

The logo for Deutsche Institute für Textil- und Faserforschung (DITF) is located in the top right corner. It consists of the letters 'DITF' in a stylized, black, sans-serif font. The 'D' is a simple vertical bar with a top curve, 'I' is a vertical bar, 'T' is a vertical bar with a horizontal top bar, and 'F' is a vertical bar with a horizontal top bar and a short vertical stem at the bottom.

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A horizontal band across the middle of the slide features a detailed, green-tinted microstructure of a textile fabric. The structure shows a complex, interconnected network of fibers, with some areas appearing more densely packed than others, creating a textured, almost crystalline appearance. The colors range from light green to dark teal.

Microfactory – Pushing Innovation for Local Production of Textile Products

Alexander Artschwager, Christian Kaiser, Dominik Surc

Introduction

- **The DITF – Your Partner für Textile Challenges**
- **Motivation**
- **Answer:**
 - Integrated Process Chain
 - Thinking 3D
 - Standardized Communication
 - Resilient Design, Automation and Algorithms
- **Result:** Rapid Prototyping and Small Series Production
- **Transfer Projects @ DITF**



German Institutes of Textile and Fiber Research



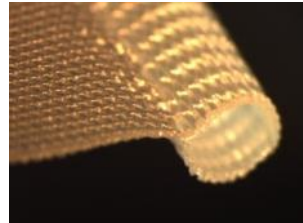
- Europe's largest textile research center
- Founded in 1921, foundation under public law
- 3 research centers, 1 production company (ITVP)
- Application oriented research from molecule to product on 25,000 m²
- Research with industrial pilot facilities, focus on technical textiles and life sciences
- Connected to University of Stuttgart and Reutlingen University by 3 chairs and 2 professorships

German Institutes of Textile and Fiber Research

Key figures 2016

- Employees: approx. 300
- Turnover: approx. 29 Mio. € (11 Mio. € public, 18 Mio. € industry)
- Industry:
(without ITVP) 31% Baden-Württemberg
35% national
34% international
49% small and medium-sized enterprises

Application oriented research from molecule to product

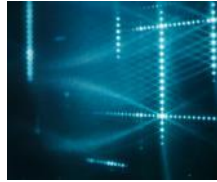


German Institutes of Textile and Fiber Research

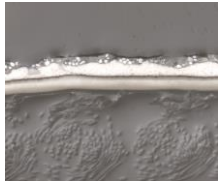
Research fields



High Performance
Fibers and Yarns



Smart Textiles



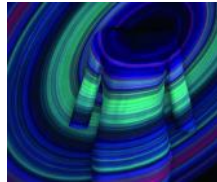
Functionalized
Textiles and
Finishing



Medical
Technologies



Lightweight Design
and Fiber
Composites



Textile 4.0

Application fields (2016)

Architecture and Construction	8%
Health and Care	10%
Mobility	15%
Energy and Environment	19%
Production Technologies	38%
Clothing and Home Textiles	10%

Digital Textile Micro Factory

- Digital Textile Micro-Factory, initiated and driven by DITF Management Research
 - Textile Factory of the Future
 - For small series (on demand)
 - CAD, digital printing, cutting, sewing
 - Shown at Heimtextil Fair, January 2017, Frankfurt a.M
 - Texprocess Fair, May 2017, Frankfurt a.M.
 - Munich Fabric Start Fair, September 2017, Munich
- History: Simulate-Print-Cut/GO, developed in EU RTD projects:
 - Leapfrog 2005-2009
 - OpenGarments 2008-2011
 - CoreNet 2010-2013
 - Awarded as Best Practice at ETP Textiles 2015
 - Industrial use case at German Government's Platform Industry 4.0 Map
<http://www.plattform-i40.de/I40/Navigation/Karte/SiteGlobals/Forms/Formulare/karte-anwendungsbeispiele-formular.html>



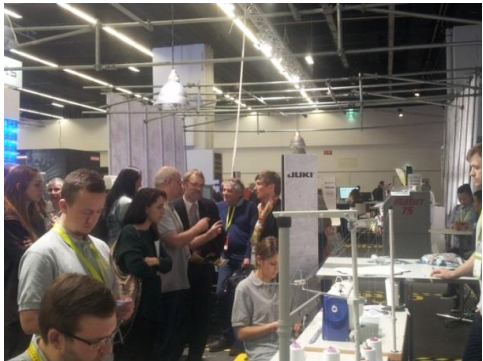
Seamless digital engineering and production of textiles!

Digital Textile Micro Factory

(Heimtextil 10.-12.01., Texprocess 09.-12.05., Munich Fabric Start, 05.-07.09.)

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Motivation

Current approaches as rather disjoint design, pattern development and production do not meet demands for highly flexible and integrated process chains



Integrated Process Chain

Streamlining the Garment development and production process

- Standardized and automated interfaces between development and production
- Increase resilience of the process chain
- Reduce communication efforts

Step 1: Thinking 3D

Background:

- Interactive garment development by bringing pattern, material and design together
- Dynamic feedback loops between pattern making textile design and material selection
- Digital twin



Simulate apparel



Place designs, logos, etc.

Step 2: 3D Design as Game-Changer

Target:

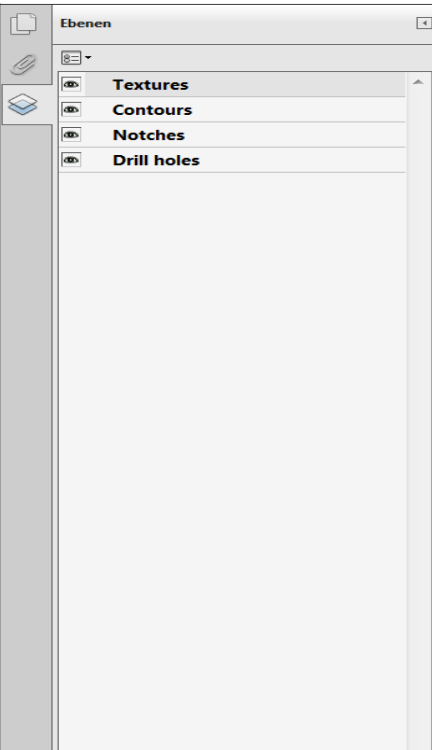
Supporting the actual production of the final garment by automatically creating production-ready input



Place designs, logos, etc.

Textured marker

Step 3: Standardized Communication



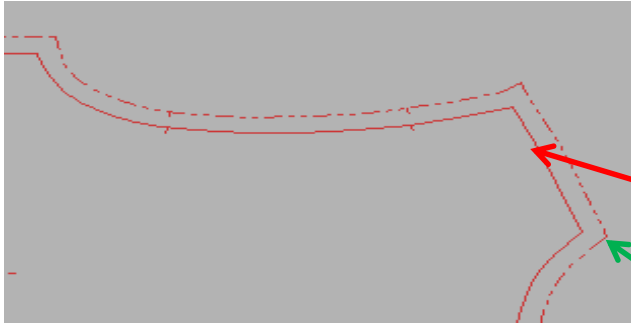
PDF as container

The multi-layer concept for PDF offers a solution to individually hide or show layers for drillholes, notches, contours and textures within a marker.

These layers are helpful for the RIP (preparation for printing and cutting) and for the actual cutting of the printed marker.

Within RIP software the print data are rescaled due to the expected shrinkage of the fabric. Register marks are added around the contour of the pattern for cutting.

Step 4: Resilient Design



Prepare Marker for Simulate, Print and Cut Workflow

The net contour used for simulation represents the finally sewn garment.

The gross contour represents the finally cut pattern piece including the seam allowance. This line is the cutting line.

The gap contour adds a safety zone for cutting and repositioning of the gross contour.





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Digital Textile Microfactory – Knitting





Quelle: blog.adidas-group.com





Quelle: Merz Maschinenfabrik

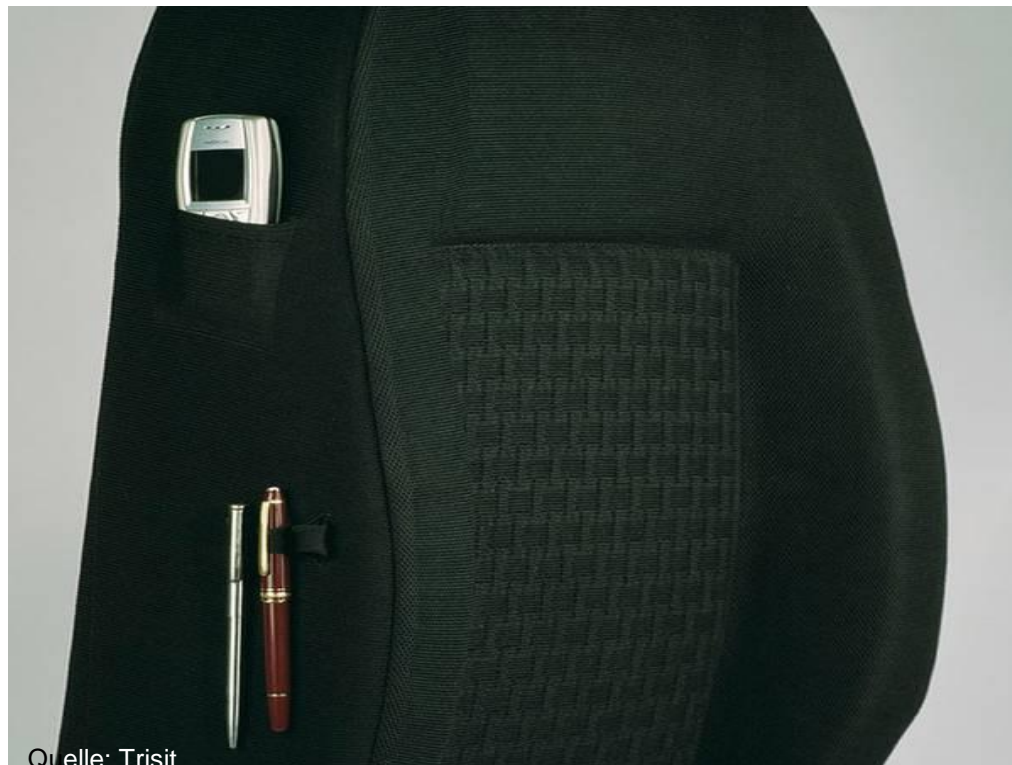








Quelle: MEY



Quelle: Trisit



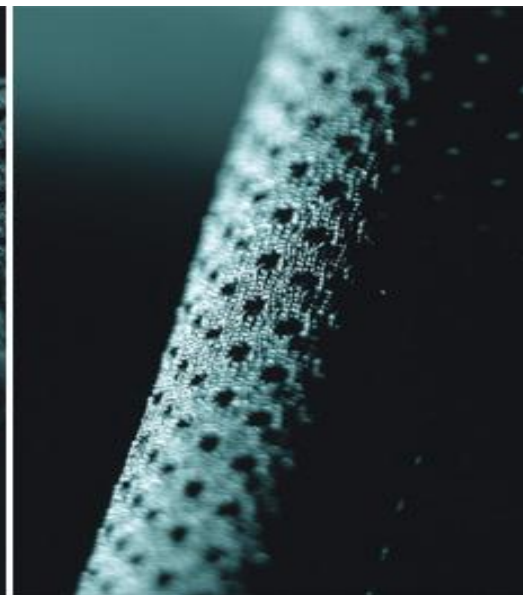
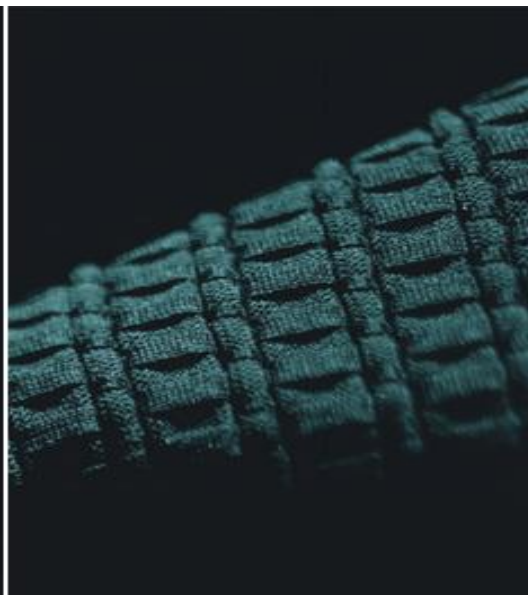
Quelle: STRÄHLE + HESS



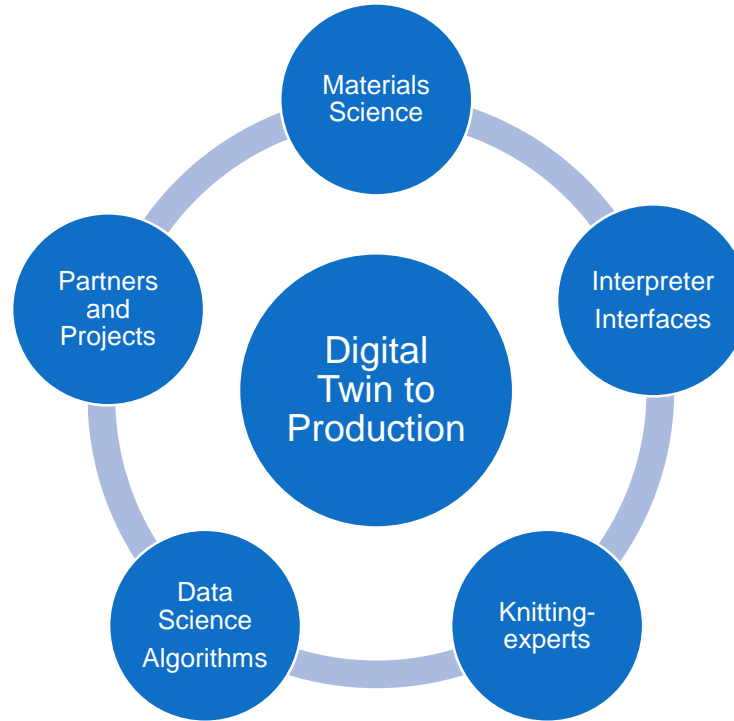


Quelle: DITF

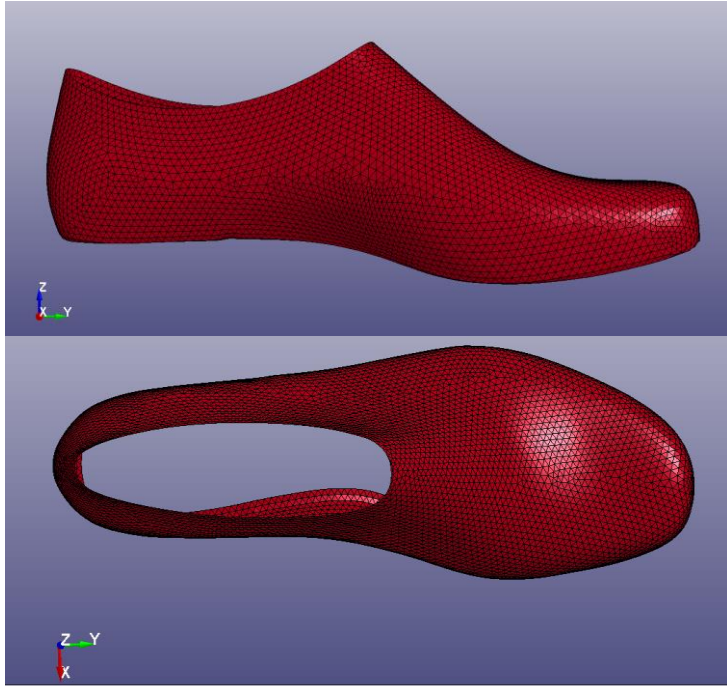




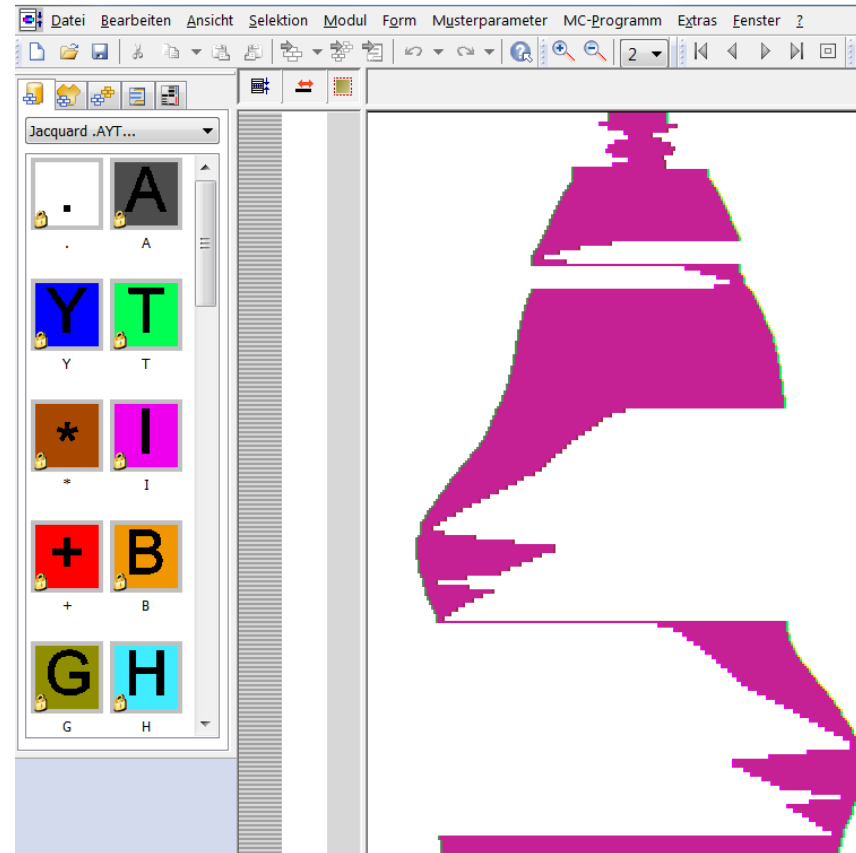
Digital Twin to Production – Enabler for Setup of Microfactories



Software Knitted Shoe: Process Overview



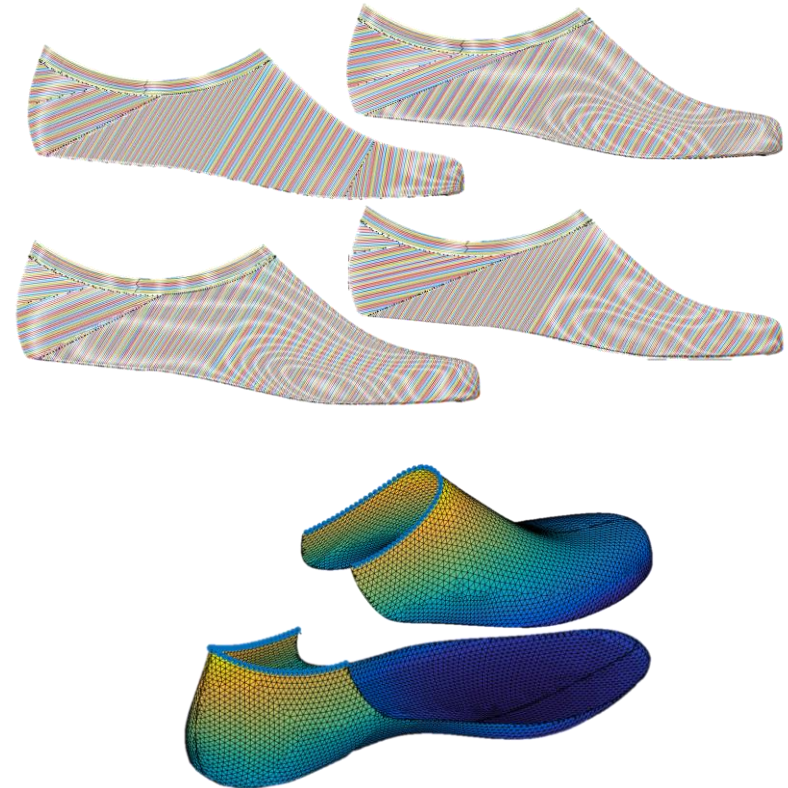
Software Knitted Shoe: Knit Pattern



3D-Knit Interpreter: Summary

- Product, quality and runtime optimization
- Flexible and consistent interpretation of 3D geometry
- Significant reduction of development time: hours or minutes instead of weeks or days

→ **Rapid prototyping**



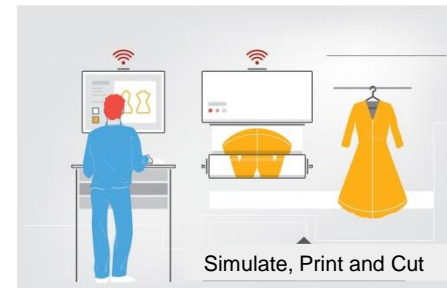
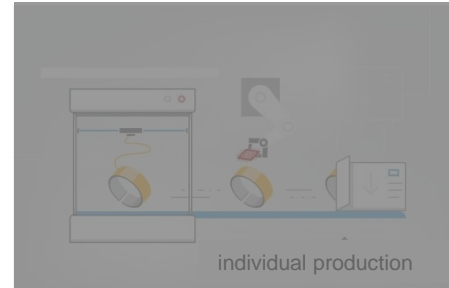
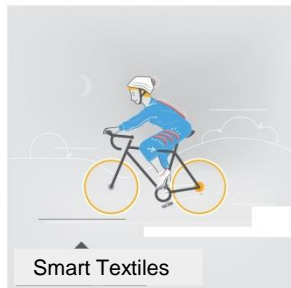
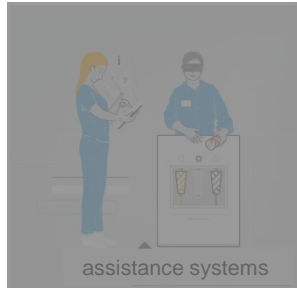
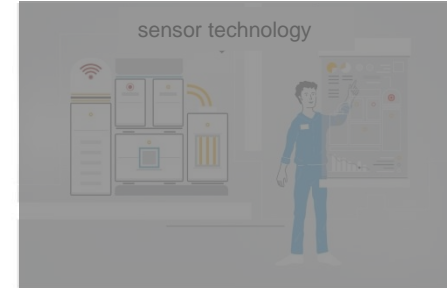
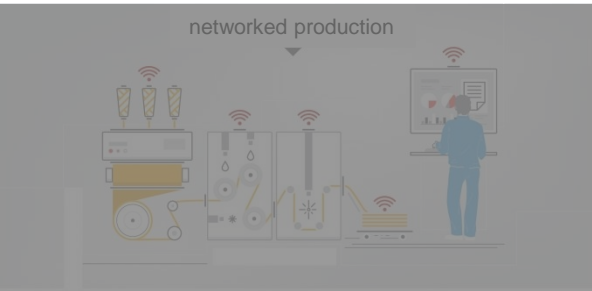
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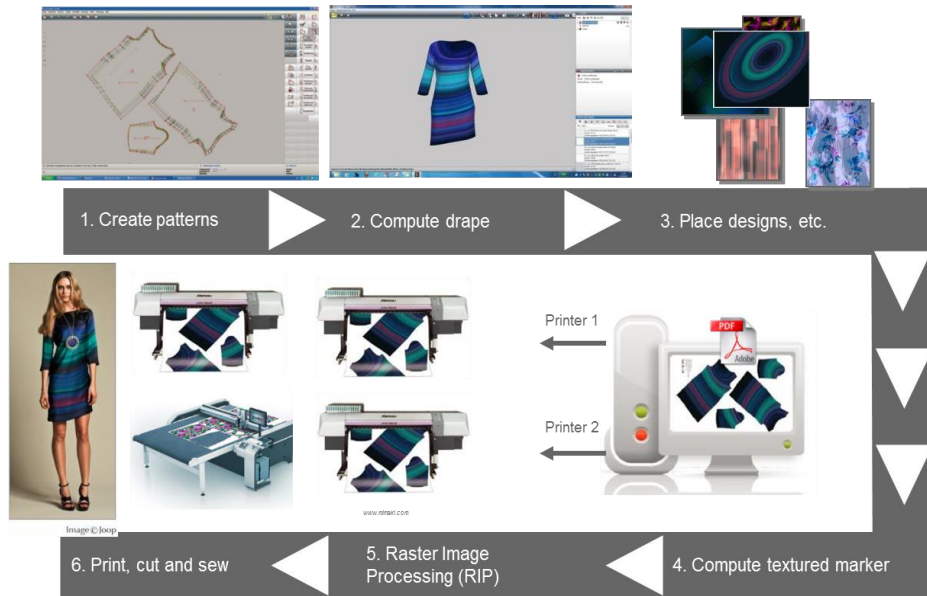
A horizontal band across the middle of the page features a collage of various textile patterns. From left to right, it includes a dark teal honeycomb mesh, a dark teal pattern with small, repeating motifs, a dark teal pattern with larger, repeating motifs, and a light green pattern with a complex, interlocking geometric design.

The DITF – Your Partner für Textile Challenges

Digital Engineering



Topic: Digital Textile MicroFactory at DITF



- End-to-end solution for the production of individual garments across individual production stages of the textile chain
- Combines 3D visualization of clothing products with large format textile printing and digital cutting
- Fast and flexible reaction to market changes and trends

Digital Textile Microfactory @ DITF



Transfer

- Virtual Reality - Retail 4.0 Open Days DITF



- Scan to Knit – MtM and On Demand Production

→ coming soon



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The Future is Textile