

Made-to-Measure Garments in 3-D

Jochen BALZULAT ^{a*}, Wolfgang SEEBAUER ^b

^a Human Solutions GmbH, Kaiserslautern, Germany;

^b Odermark Bekleidungswerke Brinkmann GmbH & Co. KG, Northeim, Germany

Abstract

Mass customization in the clothing sector is one proven solution to overcome the overall difficult market development in that industry. Nowadays there are well established made-to-measure processes that technically work but often are time consuming and error prone. Introducing 3-D body scanning intelligently supports the made-to-measure ordering and manufacturing processes by decreasing process time and increasing process stability.

Human Solutions together with its partner Odermark Bekleidungswerke Brinkmann developed and successfully implemented a seamless integration of body scanning technology from the point of sales to the cutting room. Retailers using it confirming that the technology and the underlying business model work.

In near future the present process chain will be expanded by already existing virtual try-on simulation software towards a 3-D draping solution allowing consumers to immediately see themselves dressed in customized garments of their liking.

Keywords: 3d body scanning, made-to-measure, mass customization, pattern design, virtual try-on, avatars, scanatars

1. Competitive Advantages Through Mass Customization

The industrial manufacturing of individualized clothing (made-to-measure/semi-bespoken) nowadays outnumbers the traditional fully bespoke clothing by far. It became the true success story in the apparel sector, that overall was severely depressed in the past few years.

Through sophisticated concepts the MtM processes guarantee today in almost all cases a perfect fit of the garments without any need of try-on sessions. Huge investments in the area of manufacturing lot sizes of one piece result in price brakes that are only slightly higher than those of ready-to-wear products.

This sector gives true consideration to the megatrend of this 21st century, i.e. to fulfill the constantly increasing interest of consumers for individualized and personalized items.

Established as an industrial standard so-called "try-on samples" are used to evaluate the fit of the closest size and to define the necessary pattern alterations for the individual consumers instead of developing unique single individual patterns based on consumer body measurements as it is the case for fully bespoke garments. The evaluation of fit done with help of try-on samples is the basis for a stable MtM process and allows to relinquish try-on sessions.

A second emphasis of the new MtM process is the reduction of the delivery time. In the past deliveries within two to three month were common. Today's consumers complain already about delivery times of two to three weeks as being unacceptable.

The described MtM concept however shows limits, not so much in regard to fit and design but in regard to a changing economic environment of the apparel industry and retail conditions. Constant price pressure resulted into shifting production sites into low-wage countries. As vertically organized, international companies that in the past focused mainly on sport and leisure wares recently entered the market for formal clothing prices dropped significantly in that sector. Catching up to the price points of ready-to-wear articles becomes increasingly difficult while distribution costs in the retail process increase due to the time consuming measuring and consulting requirements. Also, manufacturers struggle with still unacceptable high amount of necessary corrections of MtM orders due to measurement and configuration errors.

Further improvements seem to be difficult. Only intensive and costly training of the sales staff by the manufacturers can reduce the amount of incorrect orders. Unfortunately, typically a high sales staff turnover is observed in retail and, therefore, the overall performance is decreased again.

* jochen.balzulat@human-solutions.com; +49 631 3035600; www.human-solutions.com

The existing solutions allow only very limited worldwide export. In many countries experienced sales personal is no longer available. Training concepts that are multilingual and robust to various skill levels of trainees are not feasible and in any case costly.

To continue the success story of MtM clothing new solutions that are targeted precisely at these challenges are mandatory. [1]

2. The One-Step-Process

The partners „Odermark Bekleidungswerke Brinkmann“ and „Human Solutions“ developed jointly the „One-Step-System“ that enables to create and process made-to-measure (MtM) orders without using try-on samples at the point of sales (POS). This is possible because the whole process chain from POS to cutting room is integrated seamlessly and necessary fit information is extracted directly from the 3-D scan taken with a whole body scanner.

The benefits of such system are evident: the sales personnel is guided through an automatic process and only needs to chose the design of the MtM garment like fabric, options fit preferences. No additional differential measurements that are needed for pattern design is determined at the POS. By this the process time is reduced as try-on sessions are not needed any more and process stability is increased as the seamless automatic integration reduces errors to a minimum.



Figure 1: Examples of shop installations featuring 3-D body scanners

The One-Step-Process is split in two parts: one part consists out of hardware and software at the POS, the other part is software installed at the manufacture.

At the POS the scanner is integrated into the shop environment. The scanner hardware set-up allows that the scanner and its components can be easily and nicely adapted to the retail shop design (Figure 1). Beside the scanner control software the installation comes with software to manage the consumer database and personal information and to place the actual MtM orders. Consumers chose their preferred garments styles, fabrics, button, etc. from a digital catalog or in case of the materials alternatively from samples like fabric bunches or sample buttons (Figure 2). As the consumer is scanned and no try-on samples are needed for this process no additional measurement information needs to be collected. This does not only saves consumers' time but also increases retailers' active sales time.

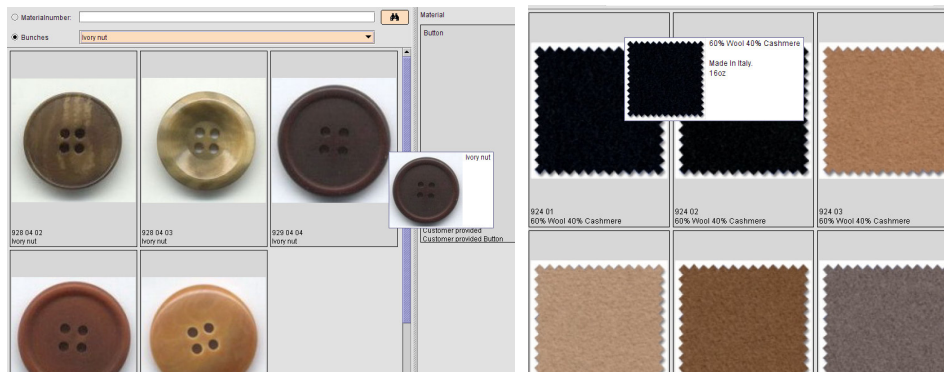


Figure 2: Examples of options offered in digital catalog

A main source of errors in the MtM process chain is the non-availability of material. Therefore, the catalogs on which the orders base are created and maintained by the manufacturer. Is the manufacturer e.g. running low on a given fabric, the fabric is removed from the digital catalog. By online access to the POS the catalog is updated and that source of error removed.

Once the order is complete and holds all garment items the consumer is interested in it is sent to the manufacturer. In manufacturing typically the order content is used in other systems. E.g. the estimated fabric consumption is forwarded to the ERP system in order to update the inventory. The One-Step-Process provides a standard interface that allows third party systems to collect the order content and to process the information further.

Automatically the order consisting out of the garment design information and the 3-D scan is forwarded to a piece of software that allows converting body measurements taken from the scan into base size information and alterations. Based on design information it is configured in such a way that the size for the base pattern is determined. As this can be seen as a virtual try-on process an advantage is that not like in real life only patterns that are bigger than the consumer body shape can be used as base pattern but also smaller ones that may result in a better fit. After the base size is determined alterations rules are executed that are specific for each garment and manufacturer. Step by step body measurements are extracted either fully automatically or interactively directly from the 3-D scan (Figure 3). Applying the alteration rules on the measurements result in alteration values for the MtM base pattern. This process emphasis strongly on a visual inspection of each step and by this makes it very obvious for the pattern designer and the operator itself what alterations are implemented and how they work for each individual order. Also, through its open architecture this tool is very flexible to configure, to integrate arbitrary measurements and alteration rules and, therefore, to adapt it to all sorts of garments, be it men's formal wear, women's wear or other garments.

Finally, once the base size and alterations are calculated a file is created that fulfill the interface specifications of the MtM tool of the manufacturer's CAD system. Depending on the process configuration from that point on the order can be fully automatically forwarded to the cutting room.

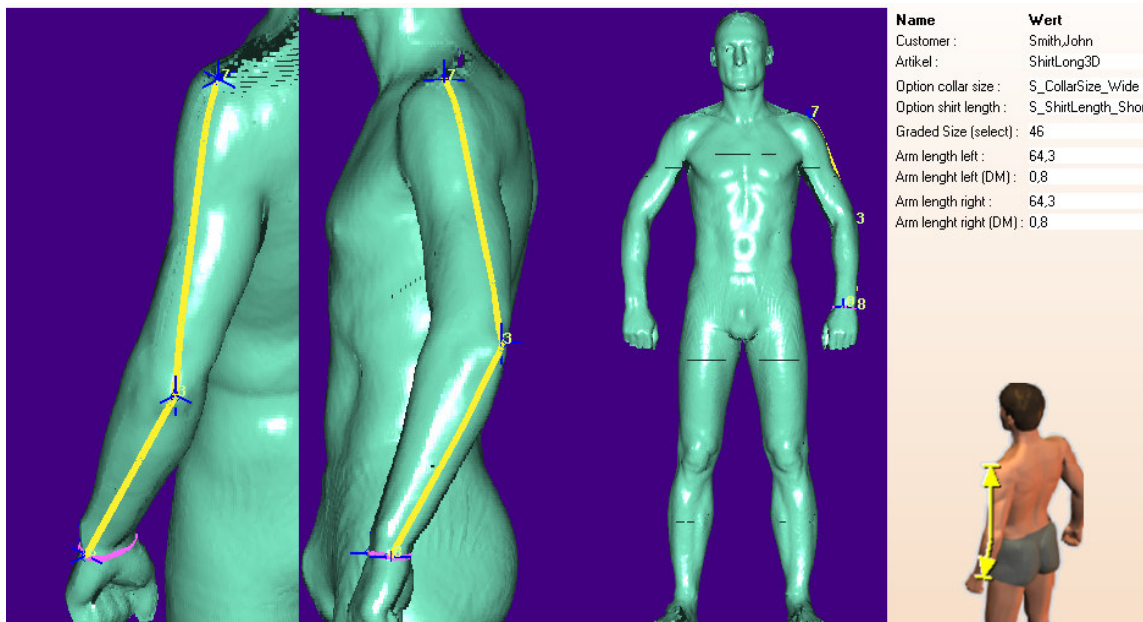


Figure 3: Sample process step to determine base size and alteration directly from 3-D scan

3. Scanatars

The quality of garment fit in processes using virtual simulation technologies is driven by many parameters. Obviously, a simulation engine is necessary that is capable of addressing material parameters, all types of seams, calculating multiple layers of garments and so on. There is high demand on the performance to use it in industrial day-to-day work. Second, the availability of patterns and the preparation of those for MtM are key. All details of the garments must be known in order to result in a realistic simulation. That is achieved by hooking up a professional CAD system that manages all the information to the simulation engine. Unfortunately, the third aspect is very often underestimated: in particularly realistic body shapes are crucial on which the garments are tested on.

Most simulation engines work with artificial human bodies that fulfill more aesthetic aspects than requirements related to correct body proportions, dimensions and 3-D shape.

Human Solutions developed a technology that turns a 3-D body scan not only into an avatar but into a “scanatar”. As apposed to an avatar a scanatar features the exact body measurements and shape of a real individual (Figure 4). Alternatively, a scanatar can be the representation of a standard size of standardized size tables or in-house models - again with exact body dimensions and realistic shape information [2].



Figure 4: Avatar (left) and Scanatar (right)

4. Perspective

As described the process to determine MtM manufacturing information based on 3-D scans and a business model including the retail is well established. But the market demands for more and the technology is ready, the pieces just need to be put together.

With assyst’s 3-D draping solution “Vidya” it is possible nowadays to fit test virtually in real-time garments on scanatars. Also, there is already now a seamless process in place that automatically creates scanatars from 3-D scans meeting the requirements for virtual draping software. Those two components together establish a solution that enables designers to optimize pattern and design.

In near future this technology will be expanded for a usage at the POS and in online shops. Consumer will be scanned, a scanatar automatically created and, and virtually dressed with the garments chosen from a digital catalog. This solution will not only support consumers to chose items of their liking from a fit and design point of view but also generates benefits for retailers as a marketing tool. Experience show that presenting customized products to the consumers increases revenue immensely. Adding to the described solution the possibly to even include ties and accessories it can be expected that revenues climax.



Figure 5: Scanatar wearing pants, shirt, and vest

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