Made to Measure Jeans

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Abstract

Finding good jeans is difficult – especially for women. A recent study shows that the average woman tries more than 10 pairs before finding a suitable one (if they find it at all). Manufacturer-mandated standard measures fit fewer and fewer people and cause increasing dissatisfaction. This problem is shared by the most people, not simply people who are larger than normal – the frustration is felt by the skinny, the petite, the short, the tall, the round, nearly everybody. We are simply not 31/32 regular.

The key to make made-to-measure jeans is the alteration system according to the body shape. We have developed a system which takes into account the body shape.

Our development system is fully automated – client 3D body scanning information and preferences are combined our inner system which creates patterns and production orders for our factories.

The NOMO experience starts with a fast and discrete 3D body scanning process in NOMO stores. The results are turned into exact personal measurements that are used to alter the pattern of the selected NOMO Jeans style for perfect custom fit. Customers can also customize the look of the jeans to fit personal taste and intended use. The customized pattern will be sent to automated cutting and bundling in the factory. The finished products will be shipped back to the shops in small weekly batches.

Customer measurements and details are stored in a customer profile that can then be used for reorders via the NOMO web store or even by call. Our web store has a special customer feature that automatically ensures perfect fit with reorder.

Keywords: Made to measure, body scanner, CAD systems

1. Mass production meets custom-fit

The requirements for the clothing industry have altered over the years. The production has to be changed from standard mass production to the custom fit production. Custom-fit is a broad term which could be defined as tailor-made. Mass customization could be defined as a massive personalization or personalization for everybody. Consequently, the custom-fit concept can be understood one-of-a-kind products that, due to their intrinsic characteristics and use, can be fully adapted to geometric characteristics in order to meet the user requirements.

Nomo Jeans' custom-fit starts with designing unique Nomo jeans from a menu of choices:

- Model (skinny, straight, bootcut, flare, loose, etc.)
- Jeans and pocket fabric / color choice
- Wash and effects (light, heavy, worn, etc.)
- Waistband height (high, regular, low)
- Waistband width
- Beltloops
- Stitching width of the hem
- Modify jean´s length
- Front fastening (zipper or buttons)
- Front pockets
- Back pockets
- Back label
- Stitching color
- Outer and inner seam stitching's.

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The next step is body scanning with the NX-16 [TC] ²'s and finishing the purchase.

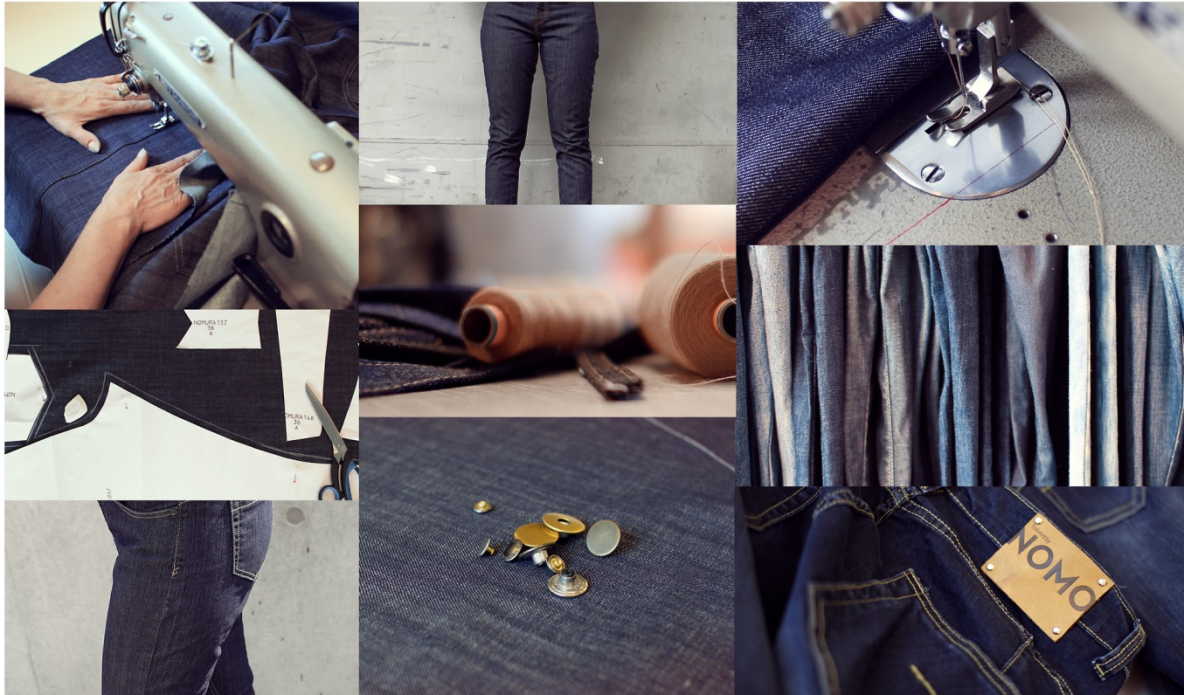The ready jeans are shipped to the customer via post or pickup from shop.

Fig. 1. Different stages in made to measure jeans production.

2. The Technologies

Mass customization strategies are triggered by a host of enabling technologies ranging from QR readers to laser cutters, body scanners to Web applications. To successfully implement mass customization strategies in the apparel industry, it is necessary to have

- a body measurement technology for collecting body measurements (3D body scanner),
- an integration tool that allows the body measurements to be analyzed and directed into CAD systems,
- computer-aided design (CAD) systems for patternmaking,
- a standard set of patterns that can be altered according to the customer's body shape determined from their body scan data,
- the Internet for communication between the customer and the customizer
- IT systems that assist with accurate and rapid production and delivery.

2.1. The 3D body scanner

The emergence of 3-dimensional body scanning has instigated a new ways of apparel retailing -
Made to measure clothing; size consultation services in department stores; mannequins, which take the shape of scanned object; visualization services. The 3D body scanner is a useful tool that enables effectively and accurately analyzes the human body and its shape proportions. Once a scan is taken, it will be sent to the computer and visualized on the screen. In the next step, software automatically locates body landmarks and generates measurements. Once a person's body is captured using a body scanner, it could be retrieved and any part of his/her body can be measured any number of times without actual contact with the measured person. Scan data is saved in a special format to be read by CAD system or integration tool that allows the body measurements to be analyzed and directed into the CAD system.

Measurement extraction with body scanner is very precise, but protocols for locating body landmarks still need to be perfected. Traditional body measurements are based on landmarks on the body, which are often identified or located by palpitation, while a computer must be programmed for every eventuality. This affects the percentage accuracy of measurements of the body scanner since certain body landmarks are difficult to identify. This is one of the major reasons for incorrect locations of waist, stomach, and crotch point measurements. The automated body measurements extraction by computers continually improves.
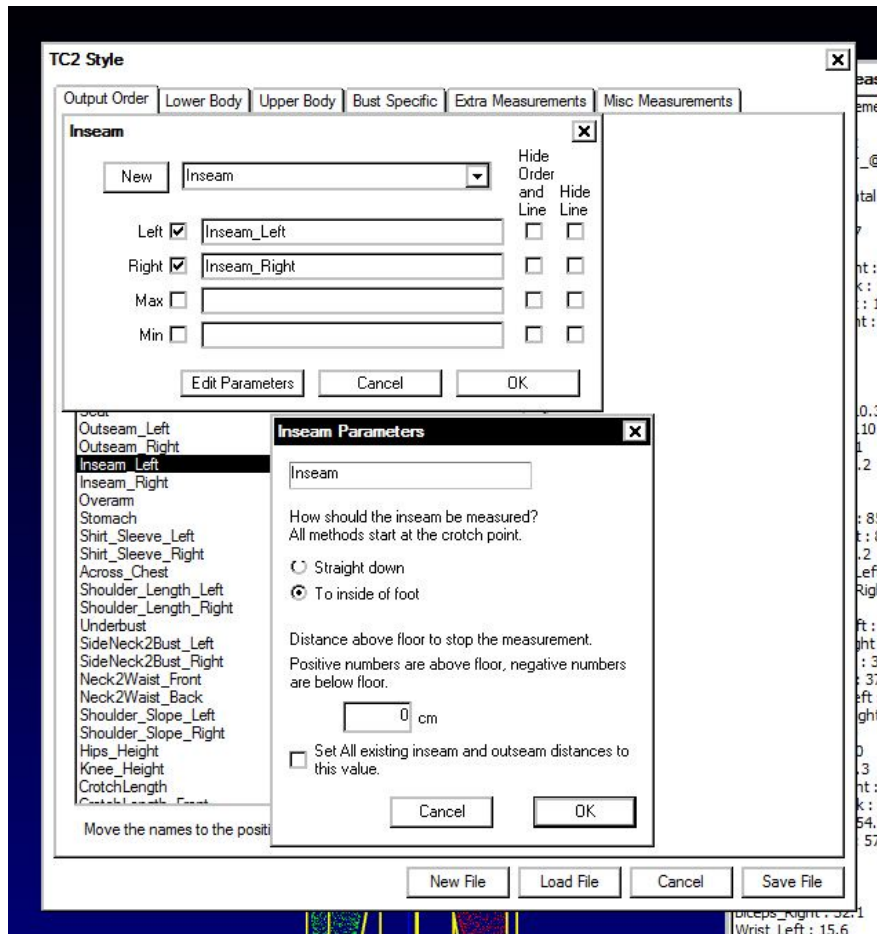

Fig. 2. Setting the Inseam lenght according to company needs.

Many measurements have parameters that determine how the measurement is extracted. For example, on the inseam length, you can choose how it can measure the inseam length or you can even calculate. You may have the program extract several inseam measurements, each with a different parameter.

2.2. An integration tool

The future of mass customization lays in the bundling of customized product in order to fulfill people's overall and not only single needs.

Many companies struggle with missing or pore standards for IT systems and configuration systems. Manufacturing capabilities are often stronger than required IT capabilities. Mass customization business model often struggle with proper change management around organization, processes and people.

The biggest problem making made to measure product is the time which takes production preparation. To produce made to measure product in mass customization way it is necessary to have integration tool between 3D Body Scanner and CAD system; customer order and CAD system; webshop, 3D body scanner and CAD system; production and CAD system. Integration tool help´s to prepare 1000 made to measure products with the same time of 1 ready-to-wear product.

The integration tool allows the body measurements to be analyzed and directed into CAD systems. The integration tool has built in background knowledge which experienced pattern makers have. Simple example, if a customer has different measurement on knee circumference, in most models there is no reason to make jeans with different knee circumference, because the product has ease on knee. At the same time it knows when the ease value is exceeded and it is necessary to make product with different knee circumference or increase the value of „smaller knee" resulting product with the same knee circumference. It knows how to act with different body types and how to manipulate with models, so that they would look the best with different problems in customers.

2.3. Computer-aided design systems for made to measure products

CAD technology is critical to the automated creation of custom fitted apparel patterns. Most apparel CAD systems (Lectra Systems, Gerber Technologies, Assyst and Optitex) have several preparatory activities in common which will allow automatic pattern alterations based on individual measurements. Although each system has a different interface to the other, the basic underlying theory is the same. It starts with development of standard size patterns and alteration points. Pattern maker generates and stores sets of alteration sequences which will modify a pattern geometrically according to customer measurements and body shape. The output is marker file, which can be directed automatically to the cutter. The made to measure systems use digital information about measurements and pattern shapes to create, modify, file, store, and reuse patterns. Scan data are saved in a special format to be read by CAD systems.

2.3.1. Problems with CAD software

The problems with made to measure programs are:

- they are created long time ago and nobody does not develop them further
- lack of people, who know programs inner life
- lack of training
- unfinished software requires additional IT knowledge from pattern makers
- price for the whole CAD system, service, training, etc.

Nowadays all the major CAD/ CAM software developers are focused on creating 3D related software, which is very good for visualization for the end customer and also for virtual prototyping, but it cannot be used for made to measure mass customization. In mass customization process anybody does not have time to preview and make modifications to every customer separately. The perfect fit has to come with seconds to be economically effective based on the trust to the chosen company. Mass customization, in manufacturing, marketing and management, is the use of flexible computer-aided manufacturing systems to produce custom output. Those systems combine the low unit costs of mass production processes with the flexibility of individual customization.

Enormous price of CAD system is stopping the development of clothing business. For instance, the price for Adobe Master Collection is $2599, but the Master Collection for CAD systems cost´s 30-50 times more. 90% of visual still and moving intellectual value content is created using Adobe master collection and they are also moving very strongly to the 3D market. The lack of pro users with CAD master collection causes problems in overall software quality, software support is replaying that you are the first person how ask this. And no help or solutions are offered. Price level and product quality does not match. In the 3D field all the leading 3D software manufacturers are offering lower priced word leading 3D visualization programs. We need proper software which is made for industrial manufacturing and does not take the price what cannot be returned from the actual business. To run current software you need special IT department and pattern maker with IT education to solve the software IT issues caused by the unfinished software. We are in deep trouble in time where also the manufacturing possibilities are shrinking every day.

Nowadays there has been big progress in 3D body scanner quality and measurement extraction software, but there is no software which would enable to produce made to measure clothing in smooth and user friendly way with only pattern maker education and dedication.

3D visualization software is not solution to mass customization according to your body measurements. Fitting the complex shape of a human body is a difficult task, even with body scanners and computer technology. In 3D programs is very hard to simulate the tightness of the jeans and how it would really affect the wearer body shape into the jeans. The interactions between body shapes, pattern shapes, and fabric properties can create an exponential number of possible fitting issues to be resolved. The development and testing of these processes is still in its infancy.

3. Conclusion

To succeed in made to measure business it is necessary to have up to date industrial pattern making software. It is necessary that industrial software would catch up to the need of clothing companies' and the industry. Also is important cooperation with fabric manufacturers. With the development of 3D programs, we need to have more data about fabrics and their properties and new definition should come to use to visualize the product in 3D. Example, fabric cosines with stretching.

We have to set our targets right and catch the rest of the word.

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