Compensating for Bias Shift

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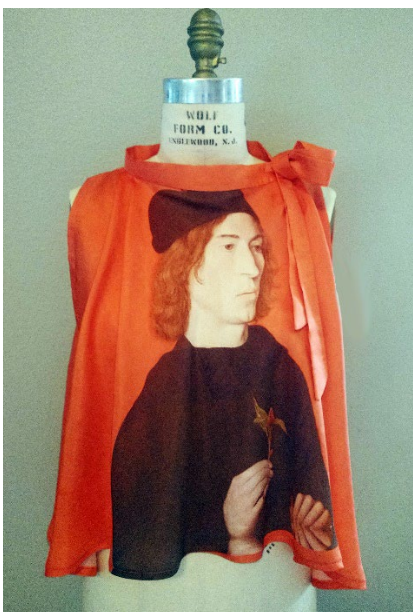
Digital textile printing is the method of using digital ink-jet technology to create an engineered design directly on fabric. Digital textile printing has provided valuable developments in the textile industry, allowing intricate photo-quality, high resolution designs to be printed easily and accurately on fabric or directly on garments, and designs capable of reducing material waste (Gooby, 2020; Hossain, 2021). The technique has been widely fostered by ITAA members as witnessed by the number of designs accepted for the Annual Design Exhibition both near the onset of the technology, with works such as Campbell (2006), and more recently by designers such as Ridgeway (2021). Although there has been large variation in the final products, digital textile printing offers wide creative potential and entrepreneurial business opportunities for apparel designers.

As designers continue to engineer prints and strive for reduced material waste, one method is printing and designing using the bias of the fabric. The 45-degree angle of the fabric, the true fabric bias, produces tensile elasticity that allows for curves that produce outfits that are more graceful and elegant (Lin & Lin, 2012). Draping or cutting cloth on the bias is frequently adopted by fashion designers, as it provides performance opportunities that are not available when cutting the fabric on grain. However, that same elasticity that is desired in garment fitting provides difficulties when working with engineered prints as they distort in both the short and long term when printed on the bias. The goal of this research project was to observe print distortion rations to determine corrections can be made to the image prior to printing so that the image has correct proportions after being printed and developed to hang on the bias.

The primary issue is that bias-cut fabrics tend to stretch in the longitudinal direction and shrink in the horizontal direction when they hang on the body. Korean researchers developed a geometrical method of measuring dimensional change by calculating the compensation ratio of fabric in the true bias direction (Park & Chun, 2012). In their study, the fabric stretched longitudinally 6.9~9.9% and shrank horizontally 7.2~11.0%. Using these percentages, we manipulated a detailed image using Adobe Photoshop to decrease the longitudinal dimension and increased the horizontal dimension of the image so that, after being printed on the bias and hanging on the body, the image proportions would be true to the original image. A detailed image was chosen so that the shifted proportions of the image were more easily viewed by the naked eye.

Using a silk twill fabric as the base, the image was printed 8 separate times: 7 times on the true bias with varying proportional changes and once on grain as a control for possible. One image of the bias had no dimensional changes applied, the other six of the images were manipulated, decreasing the length by 5%, 10%, or 20% to allow for longitudinal stretch, and increasing the width by the same percentages for potential horizontal dimensional change. The final measurements of the image were recorded after printing, washing, and drying of the fabric. To mimic the fabric being used in a bias-cut garment, the fabric was mounted on a rod, with a light weight at the bottom, and hung for 9 months. At the conclusion of the 9-month period, the images were re-measured, and the data recorded. Based on our findings, the image that was decreased in length by 5% and increased in width by 5% was the image that measured closest to the original control image.



To apply our research findings to a garment, we chose another detailed image, manipulated the proportions with a 5%-dimensional increase in width and a 5% decrease in dimensional length, then printed the image on the true bias of the same roll of silk twill. The final garment is represented here; however, the garment hasn't yet been hung on the body, so the fabric has not yet completed it's shift in length and width.

The results of this research project showed that a 5% compensation ratio, in both the vertical and horizontal direction, was the most appropriate dimensional change required when printing an image on the bias. A possible limitation of this finding is the type and weight of the fabric and possible placement of the image on the fabric as it relates to the final garment. By understanding these potential dimensional changes when working on the bias with digital prints, designers can compensate for changes in advance of production, so that the resultant garment and image is true to the original image.

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