A Case Study of the 3D Design Process Applied for Customized Art Wears

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Significance of Research. Clothing designers usually begin with sketching the garment concept, drape fabric on a mannequin to get the idea for 3D shape of clothing on the body, and then create the patterns for the actual garment (Wibowo et al., 2012). As clothing is worn by people with various body shapes, a fit related to the 3D shape is important to understand. In the design process, Computers Aided Design (CAD) systems such as OptiTex, Lectra and Geber PDS have an important role of creating patterns for garments. It has been found that new computer technologies can aid fashion designers and pattern makes in various ways (Umetani et al., 2011). For example, fashion designers often use new computer technologies to convert 2D patterns to 3D patterns (Wibowo et al., 2012). Also, the sketch of the garment in 2D can be transformed to a simulated model and developed into a pattern (Umetani et al., 2011). According to Yee et al. (2009), the user of 3D design software can develop creative garments in the 3D freeform drawing system with the improved real world context provided in the system. Although some experiment design research suggested the 3D design tools for design process, the application of 3D design technology for "mass" customization has been questionable to apparel manufactures and designers because there are not many case studies to support the efficiency of using 3D for the mass production and customization. Thus, this study was aimed to examine the efficiency of using 3D virtual design tools for customization process and creative design process by creating art wears with 3D design tools for individuals.

Method and Approaches: "The 3D Design for Art Wear Project" has been conducted by collaborating in creating a wearable form from a digital print in art. For the project, art wears were designed with OptiTex 3D virtual design tool and 3D body scanner to create a seamless art wear from a genuine digital print art "Superficial Outgrowths" created by the artist. In this study, customized art wears were made for individuals, and evaluated through two phases: In the first phase, a model for a sample size (Size 10) was scanned with an optical technology 3D body scan $[TC]^2$ NX16, extracting anthropometric data and the scanned model image. The scanned image was adjusted with AccuTran 3D in order to render the skin, then displayed on 3D OptiTex (Figure 1). For art wears, two sets of prototypes (a shift dress and a set of two pieces) were created, using Geber AccuMark PDS system and 3D OptiTex. For an experiment, flat patterns were drafted with Gerber AccuMark PDS and converted into 3D OptiTex. For the fabric, art image files were used and rendered with Shadder tool in OptiTex. Clothing was virtually placed on the 3D scanned model, and evaluated the fit on 3D. Alteration was simultaneously done on the screen, and plotted the finalized patterns. The two sets of garments digitally printed original art were made and provided to the artist. For the second phase, the artist selected one of art wears that was created from the first phase. In this phase, three models were randomly selected from Houston, TX where an Art Exhibition was going to place in a month. According to their

measurements of individuals' body dimensions, each virtual model was made with a built-in virtual model feature in 3D. The prototype art wears from the first phase were regenerated on 3D OptiTex. For each model's art wear, alteration was simultaneously done by comparing the art wear fit on each 3D model and 2D patterns. Final three sets of patterns were plotted out. Digital print fabrics made of 100% cotton were used for making seamless art wears for the individuals. Follow-up feedbacks assessed their satisfaction of the fit and the 3D design process (Figure 2).

Figure 1. Body Scanning and 3D Fit Assessment

Figure 2. Final Customized Art Wears

Results: In this experiment design process, customers were overall stratified with their fit and were impressed by the 3D design process. The following outcomes were found: 1) Efficient 3D virtual design fit assessment process, 2) Enable mass customization, providing seamless art wears for individuals with a just right fit, 3) Convenient process: A customer visits one time for scanning a body, then deliver a customized garment to the exhibition. Several meetings for their fitting process can be avoided. 4) Fast process: Compared to traditional fitting process, 3D Virtual design reduces the fitting time, 5) cuts of fabrics such as muslins, 6) Replicable process: Once files are saved in a hard drive, it is easy to duplicate the process and reproduce the outfits.

Conclusions and Discussion: It is a remarkable that once a person has been scanned with a 3D body scanner, stored in the 3D system and designed in 3D, mapping the art without unnecessary cutting and no physical fitting process. A customized wearable art with 3D design has been developed in this project. Designers could apply this 3D design process to eliminate complicate and multiple fitting processes. Also, this process provides benefits for developing the customized products for consumers with various body types and needs. These virtual design steps can be applied to mass production and mass customization such as art wears for individuals. This 3D technology application can simplify the design process and eliminate unnecessary process such as physical fitting process.

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