aimed at eliminating textile waste at the pattern-cutting stage. Cutting waste alone accounts for approximately 15% of total textile waste generated during garment production, making pattern design a central intervention point for sustainability in fashion (Enes, 2019).

Many forms of production shaped by technology, industry, design, and art are now intertwined with sustainable approaches as both a necessity and an obligation. In this regard, the concept of zero waste (ZW) has become a subject of study in the textile and fashion design (T&FD) industry, encompassing a wide range of areas, from fabric production to garment and product manufacturing. Parallel to the development of zero-waste fashion, the Do-It-Yourself (DIY) movement has gained renewed relevance through digital technologies, open-source platforms, and online maker communities. DIY fashion practices increasingly enable users not only to assemble garments but also to modify, adapt, and redesign patterns, thereby participating directly in design decision-making processes. This convergence of DIY culture and zero-waste design foregrounds the figure of the prosumer an individual who simultaneously occupies the roles of producer and consumer.

While existing literature often addresses DIY, digital fashion technologies, and sustainability as overlapping themes, there remains a lack of critical analysis focusing specifically on how DIY-based open-source practices contribute to zero-waste garment design rather than to digital fashion innovation more broadly. This study addresses this gap by asking: How do DIY-oriented, open-source garment practices support or fail to support zero-waste fashion design, and what roles do prosumers play within these systems?

Clothing patterns that are called conventional, ongoing, ordinary, and classic have been replaced over time by clothing shaped with concepts such as zero waste, waste-free, cutless, and seamless. Rather than being an element of fashion and the maker movement trend, these clothes gain meaning when they are aligned with the principles of today's slow fashion production styles.

From this perspective, the concept of sustainability in fashion and textile design has the potential to be sustainable in many ways by blending the knowledge and experience of the past with current design and technology. From a broad perspective, the concept of sustainability in fashion and textile design goes beyond design and production, representing a very broad perspective, such as business, marketing, trade, logistics, and waste disposal.

The quality of being sustainable in a design and product is a subject that is also examined in the context of environmental or traditional. At this point, sustainability in fashion should be able to be sustained, kept alive, exist, and created as abstract and concrete values and notions.

It is possible to come across sustainable textiles centuries before the concept of sustainability was coined as a term after the 1970s, due to reasons such as material limitations, difficulty, and slowness of production. In many parts of the world, it is seen that textiles are produced without seams, without cutting, without cutting waste, which are passed down from generation to generation, can be repaired and used again, and can be transformed into another product. This has led to some of these continue to exist as seamless, waste-free, cut-free garments that represent a culture, a belief, a community. Sustainable textiles, which emerged from all cultural transfers over time, came to the fore again after 1970 with their environmentally sustainable production and design features.

In this study, the qualitative research design grounded in systematic literature review and case-based analysis. This approach is considered appropriate due to the exploratory and conceptual nature of the research, which aims to examine the relationship between the DIY, zero-waste fashion, and digital production practices within textile and fashion design. In this context, the primary data sources consist of articles, thesis, collections, open-access digital platforms, and databases. Cases and sources were selected according to DIY principles, zero-waste, digital technologies amd prosumer-oriented production models. Then, these sources analyzed through thematic analysis, focusing on production methods, waste reduction strategies, degrees of user participation, and the role of digital technologies. These themes were comparatively evaluated to identify recurring patterns and conceptual relationships between sustainability, digitalization, and user-centered design. The scope of the study is limited to contemporary examples that explicitly combine DIY practices with zero-waste fashion and digital production technologies. While the study provides a comprehensive conceptual overview, it does not include empirical user testing or quantitative waste measurements, which are suggested as directions for future research.

Methodology

This study adopts a qualitative research design grounded in a systematic literature review and case-based content analysis. The research focuses on contemporary examples that explicitly combine DIY practices with zero-waste garment design and open-access dissemination. Then, primary sources include, peer-reviewed academic literature on zero-waste fashion, accessibility of garment patterns, pattern hacking, and the tendency of zero-waste thinking in these digital garment pattern platforms and databases. The secondary sources include the contribution of these open-accessed patterns for sustainability in fashion design practices, especially for future design strategies.

DIY Movement, Sustainability, and Prosumer Concepts

The potential of open-source and user-modifiable fashion practices should be considered not merely as a field of technical or digital innovation, but as a critical paradigm of production and consumption. Digital tools, particularly open-access pattern databases, downloadable and reconfigurable design systems, and online sharing platforms, strengthen DIY fashion by significantly expanding individuals' capacities to produce designs from scratch. However, these digital possibilities are not disconnected from historically rooted, craft-based, and analog DIY practices; rather, they evolve in continuity with them. The DIY movement in fashion has been shaped by anti-consumerist and sustainability-oriented activist initiatives that emerged in response to industrial mass production, fast fashion, and overconsumption from the mid-twentieth century onward, and has since become globally accessible through digitalization. Within this transformative process, the concept of the prosumer, as articulated by Alvin Toffler (1981), occupies a central position. Unlike the traditional consumer, the prosumer is not a passive subject who merely purchases finished products, but an active agent who participates directly in design, production, adaptation, and knowledge-sharing processes. In this respect, prosumerism departs from designer-centered and hierarchical production models within the fashion system, supporting a participatory, transparent, and sustainable design culture. Open-source DIY fashion practices reposition the prosumer beyond a user who merely expresses aesthetic preferences, transforming them into a conscious producer-consumer who engages with zero-waste principles and redefines value creation processes in fashion.

Within this conceptual framework, the historical roots of DIY and its intersection with sustainability movements can be traced back to the emergence of sustainable development discourses in the 1970s. To such an extent that the work carried out by local producers as artisans is actually carried out within the framework of sustainability.

Then, the creative industries movement, which began a quarter of a century ago in the 1970s when the boundaries of sustainable design and production were drawn, has already initiated the need for the formation of new definitions within art and design activities. So much so that the DIY, which was effective in revealing the potential of individuals who had no interest in art and design in the context of labor after 1950 to create an art and design object, was born in this period. "DIY first occurred during the 1950s as a reaction to a post-war shortage of labour in Britain" (Atkinson, 2003, p.2). DIY has facilitated access to craftsmanship through individual incentives. However, the issue of whether consumers who produce with DIY are craftsmen or not has also begun to be discussed in this period. So that; "The craftsman, described by Johnson in 1773 as an artificer, manufacturer, a mechanick" said Atkinson (2003). But in this perspective, DIY makers may not have formal training or education about art, design, or technics. DIY has enabled the consumer to produce the object they will consume; that is, it has enabled the consumer to become a producer at the same time, thus giving rise to producer-consumers. Thus, "The term prosumer, created in the 1980s, combines the words producer and consumer to describe a consumer able to solve problems in a Do-It-Yourself (DIY) initiative" (Duarte el al., 2017; Toffler, 1981).

Thus, a design process in which the consumer is also involved in production has become increasingly common in the textile and fashion industry. Moreover, the fact that this movement coincided with the same period when the concept of sustainability was expressed more clearly and solutions were sought made this movement valuable in terms of re-questioning

consumption. When we look at the first prosumer examples, we see that the consumer, in the product purchasing process, can customize the design by choosing one of the alternatives and shape it physically and visually in line with their own tastes and needs. Although it may seem like it encourages consumers to consume more when viewed from this perspective, when viewed from a supply-demand perspective, it plays a significant role in prevent excess supply and directly deliver what is demanded.

In the 21st century, the maker movement emerged as a subheading of the DIY movement in publishing. Then it continued in maker-centered education models (MCE), Science, Technology, Engineering, Art, and Mathematics (STEAM). The DIY movement has historically emerged in response to economic constraint, material scarcity, and resistance to mass production. Rather than assuming a lack of skill or education, DIY practices encompass a wide spectrum of competencies, motivations, and cultural contexts. In contemporary fashion, DIY intersects with sustainability by fostering repair, reuse, emotional durability, and long-term garment attachment. The concept of the prosumer, first articulated by Toffler (1981), describes individuals who actively participate in both production and consumption. Within zero-waste fashion, prosumerism acquires a specific design significance: users are not merely assembling garments but engaging with pattern geometry, fabric efficiency, and fit adaptation without generating offcuts. This distinguishes zero-waste prosumer practices from mass customization models that prioritize aesthetic choice without addressing material waste.

DIY, which have been realized on an accessible scale all over the world through many individual and collective initiatives, have always been intertwined with zero-waste approaches in the context of today's necessities. One of these areas of collaborative thinking is, significantly, the textile and fashion industry, one of the most intensive design, production, and consumption industries. From the very first day to the present, the DIY has been involved in textile and fashion design with a wide perspective, from accessories to clothing.

Just as the effort to sustain existed before the concept of sustainability, it seems that the DIY also existed before it emerged as a concept. This movement, the first examples of which are widely seen in the Bauhaus movement, actually emerged with the spread of production activities to individuals, small workshops and businesses, and collective production areas. From this perspective, the DIY is closely related to the idea of sustainable design and production. So much so that Atkinson also gathered the do-it-yourself movement under four headings, evaluating it in terms of individual preferences, abilities, requirements, and necessities as follows:

> Pro-active DIY: which contain significant elements of self-directed where the motivation is personal pleasure or financial gain. Reactive DIY: that consisting of hobbies and handcraft, kits, templates, or patterns where the motivation is personal pleasure or financial gain. Essential DIY: which consists of home maintenance activities carried out as an economic necessity or because of the unavailability of professional labour. Lifestyle DIY: that consisting of improvement activities undertaken own labour is by choice rather than need. (Atkinson, 2006, p. 3)

It is seen that the DIY, in all its forms, from necessity to necessity, has a very close relationship with both the survival of tradition and sustainability in the environmental context.

From Bauhaus to the present day, sustainable production has begun to take place through workshops as well as individual studies organized in art, craft, and design work areas, such as art workshops and cooperatives. In these workshops, the facilitator shared theoretical and practical knowledge, creating personalized products. Through this production method, participants not only learn about and embrace sustainability but also embrace the products they create, ensuring their long-term use and intergenerational sustainability.

DIY practices, like all disciplines and movements, have evolved and transformed over time, yet their core connection to sustainability has not been lost. From this perspective, the opportunities offered by today's technologies, the ease of production, and the increased availability of resources, materials, and equipment have added a new perspective to the DIY movement. All of this has led to innovative practices related to sustainability.

DIY Movement within the Scope of Zero Waste

The zero-waste approach has become one of the most emphasized concepts at every stage of both design and industrial production processes of textile and fashion design. As sustainability gains importance in this industry, minimizing waste generation has emerged as a central objective. In particular, cutting waste constitutes approximately 15% of all textile waste generated through clothing and textile production (Enes, 2019). This corresponds to an average of 60 billion m² (around 92 million tons) of discarded fabric each year (Rissanen & McQuillan, 2016). Consequently, increasing attention has been directed toward production methods that aim to eliminate or minimize waste and reduce environmental damage (Kurtuldu Dönmez, 2025).

Within this framework, the DIY has become an influential force aligned with the principles of zero waste. The DIY approach encourages individuals to design, create, and repair their own garments and accessories, thereby extending product life cycles and reducing dependence on raw materials. This form of participatory production supports localized, small-scale, and low-impact methods, as Fletcher's (2008), notion of "craft of use," which emphasizes user engagement, emotional durability, and the longevity of garments. By encouraging creativity and personal engagement with clothing, DIY practices challenge the disposability of fast fashion and support the development of a more sustainable fashion system.

DIY-based production within the scope of zero waste often involves reuse, recycling, and upcycling strategies. According to Gwilt (2020), these processes encourage designers and consumers alike to rethink material, value and design garments that generate minimal waste throughout their lifecycle. Techniques such as zero-waste pattern cutting, discussed extensively by Rissanen and McQuillan (2016), allow designers to utilize the entire fabric surface without producing offcuts, thereby addressing one of the most significant sources of material waste in garment manufacturing.

From a broader perspective, the DIY also represents a social and cultural transformation. As Niinimäki (2013) argues, sustainable fashion is not merely a question of materials or technologies but also of changing consumer behavior and fostering deeper emotional engagement with clothing. DIY practices empower individuals to transition from passive consumers to active producers, instilling a sense of agency, environmental responsibility, and craftsmanship. The growing presence of online communities, repair workshops, and collaborative making spaces and studios further strengthens the cultural dimension of this movement, promoting knowledge sharing and collective creativity.

In conclusion, the DIY can be understood not only as a personal creative practice but also as a socio-ecological strategy that integrates seamlessly with zero-waste principles. By encouraging creative production, resource management, and participatory design, DIY practices contribute to the reduction of textile waste and the redefinition of fashion's value system.

In this context, with the opportunities provided by digital technologies, production models that enable more global and active participation through easier and more affordable access for consumers have begun to develop. Within the framework of the DIY, particularly in relation to zero waste and sustainability, the production methods illustrated through the examples below demonstrate their contributions not only in environmental terms but also within socio-economic and cultural dimensions. Accordingly, it is anticipated that these studies will form the foundation for waste-free production models grounded in a sustainable philosophy, and that the number of conscious producer-consumers will increase through future research integrating artificial intelligence-based applications.

Zero-Waste Laser Cutting for DIY Garments

Among the digital methods aligned with the DIY and zero-waste movements, laser cutting stands out as the oldest. Dating back to the 19th century, laser cutting is important not only for reducing cutting waste but also for offering environmental solutions through other methods such as "engraved, embossed, and denim fading" (Nayak & Padhye, 2016). When considered in terms of cutting, "In synthetic fabrics and leathers, laser cutting produces well-finished edges as the laser melts and fuses the edge, which avoids the problem of fraying produced by conventional knife cutters" (Nayak & Padhye, 2016).

Zero-waste pattern cutting, as theorized by Rissanen and McQuillan, involves designing garment patterns that use the entire fabric surface. Within DIY contexts, such patterns must also be legible, adaptable, and resilient to user modification. Open-source zero-waste patterns enable prosumers to adjust fit or silhouette while preserving waste-free logic as a key distinction from conventional downloadable patterns.

It's achieved by cutting fabric using a laser, based on information transferred from digital data. This method was used even before the zero-waste movement, particularly for cutting large-scale garment patterns. It stands out as a method that produces less waste compared to cutting fabric with scissors. It has also become widespread due to its reduced margin of error and increased production capacity. Laser cutting is widely used in the industrial sector because it is suitable for a wide variety of fabric types and yields results in fabrics with varying elasticity, volume, and fiber orientation. Laser cutting also facilitates production methods requiring more detailed handwork, such as lace, carving, and embroidery.

In terms of production method, laser cutting can be expressed as "fabric + laser cutting (+/- sewing) = garment +/- waste" (Figure 1).

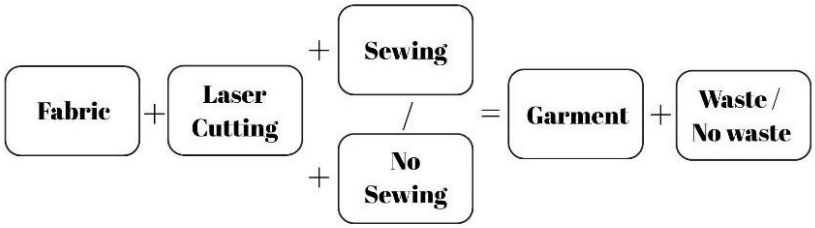


Figure 1. Production Flow of Laser-Cutting for Garments

As previously mentioned, laser cutting, combined with printable patterns and open-access resources, contributes to the DIY and zero-waste movement. For example, Dutch designer Martijn van Strien's 2015 collection, titled Post-Couture, stands out for its synthesis of innovative technology and sustainability. Strien's work utilizes pattern systems based on the principle of zero waste. Aiming to create a seamless collection, Strien designed the garment like a puzzle, connecting the pattern edges at all points where stitching allows for a snug fit (Figure 2). The collection was then completed by laser cutting the patterns and assembling them in a seamless, waste-free manner. These puzzles can be combined by the user in various ways or left unjoined to create a different look. This provides the consumer/user with a DIY experience. Following this collection, the designer continued with similar designs and productions, customizable. The user assembling the clothing sent as a kit can actually be considered as a method of marketing an experience as well as marketing a garment.



Figure 2. Post-Couture, Laser-Cut Seamless DIY Garment, Martijn van Strien
(Reference: https://www.henryvandevelde.be/en/awards/17/post-couture-antwerp)

The rapid expansion of laser cutting in the fashion and textile industries, followed by its potential in line with the sustainability movement after 1970, provided significant background knowledge and experience for zero-waste clothing creation. Subsequently, in the 21st century, with the addition of digital and technological solutions to zero-waste clothing creation methods, the DIY movement took a step further, becoming accessible on a global scale, and supported the maker movement, such as individual production and producer-consumer. These approaches,

outlined below, are intertwined production methods that cannot be clearly separated. At the same time, these methods, by incorporating the notion of sustainability, support the DIY.

The opportunities offered by technology for waste-free production are yielding positive results. For example, digital pattern and cutting systems, seamless, cut-free, and waste-free production lines, waste-free pattern designs, as well as the availability of technologies from different disciplines for textile and fashion design, and the addition of artificial intelligence applications have facilitated waste-free production. In addition to all these opportunities, the proliferation of open-access resources, particularly in the wake of the global pandemic (Covid-19), has fostered both zero-waste awareness and the DIY.

From this perspective, printable, user autonomous, downloadable, laser-cut, customizable, and open-access garments cannot be strictly separated. it's impossible to clearly distinguish between Because these mutually reinforcing concepts, when considered and designed as one or more of them, contribute even more to the zero-waste and DIY.

Printable DIY Clothing

Digital systems have made a significant contribution to the production of zero-waste clothing using innovative production methods and technological advancements. These creative methods, inspired by applications from various disciplines, have been adapted to textile and fashion design and have reached the present day. When we examine the production of printable and downloadable garments with a zero-waste principle, we see that this is achieved with the support of digital systems. The digitally designed garment pattern is printed onto fabric using ink. This process operates on the same principle as printers that print with ink on paper. The only difference is that instead of paper, we use low-stretch, elastane-free fabrics, which have a smoother and denser weave structure, preferably woven fabrics. Depending on the type of fabric used, the ink placed in the printer transfers the garment pattern, sent from the computer, onto the fabric. The smoother and more even the fabric surface is, the better the transfer of the pattern will be.

These printable patterns, which are being studied extensively, particularly in the area of zero-waste clothing design, are created using a clothing program, a pre-made pattern, or a drawing scaled to fit the fabric width in a different program. Designed as a zero-waste pattern on the screen, the pattern can be cut at specific points after being printed onto the fabric, enabling seamless, waste-free garment production. In some cases, waste-free production is only possible by stitching multiple printed fabrics together. In this case, the production method for printable/downloadable garment patterns can be expressed as “download + printing on fabric + cutting (+/- sewing) = garment +/- waste,” as shown in Figure 3. This production method is also important because, from a cutting perspective, it rarely produces waste.

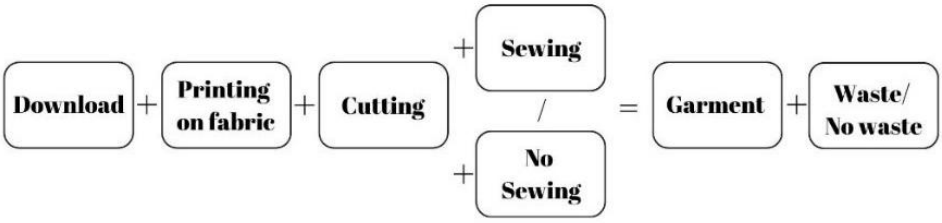


Figure 3. Production Flow of Printable/Downloadable Garments

Notably, the significant contributions to printable and downloadable zero-waste clothing patterns, in terms of cutting, sewing, and waste-free design, have been made by Madeleine Vionnet and Issey Miyake, and more recently, Holly McQuillan and Timo Rissanen. The garment pattern below is printed in color directly onto fabric and then stitched together, resulting in colorful garments with no cutting or waste (Figure 4).



Figure 4. Zero Waste Garment, Printable Zero Waste Garment Pattern Design, Holly McQuillan (McQuillan, 2019).

In light of these studies, it's possible to find examples of printable, downloadable, zero-waste clothing patterns from many designers. Among these projects, "tessellation (shape repeats)" (Saeidi & Wimberley, 2015, p.1) and jigsaw puzzles (McQuillan, 2011), designed to create zero fabric waste, are particularly noteworthy. These patterns are arranged like a puzzle, leaving no gaps in the fabric. Once cut, they can be sewn together without creating any fabric waste. These patterns can be printed on paper or directly onto fabric under suitable conditions. Printable patterns, transferred to fabric in color or pattern using digital printing, can also be produced by prosumers with color and pattern changes.

For example, the open-source educational website University of Fashion offers training in jigsaw puzzles and zero-waste garment pattern design. Some of the training content is also shared openly. Short and long-term certified training is also offered on this and similar platforms (Figure 5).



Figure 5. Creative Draping Zero-Waste Puzzle Dress, Fiona Liu, 2025

(References: https://www.universityoffashion.com/lessons/creative-draping-zero-waste-puzzle-dress/)

Customizable DIY Clothing

When looking at examples of customizable DIY clothing, we come across Holly McQuillan, who has been particularly innovative in her work on zero-waste clothing and zero-waste textiles (Figure 6). McQuillan's research project at Massey University, "Make/Use," explores the concept of zero-waste user-modifiable clothing (McQuillan, 2015). These garments are also described by their designers as "User-Modifiable Zero Waste Fashion (UMZWF)" (McQuillan et al., 2018, p. 1). These garments are designed as systems rather than fixed outcomes. These systems allow users to reconfigure garments over time without material loss, positioning zero waste as an ongoing practice rather than a single production event. Importantly, the visual coding of zero-waste patterns—such as color segmentation—serves to communicate construction logic rather than digital printing instructions. Misinterpretation of such representations risks conflating zero-waste geometry with surface design.

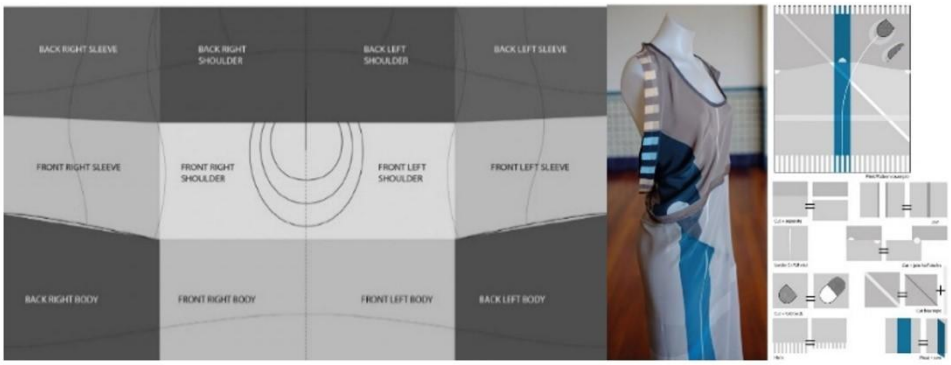


Figure 6. Make/Use, Pattern and Garment, Holly McQuillan (McQuillan et al., 2018).

The production method of customizable clothing patterns can be expressed as "customizing + download + printing/drawing on fabric + cutting (+/- sewing) = garment +/- waste" as given in Figure 7.

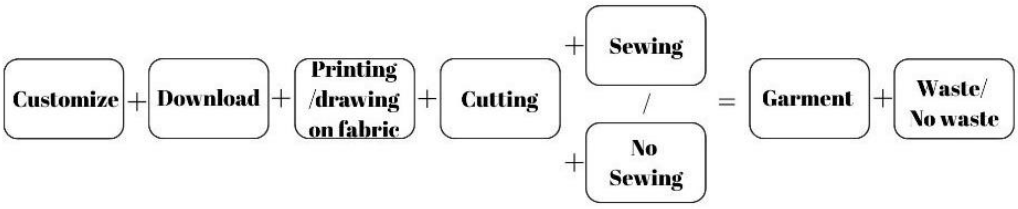


Figure 7. Production Flow of Customizable DIY Garments

Just like McQuillan's work, many designers, engineers, and brands are developing different digital approaches to the concept of waste-free clothing. Names like Bonny Beattie (Figure 8). Anna Piper, Julian Robert, Ariel Bishop, Rickard Lindqvist, Greta Menzies, Mark Liu, and Daniel Silverstein are all using digitalization in their zero-waste clothing designs, sharing their work as open-source and customizable. These open-access, customizable designs can be downloaded online and redesigned using a suitable drawing program to meet individual body measurements and requirements. This allows prosumers to produce zero-waste, sustainable clothing within their own resources.

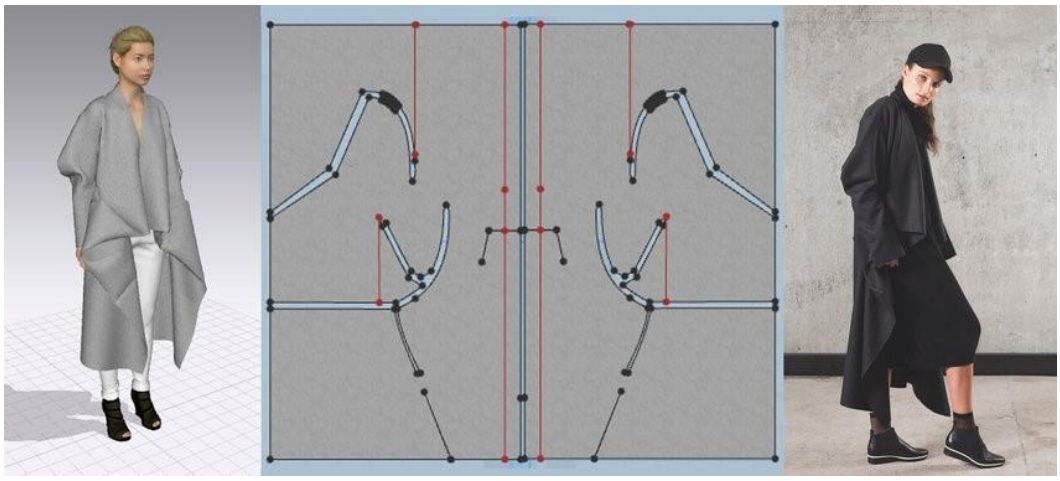


Figure 8. Zero waste customizable open-source jacket, Bonny Beattie (McQuillan, 2020).

Open Source Accessible Platforms and DIY Zero-Waste Communities

One of the most important working disciplines in the DIY is the concept of open-access fashion clothing. "Open-Source Clothing refers to apparel designs and production methods made freely available for anyone to use, modify, and distribute. This approach fosters collaboration and innovation, promoting transparency and community-driven development within the fashion industry. It challenges traditional proprietary models, encouraging a more democratic and accessible system for creating and sharing clothing designs." ("Open Source Clothing", 2024). When viewed from a sustainability perspective, open-access resources are crucial for reducing resource consumption, reducing waste, encouraging local and individual production, and reducing carbon emissions. In fact, producers and consumers can now easily access all the necessary information and criteria to access resources simply through a digital platform. Sharing designs freely and openly on digital platforms and social media channels is also valuable for promoting sustainable, waste-free clothing designs and fostering the adoption of slow fashion over fast fashion.

A look at open-access fashion resources reveals that their foundations began with paid, open-access platforms. WGSN, in particular, facilitates trend analysis, online research, and sharing, providing designers with access to garment patterns, print patterns, knitted and woven patterns, and accessory drawings. Designers then process this data in appropriate programs, achieving efficiency in terms of time, raw materials, and energy. The Techpaker platform, then, elevates resource sharing by providing designers with a diverse and interactive environment for exchanging ideas, along with a wealth of digital drawings that can be modified, enhanced, and personalized. This has become a communication tool used not only by designers but also by manufacturers and customers. Designers can download templates and make direct changes to the drawing program. This reduces production error criteria, time, and resource consumption, thereby providing global efficiency.

Open-source zero-waste fashion platforms differ fundamentally from general digital fashion repositories. Platforms such as the "Zero Waste Pattern Database" (Figure 9) explicitly curate patterns according to zero-waste criteria, enabling users to compare design strategies, share feedback, and adapt patterns within waste-free constraints. Some websites such as

Clothkits, Digital Pattern Library, and Birgitta Helmersson also offer access to zero-waste clothing patterns for a low fee or for free, in addition to the garment patterns that not mentioned as zero-waste.In contrast, platforms that merely offer digital templates or 3D visualizations without addressing cutting waste cannot be assumed to support zero-waste fashion. Therefore, openness alone does not guarantee sustainability; zero-waste outcomes depend on pattern logic, material strategy, and user literacy.

DIY zero-waste communities, often operating through blogs, workshops, and social media, play a crucial role in disseminating tacit knowledge, documenting pattern adaptations, and collectively refining waste-free design practices. These peer-to-peer exchanges represent an underexplored but vital dimension of zero-waste fashion systems.

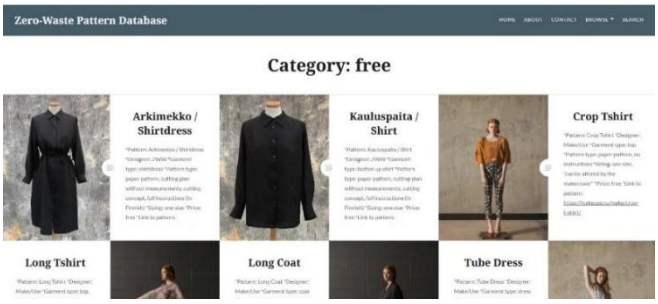


Figure 9. Open Access Database Sample

(Reference: https://zerowastepatterndatabase.wordpress.com/category/price/free)

These databases allow sharing not only the works of individual users but also designer-specific works, whether paid or free. For example in Figure 10, features a three-dimensional rendering of a garment from fashion designer Iris Van Herpen's collection, created using 3D printing technology. This and similar seamless, cut-free, and waste-free garment production methods are shared openly on the platform. Producers and consumers with a 3D printer can directly produce and modify the garments themselves, thanks to this platform.

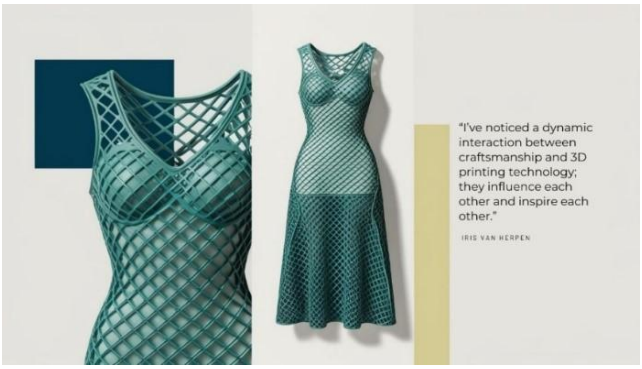


Figure 10. 3d Printed Garment Design, Iris Van Herpen, 2025

(Reference: https://techpacker.com/blog/design/indefinite-guide-to-3d-printing-in-fashion/#google_vignette)

Customization is also possible with open-source garments produced using 3D printers. Because 3D printing allows for the creation of variations in size, depth, relief, volume, color, and texture through a computer program. By printing downloaded designs using 3D printers, garments can be produced with a small amount of PLA residue (polylactic acid) or new sustainable materials, depending on the design, resulting in near-zero waste. The production method achieved through 3D printing can be expressed as "+/- customizing + download + 3D printing = garment +/- waste," as shown in Figure 11.



Figure 11. Production Flow of 3d Printed Clothing.

Among the many platforms where free, open-access fashion resources are shared, Open-Source Circular Fashion, founded by Fabricademy, stands out. This initiative focuses on sharing new technologies and ideas applied in the textile industry, open to everyone, and supports the DIY movement by promoting waste-free, cut-free, seamless, sustainable, and slow fashion approaches (Figure 12).



Figure 12. Zero Waste Digital Designed Garments

(Reference: https://fashion.sustainability-directory.com/area/open-source-clothing/)

Sharing material on a wide range of textile and fashion production techniques, including garment pattern design, three-dimensional drawings, production stages, sewing stages, digital prints, and knitting samples, is featured. Many producer-consumers on the platform share their work, both positive and negative, in full detail, helping others create the same design more sustainably, while consuming less material and time.

Just like Open-Source Circular Fashion, Techpaker, Fashion Open Studio, and Thingiverse are also important open-access fashion platforms. Techpaker, in particular, stands out as a platform that includes digital drawings that can be modified, improved, and

personalized. Open-access, downloadable garment patterns can be defined as "download + printing on fabric/paper + cutting +/- sewing = garment +/- waste." (Figure 13).

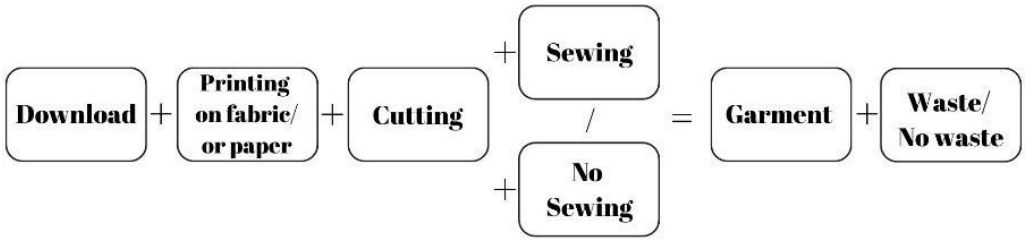


Figure 13. The Production Flow of Open Access Sourced Clothing

In this context, when looking at individual initiatives, Victoria Konash is one of the most important designers who shares openly downloadable zero-waste clothing patterns and production processes. Having spent her life in post-Soviet Belarus in the 1990s, the designer states that she was born into a zero-waste lifestyle (Konash, 2021), (Figure 14).



Figure 14. Downloadable open-access zero waste garment samples, Victoria Konash, 2011.

(Reference: https://www.zwdcollective.org/post/a-journey-to-create-10-zero-waste-dress-designs-by-victoria-konash)

While the designer shares the patterns and production stages of all her works openly, she also works with a donation system to facilitate accessibility. This allows prosumers with varying budgets to experience the same zero-waste design by creating it themselves using different fabrics.

Empirical Content Analysis of DIY Zero-Waste Communities

To address the lack of empirical grounding in existing zero-waste DIY fashion research, this study incorporates a qualitative content analysis of active DIY zero-waste fashion communities operating on digital platforms. The analysis focuses on publicly accessible content shared between 2020 and 2025 on Instagram, independent blogs, and open-access pattern-sharing platforms. Data were collected from:

Instagram posts using hashtags such as #zerowastefashion, #zerowastepattern, #diyfashion, and #makeuse

User comments and pattern modification notes from the Zero Waste Pattern Database

Designer-led blogs and documentation pages accompanying downloadable zero-waste patterns

A purposive sampling strategy was applied to select content that explicitly referenced zero-waste pattern logic, pattern modification, or user-led garment adaptation.

RESULTS

The analysis indicates that successful zero-waste DIY practices rely heavily on clear pattern logic and transparent documentation. Users frequently adapted garments through modular reconfiguration and fit recalibration rather than altering pattern outlines, thereby maintaining zero-waste integrity. Community discussions often centered on resolving fit challenges without generating offcuts, demonstrating an applied understanding of zero-waste principles.

However, the findings also reveal that not all open-source patterns labeled as zero-waste enable meaningful user modification. Patterns lacking construction explanation or geometric rationale often resulted in user confusion or unintended waste generation. This highlights the distinction between nominal openness and functional zero-waste usability.

The DIY Movement, considered in terms of sustainable fashion and zero-waste approaches, has expanded its reach, particularly with the contribution of digital technologies. Printable, customizable, downloadable, and printable waste-free clothing designs, considering contemporary notions of textiles and fashion, bring about a more democratic production process. Increased user participation, particularly the ability of consumers to simultaneously assume the role of producers, reflects the rise of sustainability as a social and cultural phenomenon. Thus, sustainability gains significance not only from an environmental perspective but also from a societal perspective.

The analysis reveals that DIY-based zero-waste practices facilitate a shift from passive consumption toward active user participation. Printable, downloadable, and customizable garment systems enable users to engage directly in design and production processes, thereby strengthening user autonomy and user agency. In this context, the prosumer model emerges as a central framework through which sustainability is operationalized at the individual level.

The study's contribution to the field reveals that zero-waste fashion is not merely an ecological design strategy. It is particularly important for conveying production methods that strengthen the producer-consumer model in the digital age. In this context, it suggests that the roles of producer and consumer in textile and fashion design can merge into a single producer-consumer role, and that individual production can become a sustainable approach thanks to open-source access. Thus, instead of a solely consumption-focused system, it offers a sharing-based, experience-based, and collective production practice, enabling the supply-demand balance. It appears that digital technologies form the basis of these producer-consumer-centered practices.

Laser cutting, 3D printing, digital pattern systems, AI-assisted design tools, and open-access databases are compatible with sustainability not only in terms of resource use but also in terms of speed and time. Thus, individuals can design waste-free clothing based on open-access resources, developing and customizing patterns according to their preferences. This emphasizes the even greater importance of participation-focused fashion as it evolves towards a sustainable future.

From a forward-looking perspective, the integration of augmented reality (AR), artificial intelligence (AI), and digital twin technologies into fashion design processes is also seen as crucial in the DIY's relationship with sustainability. It is anticipated that within the next quarter-century, AR-based applications will elevate waste-free clothing design by allowing users to visualize their designs in a virtual environment and customize them to their bodies. Similarly, in this study: Digital twin technologies are also believed to be openly accessible, enabling waste-free personal production with zero error by creating a virtual model of an individual's physical measurements. It is also anticipated that artificial intelligence applications will provide a valuable information archive for producers and consumers, particularly on topics such as resource management, waste reduction, and zero waste.

Both as a craft activity and as a digital output, all DIY practices will contribute to environmental sustainability. In this context, sustainability is not only relevant to environmental impacts but also to social, economic, and cultural sustainability. As with all sustainability-conscious fashion approaches, open-access resources are also encouraging in terms of providing equitable access and sharing. It is possible to integrate digital technologies into local, small workshops, and individual production without breaking away from traditional fashion approaches. Therefore, it is crucial that the DIY movement be supported by fair production models that both protect the environment and make labour visible in terms of sustainable fashion.

In conclusion, this study examines the innovations offered by the DIY in the context of zero-waste fashion from an interdisciplinary perspective. By combining technological, social, and cultural components, it proposes a conceptual framework for the future of fashion. This new understanding of production, situated at the intersection of digitalization, sustainability, and user participation, transforms fashion not only into a design field but also a tool for ethical, environmental, and economic transformation. Furthermore, the studies cited above strengthen the role of the prosumer, enabling individuals to become active producers. The experiences of production offered by these studies are significant in terms of increasing consumer awareness of responsibility and fostering their embrace of slow fashion trends.

This study demonstrates that the integration of DIY practices, zero-waste design principles, and digital technologies offers a viable and sustainable alternative to conventional fashion production systems. By positioning users as active participants rather than passive consumers, DIY-based zero-waste fashion redefines value creation within the industry. The findings contribute to the literature by framing zero-waste fashion not only as an ecological strategy but also as a participatory and digitally enabled production model. Future research may build upon this framework through empirical studies, user-centered evaluations, and quantitative assessments of waste reduction outcomes.

These findings support the argument that zero-waste fashion operates most effectively as a participatory system when supported by active knowledge exchange. Prosumers function not

only as makers but also as co-designers who refine and extend zero-waste systems through iterative practice. This empirical layer substantiates the conceptual claims of the study and demonstrates how DIY communities contribute to the evolution of zero-waste fashion beyond designer-authored models.

REFERENCES

Atkinson, P. (2006). Do it yourself: Democracy and design. *Journal of Design History*, *19*, 1-10.

Doğan Sözüer, Z. & Dönmez Yavuz, G. (2023). Eşitlikçi bir tasarım hareketi olarak "kendin yap" ve modaya yönelik uygulamalar. *yedi: The Journal of Art, Science and Design, 29,* 99-114. https://doi.org/10.17484/yedi.1068680

Duarte, A. Y. S., Sanches, R. A. & Dedini, F. G. (2017). The influence of mass customization and maker movement in the textile and apparel industry. *J Textile Eng Fashion Technology, 2(5),* 478-479. https://doi.org/10.15406/jteft.2017.02.00072

Enes, E. (2019). *Adaptation of Zero-Waste Pattern Design Method to Fashion Industry with the Case of Turkey*. Doctoral Thesis. İzmir Ekonomi University.

Fletcher, K. (2008). *Sustainable Fashion and Textiles: Design Journeys.* Earthscan.

Gwilt, A. (2020). *A Practical Guide to Sustainable Fashion* (2nd edition). Fairchild Books.

Kurtuldu Dönmez, E. (2025). *Sürdürülebilirlik Kapsamında Dikişsiz Dokuma Giysiler ve Biçim Arayışları.* Doctoral Thesis, Dokuz Eylul University, Faculty of Fine Arts.

McQuillan, H. (2011). Zero-waste design practice: strategies and risk-taking for garment design. A. Gwilt & T. Rissanen (Eds.), *Shaping Sustainable Fashion: Changing the Way We Make and Use Clothes* (p. 83-97).

McQuillan, H., Archer-Martin, J., Menzies, G., Bailey, J., Kane, K., & Fox Derwin, E. (2018). Make/Use: A System for Open Source, User-Modifiable, Zero Waste Fashion Practice. *Fashion Practice*, *10(1),* 7–33. https://doi.org/10.1080/17569370.2017.1400320

McQuillan, H. (2019). *Zero Waste Design Thinking.* Master Thesis, University of Borås.

McQuillan, H. (2020). Digital 3D design as a tool for augmenting zero-waste fashion design practice. *International Journal of Fashion Design, Technology and Education, 13(1),* 89-100. https://doi.org/10.1080/17543266.2020.1737248

Nayak, R. & Padhye, R. (2016). The use of laser in garment manufacturing: an overview. *Fash Text, 3(5),* 1-16. https://doi.org/10.1186/s40691-016-0057-x

Niinimäki, K. (2013). *Sustainable Fashion: New Approaches.* Aalto University.

Open Sounce Clothing (2024). Open Source Clothing website. Access date: 13.08.2025 https://fashion.sustainability-directory.com/area/open-source-clothing/

Rissanen, T. & McQuillan, H. (2016). *Zero Waste Fashion Design,* Bloomsbury.

Saeidi, E. & Wimberley, V. (2015). Precious circles-zero waste design. *In International Textile and Apparel Association Congress Proceedings Book* (pp. 120-135). University of Alabama, USA. https://www.itaaonline.org/