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Physical to Virtual: Optimizing the Apparel Product Development Process to Reduce Solid Waste in Apparel

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Physical to Virtual: Optimizing the Apparel Product Development Process to Reduce Solid Waste in Apparel

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Introduction: In 2012, 14.33 million tons of textile waste was generated in the United States, which represented 5.7% of total municipal solid waste. Of these textile waste, 15.7% was recovered and 12.08 million tons were discarded. The apparel giant Nike (2013) defines waste as any product or material purchased anywhere in the supply chain that does not ultimately end up in the consumer’s closet. This definition includes non-product waste (such as packaging), manufacturing waste (such as scrap material in contract factories) and product waste such as samples. In addition to textile waste from the cutting room and post-consumption, apparel sampling can also generate a huge amount of textile waste. A major apparel brand would easily have millions of product samples each year, which may become textile waste. The purpose of this project was to focus on using virtual prototyping as an alternative to waste generated in physical apparel sampling. Many types of materials are used in apparel products, and each material has different environmental impact. Sustainable Apparel Coalition has developed material sustainability index (MSI) that can help companies choose the most sustainable textile materials. We sought to mesh the possibilities of virtual prototyping with MSI data, using version 2 of the MSI tool. Waste Reduction in Product Development Phase: We hypothesized that waste reduction in apparel production can be achieved through increased efficiency in the product development phase by the utilization of 3D technology, the benefit of using 3D technology is that problems can be solved prior to generating physical waste. Virtual Prototyping enables designers to quickly visualize how a material will ultimately appear on a product. If it is not the desired look, the developer can try different materials until the perfect match is found. The virtual/visual data help in transcending the technical aspects of fabric composition and improve tactility. Virtual prototyping saves time and money and allows the designer to explore and experience hundreds of options before making a final choice (Bux, 2014). The MSI assesses material impacts in the areas of energy, chemistry, water and waste. The current process of fabric selection in apparel product development does not take into consideration the environmental impacts of chosen materials. With a lack of access to information regarding material sustainability, developers and other decision makers cannot make informed, sustainable decisions (Nike, 2013). By embedding MSI data into the 3D prototyping system fabric library, we can educate product creation teams to use environmentally better materials and further improve sustainability. Processes and Results: A team of researchers investigated the potential of virtual prototyping by customizing a virtual fabric library based on measurements of textile mechanical property data from two knit and two woven fabrics. Optitex CAD software was used to create the virtual garment. Researchers referred to MSI data during
fabric selection. Textile material characteristics such as weight, thickness, stretch, bend, shear, and coefficient of friction were measured in Optitex laboratory and were incorporated into the customized fabric library. Researchers customizing avatar features in Adobe Photoshop and Optitex 3D model properties. The virtual garments were then created by developing 3D virtual textile structures, applying texture mapping to virtual garments using Adobe Photoshop software, embedding into the Optitex CAD software fabric library. Concurrent with virtual garment construction, researchers constructed physical garment samples out of selected textile materials, comprised of one light and one heavy weight of both knit and woven substrates as shown in table 1. Example of virtual and physical garments are in Figure 1.

<table>
<thead>
<tr>
<th>Fabric</th>
<th>Bull Denim Natural 60&quot;</th>
<th>100% Hemp Summer Cloth 53&quot;</th>
<th>Silk Velvet 45&quot;</th>
<th>100% Bamboo Rayon Fleece 60&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSI</td>
<td>26.6</td>
<td>22.5</td>
<td>19.614</td>
<td>18.3</td>
</tr>
</tbody>
</table>

Table 1: fabric selection with MSI data

Figure 1. example of physical and virtual garment.

Conclusion and Future Study: It was found that the virtual and physical garments in Figure 1 are similar. With appropriate textile characteristics measurement and textile mapping, virtual garments have the potential to replace physical garments in sampling. Improvements can be made by outsourcing 3D model features such as hair and by documenting physical garments in 360 degree format concurrent with offering runway viewing format (or similar) as output from Optitex. MSI data could be seamlessly incorporated into CAD system to facilitate sustainable material selection. Future studies include to compare virtual and physical garments by an industry expert panel survey; to measure potential waste reductions of virtual apparel prototype production in contrast to physical apparel prototype production; and to develop recommendations in optimizing apparel product development via virtual prototyping methods.

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References