

Implementing Zero Waste Fashion in Apparel Design

Faradillah Nursari¹ & Fathia Husna Djamal²

¹School of Creative Industries, Telkom University, Bandung, Indonesia

²School of Creative Industries, Telkom University, Bandung, Indonesia

faradillah@telkomuniversity.ac.id (Faradillah Nursari), fathiadjamal@gmail.com (Fathia Husna Djamal)

Abstract The fashion industry is one of the largest contributors to the economy in Indonesia. However, this industry is the producers of both pre-production and post-production waste in large quantities causing environmental pollution. To meet the needs of consumers for fashion products, this industry actively design or renewing the design of apparel, resulting fabric waste from production in significant quantities during the process. Currently, there are varying viewpoints from practitioners and academics who argue that in order to reduce waste, the effort will be optimized when done during the pattern making and cutting process. Since the year 2008, the concept of zero waste fashion design or better known by the acronym ZWFD has been widely studied and practiced by students, academics, and practitioners in the field of fashion that has interest in the issues of waste pre-production and its influence on the environment. ZWFD itself refers to the steps to produce apparel with the minimum waste from fabrics during the pattern making and cutting process. This research aims to examine how the concept of ZWFD can be implemented in the course of design and apparel production. Characteristic of the fabric used in this experiment is first identified in order to deliver the possible way to work with the fabric in a three dimensional form. Furthermore, the experiment process continues until a certain form and a lowest waste percentage is achieved. The final result of this research is a garment with as much as seven different looks from one key pattern with two different pattern making methods, namely flat pattern cutting and draping.

Keywords : Apparel, Draping, Zero Waste

1. Introduction

In the textile and fashion industry, there are two categories of waste, namely industrial waste and consumer waste. [1] Rissanen and Mcquillan (2016) explained that one of the industrial wastes that received less attention was pre-consumption waste originating from the garment production process. Every garment that goes through a pattern cutting process produces a patch of textile waste with an average of 15% per garment, while the estimated textile material used in garment production in 2015 is 400 billion meters. One solution that has been applied in the textile and fashion industry since 2008 is the application of the Zero Waste concept that optimizes the character and availability of materials with less than 15% pre-production

waste in the garment manufacturing process.

A fashion designer has an important role in determining the material and design of each garment in a collection. In addition to having a good sense of style and taste, the designer should also understand the pattern making and sewing process. The knowledge in garment production will also benefit designers in producing a prototype and creating more innovative designs in the future. Creative pattern cutting is a term where designers apply creative techniques to cut, drape, or manipulate pattern when producing a prototype for a certain garment design. The creative pattern cutting technique for garment production today has developed to address waste issues such as pre-production waste from remainder materials. One of its objectives is to practice sustainable values by optimizing the use of a

material in a garment to reduce pre-production waste.

1.1. Zero Waste Fashion

In the fashion industry, there are two types of waste produced in the garment production process. First, there is waste produced by the industry during the production process, such as chemical residue and material left-over. Second, there is waste produced by consumers from the consumption process. Zero waste fashion focuses on suppressing the remainder of textile waste or left-over fabric produced in the garment production during the cutting process or known as pre-consumption waste.

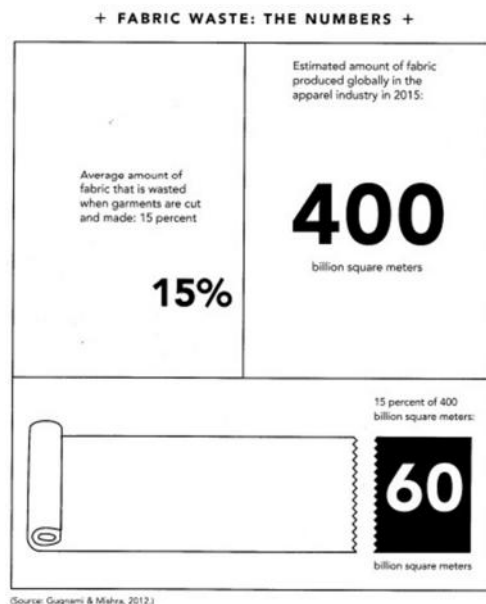


Figure 1. Pre Production WasteSource: Rissanen & McQuillan (2016)

1. **Visual Appearance.** It is important for a zero-waste garment to be visually pleasing for the consumers.
2. **Garment fit.** A zero-waste garment should have a proper fit and sizing.
3. **Cost.** The cost of a zero-waste garment should be calculated accordingly and it should not increase manufacturing cost due to its complicated patterns.
4. **Sustainability.** The characteristic of the material used to create a zero-waste garment should have durability traits, visual longevity, and ideally using sustainable fiber types.
5. **Manufacturability.** The possibility of a zero-waste garment to be made in custom or mass produced.

The criteria of a zero-waste garment ideally should include the above mentioned, however, it also depends on the context of the garment design itself. [2] Rissanen and McQuillan (2016) mentioned that the weight and importance of each criterion should compliment each other and should not result in any more issues such as the high production cost due to complicated design.

Futhermore, [3] Rissanen and McQuillan (2016) suggest that during the design process of a zero-waste garment, there are few considerations a designer should oversee, namely:

1. **Garment type.** The garment type and its basic shape will influence how designers implement the zero-waste concept, thus altering the visual appearance of the basic garment.
2. **Fabric Widht.** The width and in most cases, the length of the fabric will influence how the designer or pattern-maker decide on how to implement the zero waste concept according to the garment type. Furthermore, the dimension of the fabric used should be measured accurately and with consideration.
3. **Fabric type.** Designer or pattern maker should understand the characteristic of the fabric and how it will influence the visual appearance of the garment.
4. **Silhouette.** An appropriate block should be used according to the type of fabric or garment.
5. **Fixed areas.** The number of fixed areas in the pattern plot should not complicate the process. Ideally, there are flexible areas which designers or pattern-makers can manipulate accordingly.
6. **Specific features.** There should be a consideration on what and how to apply specific features or detail in a garment.
7. **Construction and finishing.** Details on closure and other supporting details will need further consideration in order to comply with the zero-waste concept.
8. **Pattern pieces.** Develop a system on how to document pattern pieces to assure future sustainability in the design process.

Zero-waste fashion concept has basically been practiced in various forms of traditional dress. One application of zero-waste fashion can be seen in the form of traditional

clothing in Indonesia that utilizes basic geometric shapes in its fashion patterns. The geometric shape used is generally a square shape because fabric material for clothing is made by weaving or felting techniques so that the dimensions of the material produced depend on the size of the loom. Due to the process of making material that is difficult and takes a long time, traditional people will try to optimize the existing material for clothing. Furthermore, because of this tendency, generally, clothing that has passed its lifetime will be re-constructed again so that it can extend the life of the clothing.

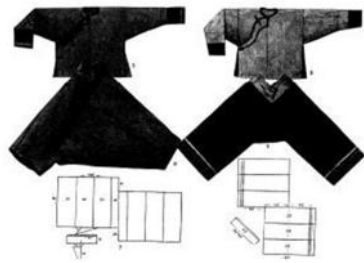


Figure 2. Example of Zero Waste Garment in History Source: Rissanen & McQuillan (2016)

Following are some forms of applying the ZWFD concept, both by current practitioners and academics:

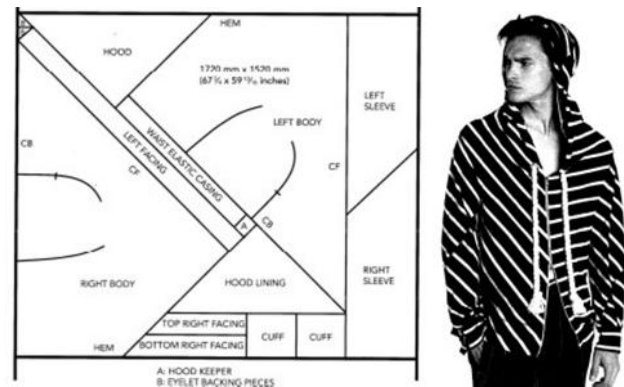
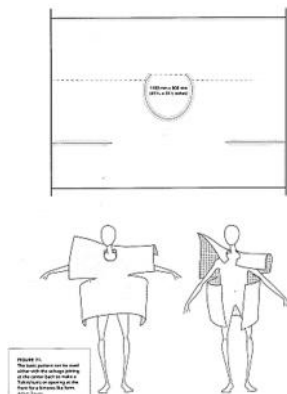


Figure 3. Example of Zero Waste Garment Today Source: Rissanen & McQuillan (2016)

Based on the picture above, it can be seen that in the application of the ZWFD concept, there is no change in the optimization of material utilization but it can be seen that the design of clothing produced can be adjusted to the tastes, functions, and needs of today's modern society. The technique used has developed and not only focuses on the process of utilizing geometric shapes to create fashion patterns but more exploratory with variations in the shape of design lines and motifs on the material used.

1.2. Design Method in Zero Waste Fashion

[4] Timo Rissanen (2013) explained in his research on various methods in the creation of fashion products in terms of the possibility of waste produced, he simplified the various methods as follows:

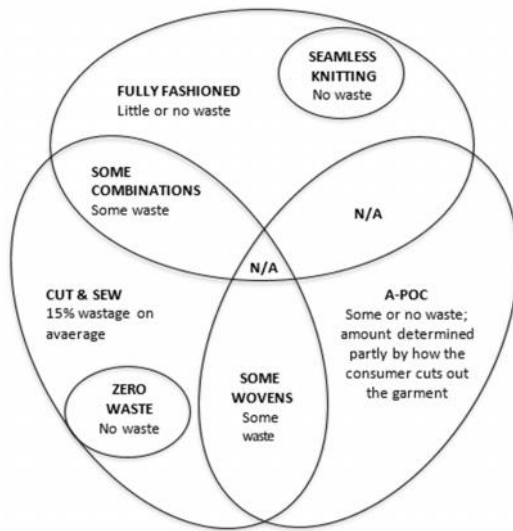


Figure 4. A Diagram of Various Zero Waste Methods Source: Rissanen (2013)

[5] Rissanen (2013) explains that the two most commonly used methods in the fashion industry are Cut & Sew, which is making clothes through the process of cutting and sewing cloth, then Fully-fashioned, namely making clothes by weaving and knitting. Based on the diagram above shows that the Fully-fashioned method often produces no waste at all, compared to the Cut & Sew method which on average produces waste as much as 15% of the total fabric. Based on the diagram, the zero waste concept is used as a solution to the use of the Cut & Sew method that can minimize the waste produced. Below are the differences between the conventional process in designing fashion and the zero waste fashion design approach:

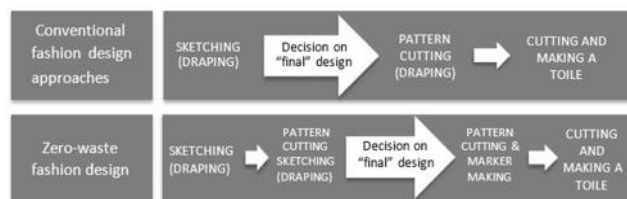


Figure 5. Comparison of Conventional and Zero Waste Approach in Garment Manufacture Source: Rissanen & McQuillan (2016)

In the conventional fashion design approach, the final design is decided based on the sketching process whereas in

the zero-waste approach, sketching is a process of draping a fabric on an human form (mannequin) and continuously adjusting on the form until the final look is decided. In this process, a designer will have different results by adjusting and cutting the fabric to create a final look. However, the designer also needs to consider the amount of cutting in the following process to avoid having more fabric waste than 15% to meet the criteria of being zero waste. When the final look is decided, the fabric is taken off from the human form (mannequin) after certain marking are made to help the pattern cutting process. In the zero waste fashion design concept, patterns are not made with drafting papers, but with the final draped fabric, thus eliminating waste from wide and long drafted patterns on papers and its cutting waste. This process is known as pattern cutting and marker making, which continues to be sewn as a toile (prototype). Most designers will consider using the actual fabric rather than the muslin, to further eliminate waste. Furthermore, by using the actual fabric, the designer is allowed to closely observe the flow, drape, and fall of the fabric on a human form (mannequin) and have a better result in the final product.

1.3 Creative Pattern Cutting in Zero Waste Fashion

Creative pattern cutting is an approach on how to apply the zero waste fashion design concept in creating a garment. Instead of the conventional process as mentioned by [6]Rissanen (2013), creative pattern cutting is a flexible method that allows designer to alter, manipulate, or combine the basic principles of pattern making method, such as contouring, added fullness, and dart manipulation [7] (Armstrong, 2010). Furthermore, designers could choose to work with a flat pattern cutting method or draping or combine both technique, which is also the sketching process, as explained in the zero waste fashion design approach [8] (Rissanen, 2013).



Figure 6. Draping Technique Directly on Human Form (Mannequin) Source: Onuma (2009)

Draping, traditionally, was a process of having a fabric on a human form and making adjustments to create a certain shape. The result is often uncertain due to the fact that human cannot control the drape, flow, and fall of the fabric due to gravity and characteristic of the fabric. However, in creative pattern cutting, draping can be controlled process with certain results as explained by [9] Onuma (2009) by marking or mapping the form to create style lines before draping the fabric. The cutting process, such as bias, on warp, or on weft, of the grain direction in the fabric could also have different final results.

Another method that is frequently used as an alternative to draping method in creative pattern cutting is flat pattern making. In the conventional process of garment making, this method is favored by designers in the ready to wear industry, due to its systematic working procedure for the garment manufacturing process. To apply flat pattern making methods in creative pattern cutting, designers should understand the grain direction of the fabric, its characteristic, dimension, drape factor, and the shape of a basic bodice pattern. Albeit the fundamental knowledge mentioned before, a designer is allowed to alter or manipulate the basic bodice to a shape more suitable for the final design. Geometric shape is commonly used to replace the basic bodice shape in mapping the pattern directly on the fabric as seen on image 2.5 above by [10] Rissanen and McQuillan (2016). Furthermore, geometric shape manipulation allows designer to optimize the use of fabric for a zero waste fashion design approach.



Figure 7. Hussein Chalayan Trompe L'oeil Collection With Engineered Print Source : Bowles (2012)

Technology is often used in garment manufacture process, specifically in pattern drafting with Gerber or Lectra, Computer Aided Design (CAD) for technical drawings, or implementing laser cutting or digital image on fabric [11] (Bowles, 2012). The use of CAD software and other digital imaging software is common today and there are more designers whose works relies on it, such as Hussein Chalayan's *trompe l'oeil* collection in 2012. The patterns for the collection is drafted in a pattern making software and developed in digital imaging software to achieve a garment that is visually seamless by applying digital images throughout the entire garment. This process is also known as engineered print, where a certain print is specifically designed to follow the form of the garment.

2. Methods

2.1. Research Method

The objective of this experiment is to create a wearable garment by applying creative pattern cutting methods and zero waste fashion design approach. Despite being a wearable garment, the user should also be able to convert the garment by adjusting certain parts of the garment to create another look. Jersey, a stretch knitted fabric is used for this garment due to its two way stretch characteristic. As a non woven fabric, jersey is known to be versatile for wearable garments and provide physical comfort to the user. Furthermore, the dimension of jersey, which is mostly available in the average width of 150cm, is considered ideal for a wearable garment that can be converted into various looks. Creative pattern cutting in this experiment is conducted with flat pattern making and afterwards continues with draping method when trying to modify the garment. Flat pattern making is used to map geometric shapes in the width and length of the jersey fabric in order to create the first pattern as the key to create a convertible garment. As the key pattern decided, the garment is draped in human form (mannequin) and adjusted in several ways to create few other looks and evaluated for better result. Last but not least, the key pattern must have zero waste or less than 15% of waste from the fabric used to optimize the usability of the fabric.

3. Result and Discussion

Figure 8. below is the key pattern created with flat pattern cutting method. The width and length of the jersey fabric used is 150 cm by 150 cm with the total waste of 5.7%.

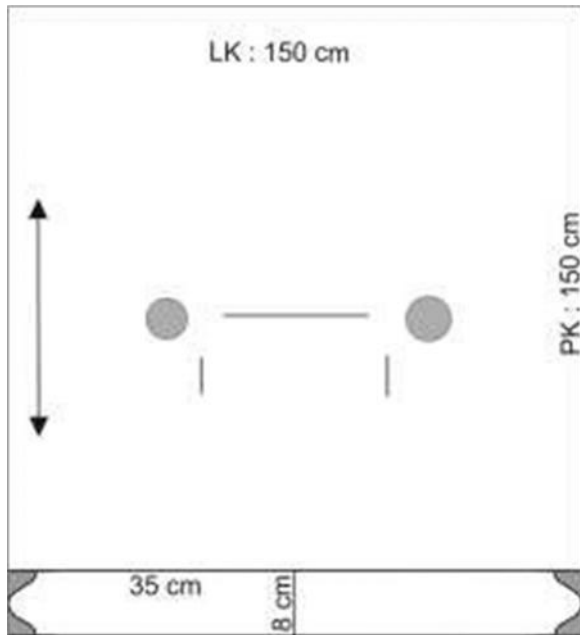


Figure 8. Key Pattern Mapped in Jersey Fabric

After the key pattern is made, the fabric is ready to be draped on the human form (mannequin) for further adjustments, added details such as hidden buttons and drawstring, to achieve a convertible garment with multiple look, derived from one key pattern. Below are the results of seven final look:

1. Look 1



2. Look 2



3. Look 3



4. Look 4



5. Look 5



6. Look 6



7. Look 7



The experiment shown how the right fabric and pattern making process could benefit the final result. However, there are other creative means in pattern making that is possible to try besides the fundamental technique of flat pattern making and draping. Adding technology, such as the use of pattern making software, digital imaging, or laser cutting is also a possibility in garment production process. Other kinds of fabric besides a non woven jersey should also be a consideration when attempting creative means in the pattern making process.

4. Conclusion

Based on the experiment, it is evident that creative pat-

tern cutting is applicable as long as the basic methods and fundamentals in pattern making is acknowledged before deciding on any combination or manipulation in the process. It is also possible to create a garment with as much as seven different looks from one key pattern with two different pattern making methods, namely flat pattern cutting and draping. Geometric shapes is also proven to be versatile in flat pattern making with many possibilities of variations depends on the characteristic of the fabric, cutting process, and the position or direction of the pattern on the fabric itself. Last but not least, by examining the final fabric waste of 5.7%, the combination of flat pattern cutting and draping by creative means is shown to be a potential method in creating zero waste garments that is not made by patchwork or fabric scraps, thus adding more usability, durability and value to the garment.

References

- [1] Rissanen, T., & Mcquillan, H. (2016). *Zero Waste Fashion Design*. London: Bloomsbury
- [2] Rissanen, T., & Mcquillan, H. (2016). *Zero Waste Fashion Design*. London: Bloomsbury
- [3] Rissanen, T., & Mcquillan, H. (2016). *Zero Waste Fashion Design*. London: Bloomsbury
- [4] Rissanen, T. (2013). *Zero Waste Fashion Design: A Study at the Intersection of Cloth, Fashion Design, and Pattern Cutting*. Sydney: University of Technology
- [5] Rissanen, T. (2013). *Zero Waste Fashion Design: A Study at the Intersection of Cloth, Fashion Design, and Pattern Cutting*. Sydney: University of Technology
- [6] Joseph-Armstrong, H. (2010). *Patternmaking For Fashion Design*. New Jersey: Prentice Hall
- [8] Rissanen, T. (2013). *Zero Waste Fashion Design: A Study at the Intersection of Cloth, Fashion Design, and Pattern Cutting*. Sydney: University of Technology
- [9] Onuma, S. (2009). *Fundamentals of Garment Design*. Tokyo: Bunka Publishing Bureau
- [10] Rissanen, T., & Mcquillan, H. (2016). *Zero Waste Fashion Design*. London: Bloomsbury
- [11] Melanie Bowles, C.I. (2012). *Digital Textile Design*. London: Laurence King Publishing