



Integration of 3D Body Measurement,
Advanced CAD, and E-commerce Technologies
in the European Fashion Industry

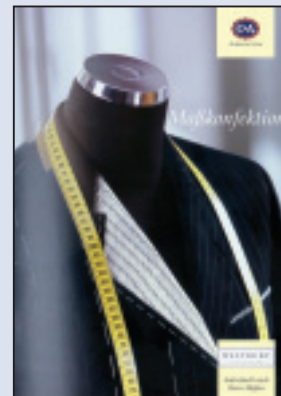
e-Tailor

FINAL RESULTS

A complete suite of technology solutions to offer industrial made-to-measure services pages 2 & 3
Real business integration and demonstration sites pages 1 & 4
Project partners and full contact details page 4

Scanner-based Made-to-Measure Services at C&A

The E-Tailor project demonstrates the proven functionality of the scanner-based industrial made-to-measure process at its main demonstration site, the C&A flagship store in Hamburg, Germany.



Company statement

The E-Tailor Project has clearly offered C&A the perfect opportunity to investigate this developing market and to test these new technologies in a large retail store environment. Together with Human Solutions, some of the main technology partners of the E-Tailor project, and reputable German based supplier we developed a full supply chain for Made to Measure Suits, Jackets and Trousers including the key steps of:

- Scanning a Customer's Individual Body Measurements with a Human Solutions Bodyscanner
- Utilising Made to Measure Software for composing a Customer's individual order
- Transferring a Customer's order and key measurements to our suppliers
- Delivering a Made to Measure garment in 4 weeks.

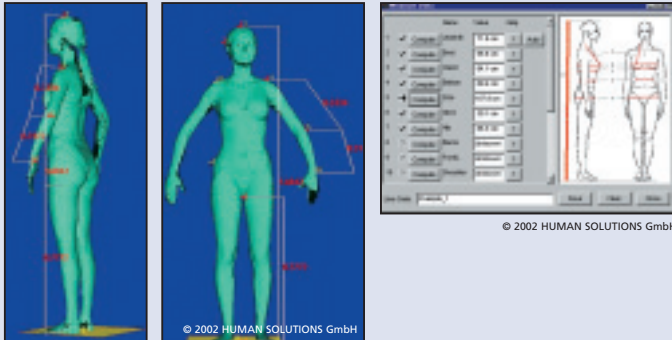
www.atc.gr/e-tailor



The E-Tailor Suite of Products

European Anthropometric Database (EAD)

- The EAD developed by Athens Technology Center (ATC) is an object-oriented database. Main objects are 3D body representations and body measurement sets.
- EAD permits uploading of data from remote sites (collection centres for future European sizing surveys and/or National Anthropometric Databases, built according to the EAD model). XML notation is used for data interchange.



The main advantages of E-TAILOR's EAD are:

1. Scale:

An upper bound estimate for the total number of 3D body data that may eventually be stored is 100,000 3D bodies. Depending on the size of the final representation per 3D body (currently ranging from a few MBs to a few 10s of MBs), the scale of EAD is estimated to be immense.

2. Commercial advantages:

EAD represents a raw model for Anthropometric Databases, as well as for customer data stored by retailers and mail order groups that will introduce MTM services, either at their retail outlets, or at Virtual stores.

System-independent Body Measurement Software

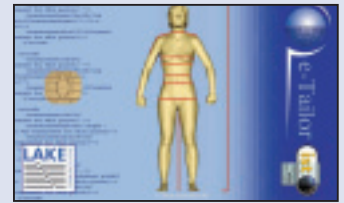
The system-independent measurement software developed by the HUMAN SOLUTIONS GmbH allows the fully automatic extraction of body measurements from 3D body scans recorded by body scanning systems like e.g. the VITUS/Smart laser scanner offered by HUMAN SOLUTIONS. By guaranteeing that unified and reproducible measurement results can be obtained from different scanning systems, it provides the basis for an integration of the 3D scanning technology into the process chain for individualised products and thus for a wide market penetration. In particular, the system-independent measurement software of the HUMAN SOLUTIONS GmbH provides



- Fully automatic extraction of all measurements necessary for the MTM chain,
- Measurements taken by standardized measurement methods,
- Configurable measurement rules based upon user's needs,
- Possibility for interactive adaptation to individual customer's wearing habits,
- Measurement results independent from scanner hardware,
- Standardized output (structure, format).

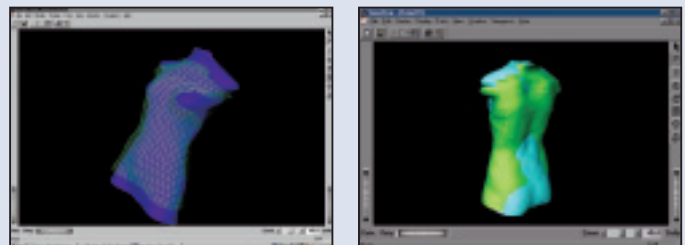
E-TAILOR smart card applications

The e-Tailor Smartcard software developed by LAKE Communications enables the loading, storage and reading of compressed 3D body representations (Layered Point Data - LPD - files as developed by NTU), in addition to the primary measurement XML files. This is a particularly interesting achievement, since it opens a new path for a new range of smartcard applications, involving the storage of sensitive personal data, which are under the full control of the owner. This is the best solution to the data protection problem. The e-Tailor smartcard application was developed using specially designed Javacard applets, which run from a web browser to read/write from the latest advanced Javacards using the OpenCard Framework (OCF).



Advanced Shape Analysis Software (Active Shape Models Generator)

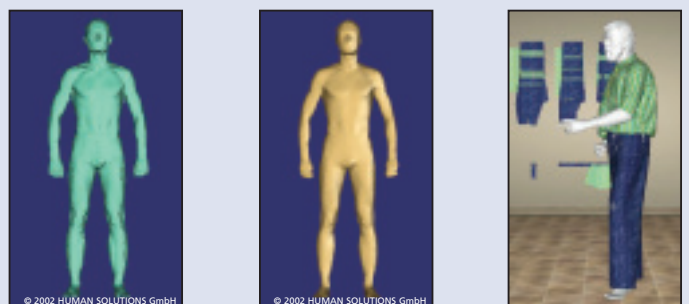
Initially developed by University College London, and currently acquired under licence by e-Tailor, this data analysis application has been adapted to interface directly with SomaView, a 3D body Visualisation Software developed by the Somatometric Institute/SomaVision. BMV enables the user to model and analyse the 3D shape of a filtered population subject directly from the 3D data (Active Shape Models), as well as to use the results of the active shape modelling in order to quantify the modes of variation of the 3D shape. In that way, users can utilise the variation modes for automatic somatotype generation independent of a-priori assumptions and without the use of collateral data. It is a novel approach that deviates from the current trend of assessing and describing human body shape indirectly by using body measurements.



Morphological Editor Software

The Morphological editor developed by Lectra & Human Solutions automates a large number of pre-processing steps that are currently performed manually, in order to derive a 'watertight', smooth and segmented body surface to which a suitable 3D garment will be simulated and fitted.

Draping a virtual garment on a human avatar and obtaining an objectively, as well as subjectively realistic appearance, is a very "hot" issue for virtual prototyping (design of new collections), which is currently a time-consuming and costly iterative process (from sketch to patterns to sample garments, which have to be tried on mannequins, modified and often redesigned).



Intelligent Pattern Alteration Software

The technology gap between 3D body scanners and clothing CAD/CAM production systems has been filled by IPA software development. **NTU** pattern cutting experts in conjunction with **Lectra** have worked alongside 2D/3D mathematical modellers to produce prototype software for womenswear. Scan data is analysed for shape characteristics so that expert system adjustments can be made to patterns for perfect fit.



Customised Order Clustering Software

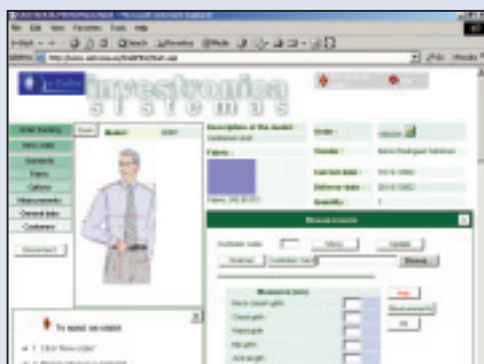
MTM order workflow optimisation system based on 3D body shape and size analysis to reduce costs of MTM and mainly Mass Customisation services by reducing the need for single-ply cutting of fabric. It will apply statistical analyses of MTM modification orders as functions of 3D body size.

The Customized Order Clustering software developed by **TELMAT Industrie** enables the classification and clustering of MTM orders based on a statistical analysis of the corresponding customers' body size data (body measurements and body shape data). This software can be used to derive generic body models according to body shape analysis criteria. This is also a particularly interesting achievement, since clustering MTM orders will enhance the cost effectiveness and success of customised services thanks to a limitation of single-ply cutting, notably for the corporate clothing market.

Web enabled components for MTM integration

The system developed by **Investronica** includes front-end components with links to the virtual try-on software, 3D scanning software and Smart cards.

The system has also links to back-end components such as the manufacturer's ERP, the automatic alteration software and the MTM production sequencing software.



- Radical improvement of the manufacturing chain for MTM goods from the Point of Sale (Real or Virtual) to the Manufacturing plant linked by the Internet.
- More efficient manufacturing of MTM goods. (see demo page 4)

Virtual Try-on Software & Clothing simulation animation applications

The Real Time Virtual Try On is an altogether new approach to online visualization and immersion that lets any standard web browser dis-

play interactive 3D dressed virtual bodies. Our approach provides a minimal response time to the user, since a major part of the content to be manipulated is generated on the client side rather than on the server. The **MIRALab** Virtual Try On client application is not only involved in the visualization of garments, but also used for the calculation of the cloth and body deformation.



The architecture of the client makes use of three different layers for the implementation: C++, Java-Script and HTML. The Real Time Virtual Try On ActiveX control is composed of several modules: the FTP client for downloading data from the server, the VRML loader that is in charge of loading the data into the scene manager, the skeleton

animation player for animating the mannequin skeleton, the body/cloth sizing module for fitting the body and clothes to the user measurements, the skin and cloth deformation module for real-time animation, and the 3D viewer for visualization of the scene.

MIRACloth engine includes the modules of mechanical model, collision engine, rendering and animation. The algorithms have been integrated in a 3D design framework allowing the management of complex garment objects in interaction with animated virtual characters.



This integration has been carried out in the form of a 3DStudio Max plug-in. MIRACloth makes use of predetermined conditions between the cloth and the body model, avoiding complex collision detection and physical deformations wherever possible. Garments are segmented into pieces that are simulated by various algorithms, depending on how they are laid on the body surface and whether they stick or flow on it. Clothes are classified into several categories depending on how the garment is laid on and whether it sticks to, or flows on, the body surface.

Virtual Store (Integration platform)

The Virtual store developed by **ATC** is a typical business-to-customer interactive E-Commerce application, highly multimedia-oriented. A simplified version of the Virtual store prototype will be used at e-kiosks.

The E-TAILOR Virtual Store aims to introduce the vital element of virtual realism, besides the Internet shopping fun aspect, at least to the extent necessary to convince the customer that "this is not a shopping game". This will be achieved by the following missing aspects from existing sites:



- Very close to real 3D bodies, wearing "real" simulations of garments (constructed from real patterns, incorporating certain mechanical fabric properties).
- Animated dressed mannequins.

Demonstration of Commercial Application of E-Tailor Developments:

Scanner-based Made-to-Measure Services at C&A

In addition, MIRALab developed animation software that was demonstrated in our Hamburg store to show how scanned measurements could be transferred into animated simulations, which emulate the fabric and style of garments being selected by a customer. Through the extraction of specific measurements from scan data derived from the HUMAN SOLUTIONS Bodyscanner, MIRALab developed attractive body visualization with automatic addition of texture and individual skeletons. This represents the generation of animatable texture bodies. This technological development is a clear step forward and an industry milestone for mass customisation technology offering retailers and customers the opportunity in the future to visualize their made-to-measure orders if they wish so. This application was integrated into ATC virtual store platform.



At C&A, the opportunity to participate in the E-Tailor project was the chance to work together with leading European developers of new technologies to investigate the possibility of offering customers Made to Measure as well as ready to wear clothing in our Men's formalwear offer in our Hamburg store in the most modern and advanced way.

E-Tailor has not just been about theory but also the opportunity to test new technologies in practice.

Project partners



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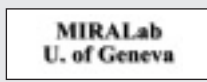
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