Collision

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Contextual Review and Concept: The production of apparel creates a significant amount of textile waste, thereby distending the industry's ecological footprint (Black, 2012; Fletcher and Grose, 2012; Fletcher, 2008). Textile waste may either be sent to a landfill, incinerated, or reclaimed (Hawley, 2006). Compared to other methods of textile disposal and recovery, upcycling has been identified as the best method for reducing the amount of textile waste (Han et al., 2017; Lee and DeLong, 2016; Janigo and Wu, 2015; Fletcher and Grose, 2012; Fletcher, 2008; Young et al., 2004). This is because upcycling provides a transitional solution by transforming textile waste into new products with a higher retail value (Hawley, 2006).

Previous design scholarship has explored the use of new patternmaking or cutting techniques for the upcycling of used clothing and other forms of textile waste (Hahn, 2018; Hwang and Hahn, 2016). For instance, Rissanen and MacQuillen (2016) proposed several solutions to reduce the amount of waste created when redesigning with post-consumer textile waste, such as "jigsaw or "tessellated" patternmaking. Even though these techniques have been proven to reduce the amount of textile waste generated during the production of upcycled apparel, the length of time it takes to create an upcycled garment in addition to the complexity of the design are the main reasons why such methods are not a viable option for mass production.

Very few scholars have focused on the upcycling of pre-consumer textile waste generated during the production process (Saeidi and Wimberley, 2018; Janigo and Wu 2015; Young, Jirousek, and Ashdown 2004). According to MacQuillen (2011) standard fashion design and production methods only use about 85% of the fabric bolt, while the other 15% is left on the cutting floor. Compared to second-hand clothing, textile waste generated during cutting is quite easy to upcycle because of the volume produced in addition to the consistency of the size and shape of each piece. For this garment design, I explored the upcycling of cut-offs for limited production using the apparel design software, EFI Optitex.

Process, Technique, and Execution: I utilized the design process outlined by LaBat and Sokolowski (1999) that consists of (1) problem definition and research, (2) creative exploration, and (3) implementation to develop a new approach for the upcycling of pre-consumer textile waste. The problems that lead to the development of this garment design are outlined above and include the amount of time, skill, and resources needed to upcycle textile waste. According to Han et al. (2017), the key difference between standard and upcycled production is fabric sourcing. Compared to standard fashion design, upcycled fashion design is driven by the material itself rather than consumer and market data (Han et al., 2017). Research for this design began with the survey of textile waste collected during a two-week period in India in January of 2020. I collected approximately 2 yards of rayon crepe from cut and sew facilities owned by United Dry Goods. Established in 1990, United Dry Goods has become one of the top suppliers of apparel in

South India. Their central offices are located in Bengaluru, while their cut and sewing facilities are located just outside of the city in Doddaballapur and Krishnagiri. They specialize in the manufacturing of woven apparel and largely work with brands from the Ascena Retail Group, most notably the tween girls' clothing brand, Justice.

Once it was determined how much yardage had been collected, creative exploration began by dividing the textile waste according to size and shape. Larger pieces were set aside for the front and back bodice and skirt. Afterwards, I selected an appropriate trend projected by WGSN for S/S 21 that aligned with the Ascena Retail Group's clientele. Creative exploration also occurred during pattern development. According to Young et al. (2004), elements of mass production (such as computer patternmaking, bulk pattern cutting, and industrial sewing methods) may optimize the upcycling of textile waste for mass market price points. The patterns generated for this garment design therefore were digitized using the apparel design software, EFI Optitex. Afterwards, images of the larger pieces were superimposed on top of the patterns, which allowed me to determine how each piece should be placed in order to optimize the amount of textile waste collected. This particular method was first developed by Lewis et al. (2017) who employed apparel design software to determine how new pattern pieces would fit within deconstructed upcycled garments.

After pattern development, I determined that enough pre-consumer textile waste had been collected to cut out the front and back bodice. However, there was not enough fabric for the front and back skirt. Design implementation therefore involved draping the remaining textile waste directly on the dress form to create the front and back skirt. The bodice and skirt were then sewn. French seams were used to finish seam allowances and pick stitching was used to finish necklines, shoulder seams, and the hem.

Aesthetic Properties and Visual Impact: In their comparison of standard versus upcycled fashion design and production, Han et al. (2017) found that the design of upcycled apparel is guided by sustainable strategies like "design for waste minimization" compared to consumer and market research. The strong aesthetic qualities of this design therefore were driven by my application of apparel design software, which allowed me to experiment with the orientation of each piece before design implementation. I determined that each cut-off would be positioned at a different angle to create the illusion of intersecting diagonal and vertical lines. By distorting the original pattern, the aesthetic properties of this design visually embody the disruption of traditional production methods when upcycling textile waste; line is used to characterize the non-linear nature of the upcycled design process.

Design Contribution and Innovation: While interest in upcycling textile waste has grown over the years, upcycled design scholarship has been limited to post-consumer textile waste and pattern optimization. Pre-consumer textile waste differs from the upcycling of second-hand clothing or the creation of zero-waste patterns. This garment design contributes to upcycled design scholarship in using apparel design software for the upcycling of cut-offs. Moreover, this technology may increase the rate in which pre-consumer textile waste is transformed into new products for limited production depending on the quantity and size of each cut-off. In conclusion, this garment design creates the opportunity for future research to investigate the application of

apparel design software currently used by manufacturing facilities to upcycle pre-consumer textile waste for the mass market.

References:

Black, S. (2012). *The sustainable fashion handbook*. London: Thames & Hudson.

Fletcher, K., and Grose, L. (2012). *Fashion and sustainability: Design for change*. London: Laurence King Publishing.

Fletcher, K. (2008). *Sustainable fashion and textiles: Design journeys*. London: Earthscan.

Han, S. L. C., Chan, P. Y. L., Venkatraman, P., Apeagyei, P., Cassidy, T., and Tyler, D. J. (2017). Standard vs. upcycled fashion design and production. *Fashion Practice, 9*(1), 69-94.

Hawley, J. (2006). Textile recycling: A system perspective. In Y. Wang (Ed.), *Recycling in textiles* (pp. 7–24). Boca Raton: CRC Press.

Hahn, K. H. Y., (2018). Tri-axis. *International Textile and Apparel Association (ITAA) Annual Conference Proceedings, 28*. Retrieved from: https://lib.dr.iastate.edu/itaa_proceedings/2018/design/28

Hwang, J. Y. and Hahn, K. H. Y. (2016). Polyfrost. *International Textile and Apparel Association (ITAA) Annual Conference Proceedings, 22*. Retrieved from: https://lib.dr.iastate.edu/itaa_proceedings/2016/design/22

Janigo, K., and Wu, J. (2015). Collaborative redesign of used clothes as a sustainable fashion solution: Exploring consumer involvement and experience for potential business opportunities. *Fashion Practice, 7*(1), 75–98.

LaBat, K. L., and Sokolowski, S. L. (1999). A three-stage design process applied to an industry-university textile product design project. *Clothing and Textiles Research Journal, 17*(1), 11–20.

Lee, Y., and DeLong, M. (2016). Re-Birth design analysis for developing sustainable fashion products. *Journal of the Korean Society of Clothing and Textiles, 40*(3), 566–573.

Lewis, T. L., Park, H., Netravali, A. N., and Trejo, H. X. (2017). Closing the loop: A scalable zero-waste model for apparel reuse and recycling. *International Journal of Fashion Design, Technology and Education, 10*(3), 353-362.

McQuillan, H. (2011). Zero-waste design practice: Strategies and risk taking for garment design. In A. Gwilt & T. Rissanen (Eds.), *Shaping sustainable fashion: Changing the way we make and use clothes* (pp. 83–97). London: Earthscan.

Rissanen, T., & McQuillan, H. (2016). *Zero waste fashion design.* New York, NY: Bloomsbury.

Saeidi, E., and Wimberley, V. S. (2018). Precious cut: exploring creative pattern cutting and draping for zero-waste design. *International Journal of Fashion Design, Technology and Education, 11*(2), 243-253.

Young, C., Jirousek, C., and Ashdown, S. (2004). Undesigned: A study in sustainable design of apparel using post-consumer recycled clothing. *Clothing and Textiles Research Journal, 22*(1-2), 61–68.