

The Rainbow Bridge of Ashes

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Contextual and concept statement. Fashion has embraced new technology for promoting sustainable environment (Fletcher & Tham, 2015; Lee, 2022; Scaturro, 2008) and human health and well-being (Lee, 2023). However, limited scholarly efforts were given to explore how fashion can communicate social phenomena occurring within the apparel industry with the public through the integration with emerging technology. Previous studies have shown that fashion can alter viewers' perspectives (Snodgrass, 2015) by visually communicating the sensuousness of clothing as an art (Hollander, 1993; Miller, 2007; Thompson & Haytko, 1997). Despite the importance of the social and aesthetic influences in fashion, only 0.5% of the ITAA juried designs exhibited during 2015-2022 incorporated social and environmental phenomena highlighted in the apparel industry into their design process without any design technology integration, which led us to explore our design concept. This design, *The Rainbow Bridge of Ashes*, was created to challenge how fashion can convey social and environmental issues occurring within the apparel industry (e.g., child labors, dangerous working environment) as a communicative device (Barnard, 2002; Kuruc, 2008) by incorporating aesthetic effects and the latest design technologies (e.g., 3D printing, CLO 3D, digital textile printing) in both virtual and physical spaces.

Aesthetics. The design, *The Rainbow Bridge of Ashes*, is a visual reflection of social phenomena that draws attention to the tragic events of the 2012 Pakistani textile factory fire and the 2012 Dhaka garment factory fire in Bangladesh, which let the death of many child labors. This design features a digitally printed top using bright color schemes, representing the fashion industry that attracts consumers using showy colors of clothing and eye-catching prices in marketing. At the same time, the colorful print of the top portrays the garment factory fire, which is the sacrifices of child labors who served as a "bridge" between the showy fashion industry and consumers' endless drives to the lower price product. The bright colors of the upper piece gradually tone-down to dark gray at the hemline of the dress and sleeves to metaphorically portray the death of child labors, which is represented by ashes (see Figure 1). The surface design includes images of child labors that were extracted from news reports about tragic events in the apparel industry. The crushed shape of the sleeves mimics the collapse of the two garment factories that claimed the lives of many child labors. The sharp edges of the 3D-printed interfacing panels on the sleeves represent the broken concrete of the two garment factories and the stark reality of child labors who were forced to work in the unsafe working



Figure 1.
Digitally
printed textiles

environment to meet consumer's demands for low price garments (Muhammad, 2011).

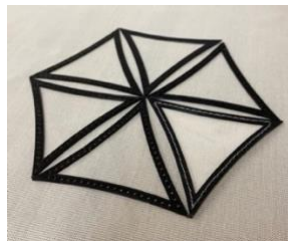


Figure 2. The 3D printed interfacing panels

Process, technique, and execution. This design utilized multiple design technologies during various design stages (Campbell & Parsons, 2004; Wong, Teo, & Russo, 2012). After completing the initial concept sketches, the design was digitized into both 2D and 3D windows of CLO 3D for patternmaking and fitting on a virtual dress form, resulting in significant savings of both time and material resources. Once the dress design decisions, including fabric type, interfacing thickness, and patterns, were finalized in CLO 3D, the triangular shape interfacing panels were created using Rhino. The 300 interfacing panels were 3D printed through multiple iteration processes; each panel consisted of 0.6mm thickness and 63 stitch holes with 1mm diameter (see Figure 2).

Total 45 hours were taken for 3D printing without counting the hours of final touches. Rigid thermoplastic polylactic acid (PLA) filaments were used to print the panels, which assist to shape the stiff mesh fabric with 100% polyester. Black PLA was chosen to well align with the dark digitally printed fabric. Meanwhile, images relating to the garment factory tragedies were collected and re-illustrated in both Adobe Photoshop and Illustrator for digitally printing on the surface of transparent stiff mesh fabric, using eco-friendly biodegradable inks. Before being printed, these print designs were simulated in CLO 3D to finalize the layout of print-designs on the physical and virtual dress form (see Figure 3). The final print designs were then imported into the CAD program associated with the MUTOH digital textile printer to ensure the high-quality digital printing. The design was finally heat-pressed on the fabric at 400°F. The 3D printed interfacing panels were attached beneath the sleeves using a sewing machine with a 3mm stitch distance. Lastly, the sleeves were shaped using draping technique.



Figure 3. The 3D prototyping

Cohesion. Using the innovative design technology and techniques, this design visually showcases social phenomena that commonly arise in the apparel industry, which may provide the better public awareness of this devastating reality within the garment factory. Following the tragic factory fires that exposed the exploitation of child labors in developing countries, this design symbolizes the unveiling dark side of the apparel industry through machine sewing 3D-printed interfacing panels and digitally printed fabrics together. The upper part of the dress was digitally printed with bold and bright colors, representing the flashy facade of fashion. In contrast, the bottom of sleeves and dress depicts the somber reality of child labors with a grayish dark mono color, evoking the sacrifices of child labors represented by ashes.

Significance, rationale, and contribution. The dress' socially conscious message challenges audiences, whether in virtual or physical spaces, to consider the impact of fashion on society and take responsibility for creating a more sustainable and equitable society. In addition, the process of creating this art piece reveals a great potential of combining 3D printing and digital textile printing for designing and developing the wearable fashion with social impact and awareness in mind.

Originality and innovation. This design showcases originality and innovation through its integration of design technology (e.g., 3D printing, CLO 3D, digital textile printing) and fashion to create the visual reflection of tragedies often occurring in the apparel industry and to provide the social awareness through this wearable art. This design is also unique and original, considering its attempt to sew the rigid 3D printed panel together with the conventional fabric for the wearable dress design.

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References

- Barnard, M. (2002). *Fashion as communication*. Psychology Press.
- Fletcher, K., & Tham, M. (Eds.). (2015). *Routledge handbook of sustainability and fashion*. Routledge.
- Hollander, A. (1993). *Seeing through clothes*. University of California Press.
- Kuruc, K. (2008). Fashion as communication: A semiotic analysis of fashion on 'Sex and the City', 2008(171), 193-214. <https://doi.org/10.1515/SEMI.2008.074>
- Lee, H. (2023). Developing a wearable human activity recognition (WHAR) system for an outdoor jacket. *International Journal of Clothing Science and Technology*, 35(2), 177-196. <https://doi.org/10.1108/IJCST-03-2022-0045>
- Miller, S. (2007). Fashion as art; is fashion art? *Fashion Theory*, 11(1), 25-40. <https://doi.org/10.2752/136270407779934551>
- Muhammad, A. (2011). Wealth and deprivation: Ready-made garments industry in Bangladesh. *Economic and Political Weekly*, 46(34), 23-27. <https://www.jstor.org/stable/23017787>
- Scaturro, S. (2008). Eco-tech fashion: Rationalizing technology in sustainable fashion. *Fashion Theory*, 12(4), 469-488. <https://doi.org/10.2752/175174108X346940>
- Snodgrass, M. E. (2015). *World clothing and fashion: An encyclopedia of history, culture, and social influence*. Routledge.
- Thompson, C., & Haytko, D. L., (1997). Speaking of fashion: Consumers' uses of fashion discourses and the appropriation of countervailing cultural meanings. *Journal of Consumer Research*, 24(1), 15-42. <https://doi.org/10.1086/209491>

