# A Practicability of Utilizing 3D Systems for Virtual Fitting Process in the Apparel Industry

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Keywords: 3D, CAD, virtual, fitting

*Significance of Research.* A "fitting" is an inevitable process for apparel manufacturers to make a decision for finalizing mass production orders. For the fitting process, 3D CAD systems are being introduced to the apparel industry. Several researchers (Sayem, Kennon, & Clarke, 2010) found that 3D CAD systems aided in visualization of the entire process from 2D pattern creation to the end product. However, according to Easters (2011), 3D human interaction technology is observed to be evolving slowly with limited success in the apparel industry. Apparel companies are reluctant to invest in new systems as they are unsure of the reliability, accuracy, and connectivity among vendors. Because of the uncertainty, this study aims to investigate the feasibility for implementing a virtual fitting process in the apparel company, providing a perspective view from the angle of technical users.

*Methodology.* This feasibility study was explored by collaborating with a global sourcing technical design team at Academic Sports Outdoor Company. A focus group consisted of seven senior students, expecting an internship in the technical design team. All users were trained for using 3D OptiTex. Virtual models were created by scanning professional fitting models. Scanned images were sent to the company and three major CAD vendors for testing if the scan data could be interchangeable. In addition, for a pattern data conversion test, a set of patterns was made with Gerber PDS, and a fitting was virtually assessed with 3D OptiTex. Then, the following questions were examined: 1) Are the virtual fitting models consistent enough for the company's use of a sample size? 2) Are the 2D/3D pattern file formats exchangeable? 3) Is this new way of a virtual fitting process efficiently improving over the typical fitting process, pertaining to the company's goal to reduce time, minimize cost of transition, and integrate serval fitting procedures? 4) How long will take for technical users to familiarize with the new system? Feedbacks from the technical users were used for data collection, and descriptive statistics was used for the data analysis.

*Findings.1) Inconsistent virtual fitting models for a sample size*: Establishing a prototype virtual fitting model was the first challenge for the company to implement a virtual fitting process. Models were scanned in several formats (e.g. OBJ, BIN, JPEG, DXF, RBD). When the files were sent to several different 3D CAD vendors, the scan data conversion was successful in recreating 3D virtual models in OBJ, WRL, or MOD file. However, two out of three CAD vendors did not have any import feature of 3D scanned images. In this case, technical users had to make a virtual model from a built-in feature by input measurements, but this manual formations process caused inconsistencies among the technical users. The key problems were associated with inconsistent manual input and users interpretations of the virtual model's body dimensions.

*2) Exchangeable production pattern data formats*: For the 3D virtual fitting process, production patterns have to be imported to 2D CAD. Pattern data conversion is an unavoidable process among apparel manufactures. In this study, technical users were asked to convert 2D patterns to the 2D/3D CAD system to evaluate a virtual fitting. Pattern data conversion from 2D to 2D was fairly easy with a conversion tool that mostly supports DXF and AAMA formats. However, some glitches were found in curve lines, points, notches, and style/model names. Although technical users were able to correct errors, they expressed that it was a tedious process and took a while to fix errors.

*3) Efficiency of a virtual fitting process:* For further investigation, one of the trained 3D technical users was placed in the technical design team, and observed a fitting process in the company. A process time of a fitting evaluation was estimated in each phase: a first sample fit evaluation, size run evaluation, pre-production evaluation, production evaluation. It has been observed that each process took only few hours with 3D. While a typical fitting process took about eight weeks in the past, a virtual fitting process took less than four days to finalize a production order. This new fitting process clearly allowed the company to reduce the time and material costs of cutting muslins and making samples.

*4) Technical users' learning curve:* All technical users in this study were previously accustomed to making patterns with 2D Gerber PDS, and they were trained for building a virtual model and a virtual fitting with 3D OptiTex PDS. In this study, it was observed that a feature of 3D process was useful for users to understand between 2D patterns and 3D outfits. Users expressed that learning the 3D tool was easier, compared to their very first time of using 2D PDS. However, users had difficulties with new functions. Although it varied by the users, it took average two and a half months for them to familiarize with the new system. Most users had difficulties with fixing errors. For novices without sufficient knowledge, they spent considerable time trying to understand the interface between 2D and 3D systems.

*Conclusions and Implications.* Overall, it is convincing that the new way of 3D fitting process enables the company to achieve improvements in process efficiencies and associated transition costs by eliminating redundant trips and materials that used to be necessary for a typical fitting process in the company. Utilizing 3D technologies might be the industry's competitive advantage. However, this study revealed limited execution in implementing 3D systems in the global supply chain. For a virtual fitting process, it is still necessary for users to have comprehensive knowledge, including 2D/3D CAD systems, anthropometry, patterns, textiles, and alteration. Further research should be performed for establishing a virtual fitting process that will impact on global supply chain. A technical design education strategy should be developed, responding to a shift from manual to virtual production in the apparel industry.

*References*

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