

Precious Cut: A Practice-Based Research Toward Zero-Waste Design by Exploring Creative
Pattern Cutting Methods and Draping Techniques

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Textile waste is created in either pre-consumer or post-consumer stages of a garment's lifecycle. Pre-consumer textile waste consists of wastage of fiber, yarn, fabric, and garments during manufacturing. Post-consumer textile waste is created by consumers, consists of any type of garment or household item that has become expendable (Hawley, 2006). This study is concerned with pre-consumer textile waste and, more specifically, the waste created during the design and cutting processes. The authors investigate the viability of two creative pattern-making techniques to achieve zero or low waste fashionable designs.

With the contemporary methods of fashion construction only effectively using 85 percent of fabric in a garment, 15 percent of the total fabric is left on the cutting room floor (McQuillan, 2011). This waste is leaving a "significant ecological footprint" (Rissanen, 2008, p. 184). Fabric waste for adult outerwear varies on average from 10 to 20 percent, with the estimation of 10 percent for trousers or pants and greater percentages for blouses, jackets, and underwear (Rissanen, 2013). This waste occurs because pattern pieces have irregular shapes, which make them impossible to interlock perfectly to be able to use 100 percent of fabric length and width.

The zero waste approach is not a new concept. Patterns taken from historical clothing show that less fabric was wasted in the process of making fashionable garments. Ethnic costumes and traditional national dress are examples of zero waste design concepts. During the Pre-Industrial Revolution period, producing textiles and garments was time consuming; therefore, fabrics were treated as a precious resource and Pre-Industrial Societies tried to use every cut piece, which sometimes resulted in using 100 percent of the fabric (Burnham, 1973). After the Industrial Revolution, the textile industry improved through new technologies being used in producing textiles with the result that some fabrics become so inexpensive that the amount of waste was not regarded as problematic or of concern.

Different ways of eliminating negative space by manipulating pattern pieces have been identified by McQuillan (2011). One practice design is *tessellation*, which consists of one shape or motif that repeats to fill the width and length of the fabric. Depending on the tessellated shape, there would be wasted areas that are not included in the design, which is mostly along the selvedge of the fabric. Holly McQuillan has tried different ways to overcome this problem; one is using mathematical objects called fractal, which have random shapes to reduce or eliminate the waste at the edges. The other solution would be using smaller sized tessellated shape as they get close to the edges of the fabric (McQuillan, 2011) or using tessellated shapes with straight edges instead of curved ones to meet the fabric width (Carrico & Kim, 2013). The shortcomings of tessellation method are as follows: first, the final look is not predictable before the cutting process is finished; second, this method cannot follow the curves of the human body because layering tessellated shapes on a dress form creates a sculptured garment rather than a draped one; finally, the whole process could consume a greater amount of fabric in comparison to a conservative, modern cutting method.

This study tried to solve the problem of this method by using curved motif while keeping the more traditional appearance and flattering the curvy, feminine silhouette. In this test the tessellated shape was circle in four graduated sizes for more pleasing appearance and judicious placement of the shape for body coverage. Rather than just using the shapes alone, this design utilized the shapes for the bodice and ground fabric for the skirt.

This study also examined the possibilities of using the new design technique called *Transformational Reconstruction*, discovered by Japanese designer Shingo Sato, to eliminate fabric waste. This technique manipulates the garment pattern in 3D not 2D. Unlike the traditional design process where a designer creates the pattern for the design and then tests the pattern by making a muslin toile, this method started with a fitting control garment. On this fitted 3D garment, the designer drew desired design lines using expertise knowledge in patternmaking and design in order to place the design lines in an appropriate place to keep the shape and fitting of the garment. In the first trial, straight lines were used for the ease of interlocking the pieces together for a zero-waste design. Fabric choice is also critical to the appearance. In this test, a double-sided fabric was used, which allowed for the pieces to use the reverse side for two-color pattern effect overall. Smaller triangular pieces were usable to get a better armcseye at the intersection with the side seam.



The two garments that resulted in this study were good fitting and attractive appearance and achieved zero-waste utilization of fabric. If the designer, pattern maker and marker maker are all committed to zero-waste design, successful garments can be produced for contemporary fashion without being noticeably of zero-waste design.

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