

# The digital transformation of garment product development

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MALINA ROSCA  
ANA-DIANA VATRA

MANUELA AVADANEI

## ABSTRACT – REZUMAT

### The digital transformation of garment product development

Many clothing companies approach digital transformation by focusing on digitizing individual processes or operations. Digital transformation is often limited to specific initiatives or programmes that only impact a few departments. Significant opportunities or existential risks are often the main drivers for digital transformation. Moreover, leaders planning the future of their companies and industries should focus on the opportunity – or existential threat – that these changes present. It is essential to find the ideal balance between focusing on quick results with innovative ideas and laying the foundation for digital transformation, such as unleashing the potential of data and analytics, managing brand and reputational risk, controlling the entire supply chain and closing the digital technology gaps are not the only significant issues. A complete change in corporate culture that puts the customer at the centre is the key component of the ultimate digital challenge for clothing companies. This article presents the opportunities, benefits and challenges of developing garment models with digital tools from Gemini CAD, a Lectra company. These tools include (in addition to the pattern) the product data sheet, a detailed description of all fabrics, trimmings, and accessories, components needed for sourcing, purchasing, and determining the cost of the product, as well as the information needed to publish the product on e-commerce and interact with the customer, including customization.

**Keywords:** digital patterns, digital fabrics, trimmings, graphic resources

### Transformarea digitală a etapelor de dezvoltare ale unui produs de îmbrăcăminte

Din ce în ce mai multe companii de confecții textile abordează transformarea digitală a fluxurilor de fabricație prin digitalizarea proceselor sau a operațiilor. Transformarea digitală este adesea limitată la inițiative sau programe specifice, cu impact doar în activitatea unor departamente. Oportunitățile semnificative sau riscurile existente sunt factorii care stimulează transformarea digitală a proceselor de producție. Managerii companiilor, cei care planifică și orientează politicile firmei cu impact asupra modului de evoluție al industriei de îmbrăcăminte, ar trebui să conștientizeze ce schimbări sunt necesare în această industrie, ca rezultat al oportunităților sau provocărilor actuale. În acest context, este esențial să se identifice un echilibru optim între dorința de a obține rezultate rapide prin implementarea unor idei inovatoare și etapele necesare unei transformări digitale a proceselor de producție, bazate pe analiza datelor firmei, gestionarea riscurilor legate de brand și de lanțul de aprovizionare și de dorința de eliminare din activitatea firmei a diferențelor semnificative în materie de tehnologie digitală. O schimbare completă a culturii corporatiste, în care clientul devine elementul central al activității unei firme de confecții textile, reprezintă o provocare pentru transformarea ei digitală. În acest articol sunt prezentate oportunitățile, beneficiile și provocările determinate de dezvoltarea modelelor produselor de îmbrăcăminte cu ajutorul instrumentelor digitale ale firmei Gemini CAD, o companie Lectra. Instrumentele digitale sunt următoarele: modelul produsului în format digital și fișa tehnică a acestuia, descrierea detaliată a tuturor materialelor și accesoriilor necesare realizării produsului, componentele activității de aprovizionare și de achiziție a celor necesare procesului de producție, elementele de calcul al costului de produs, informații pentru promovarea pe platforme virtuale al noului model, fie în scopul comercializării așa cum a fost elaborat sau pentru a facilita personalizarea modelului de către client.

**Cuvinte cheie:** modele digitale, țesături digitale, accesorii digitale, resurse grafice

## INTRODUCTION

Industry 4.0 is a topic that is being intensively discussed and analyzed by experts from education, business, industry, economics and research. The German government launched the concept at the Hannover Fair (2011) and was quickly taken up by all European countries and a slew of other ones from the rest of the world. It was defined as an industrial revolution in manufacturing, where production processes are changed by digitalization, robots and artificial intelligence. This industrial revolution is underway

and will be marked by advances in artificial intelligence, the Internet of Things, next-generation robotics, 3D printing, wearable technology, software engineering, nanotechnology, advanced materials, biotechnology and much more. Industry 4.0 is the future of manufacturing technology and a major development in automation and data exchange. The “smart factory” results from Industry 4.0, which includes cyber-physical systems, the Internet of Things, cloud computing and cognitive computing. The best way to produce high-quality products is to

use advanced technologies, digital platforms and automated processes.

Industry 4.0 provides real-time information on various processes/applications in organizations, ensuring a better understanding of current operating conditions, errors and failures, and areas for improvement. It relies on various technology components that are interconnected through ICT tools. As a result, companies need to undergo a digital transformation to fundamentally rethink and redesign their business processes to adapt to the latest wave of technology. Digital transformation, which involves changing supply and production chains and providing new products and services while overcoming structural changes and obstacles in the transformation process, can be achieved via the digital technologies of digitization and digitalization of data and processes [1]. The entire supply chain of the clothing sector is affected by the digital revolution, which is bringing about profound changes in customer service and supply chain operations [2–5]. To streamline distribution and production and shorten lead times, the clothing industry is digitizing product design, advertising and manufacturing in response to the growing trend towards customization and personalization. Mass customization is leading to a fundamental shift in the culture of the apparel industry, driving the industry towards an on-demand production model [6].

The clothing industry still has a lot of issues to address, from scanning materials to 3D product development and creation, from sales to production and distribution. Carrying out a digital transformation in all areas of corporate culture and operational procedures will transform the company activity into a sustainable business, able to ensure full transparency and understanding of its social responsibility by monitoring and ensuring that its suppliers commit to adhering to the brand's principles and policies. They will also be able to rely on data and concrete evidence to demonstrate their efforts to minimize polluting gas emissions and environmental damage at each stage of the supply chain [7].

The World Economic Forum (WEF) has highlighted the important feature of digital technology – sustainability. Digital technologies can improve resilience to global warming and natural disasters, reduce emissions and improve people's ability to take the necessary steps to achieve zero waste [8, 9].

The solutions that can make the garment industry a sustainable one are: 3D virtual sampling (this will enable one to digitally verify an entire collection and reduce waste in both design and product development); alternative textiles (eco-friendly textiles); automation and fashion-on-demand (design and manufacture on demand will reduce returns and guaranteed sales will offset these costs over time); mobile body scanning (mobile apps allow companies to design garments that fit different body types); virtual dressing (AR and VR offer virtual dressing experiences while shopping virtually); circular fashion (to keep waste out of the product and production system and keep materials and products in use as long as

possible); re-commerce (resale offers wardrobe rotation without waste, upcycling allows new garments to be made from old).

This article presents how one can use the digital tools of Gemini CAD – a Lectra company – to develop a production sheet for a garment model that includes (in addition to the pattern) a detailed description of all fabrics, trimmings and accessories, the elements needed for costing, sourcing and purchasing, and the information needed to publish the product on e-commerce and interact with the buyer, including customization.

## WORK METHODOLOGY

### General information

The fashion and clothing industry has started integrating Industry 4.0 technology by using interconnected ICT tools and algorithms to design new collections, predict fashion trends or identify market requirements. The digital transformation process must be approached from multiple perspectives to cover each supply chain stage. It is not enough to digitize only certain processes, such as purchasing; one must tailor every stage of the creation, production and buying processes to the digital age. The secret to success is to build a consistent, synchronized omnichannel system that coordinates physical and digital activities and provides an interactive, engaging experience for the customer from conception to conversion and beyond. Even though it may seem daunting, this is ultimately the direction in which the market is moving.

In line with what is necessary for the manufacturing industry, the producers of digital technologies have developed new solutions to help this sector exist and evolve sustainably. Several providers have developed specific and innovative technologies for the clothing sector.

**Lectra** has launched a new concept, “Fashion On Demand by Lectra”. This solution includes Lectra's Digital Cutting Platform and Virga, a single-ply fabric cutting solution. It is a turnkey solution that automates on-demand production from receiving the order reception to cutting the pieces. This breakthrough offers fashion companies a 360° view of the entire on-demand process, from small series to one-off production runs [10].

**Gemini CAD – a Lectra company** has developed a complete digital product solution that includes (in addition to the patterns) the product data sheet, a detailed description of all fabrics, trimmings and accessories, all the elements needed for sourcing and purchasing and to determine the production costs, a step-by-step production flow chart, labelling information, all the data necessary to publish the product in e-commerce and interact with the buyer, including customizing, etc. [11].

**Optitex Company** offers a vendor solution that unifies the entire process of making a garment, putting it at the heart of the future of this market. Creating agile workflows, saving valuable resources, increasing

ROI and moving to on-demand manufacturing are closer than ever. Due to the high complexity of a large enterprise, modern collaboration tools are essential for fast delivery and sustainable production cycles [12].

**Assyst Company** has become a leading solution provider for the digitization of the apparel industry. The company is the only provider offering integrated and break-through solutions for fashion industry processes. With the introduction of a 3D Vidya module, Assyst, the new model suite, has taken a decisive step forward and removed the last obstacle preventing the digital sale of fashion [13].

**CLO 3D** offers a Virtual Fashion end-to-end solution for the virtual simulation of garments while providing its partners with data on other designs and trends. The technology allows one to visualize the users' creations with the ability to create unlimited graphic placements, colourways and technical print layouts while accurately emulating drape-sensitive fabrics, reducing lead time [14].

Digital technologies allow the transmission of data on the availability, accessibility, and use of local resources and the condition of materials and products in real time. The product development process must be decentralized, modular, and service-oriented (see figure 1). We can presume that technology has a significant impact on how we interact, communicate, teach, work and learn. To cope with the challenge and seize the opportunities that the digital age holds for the apparel industry, a business in the fashion and clothing area has to change its business approach and modernise its processes.

### Work procedure

One of the biggest problems currently facing the garment industry is overproduction. Garment companies have been overproducing for a variety of reasons. Some of these include changing consumer attitudes, unreliable market forecasts and doubts about suppliers' ability to deliver clothing on time. While some of the unsold clothing can be donated, resold or sold at a discount, the majority of unsold clothing is buried or burned in landfills, contributing to the industry's ongoing environmental crisis.

Industry 4.0 brings important changes to the fashion and apparel industry in terms of the development process of a new model based on IoT, augmented reality, cloud computing, mobile devices and apps etc. (figure 1).

The main steps to develop a production sheet of a garment model that includes (in addition to the pattern) using specific instruments of Gemini CAD – a Lectra Company are described in the next five steps.

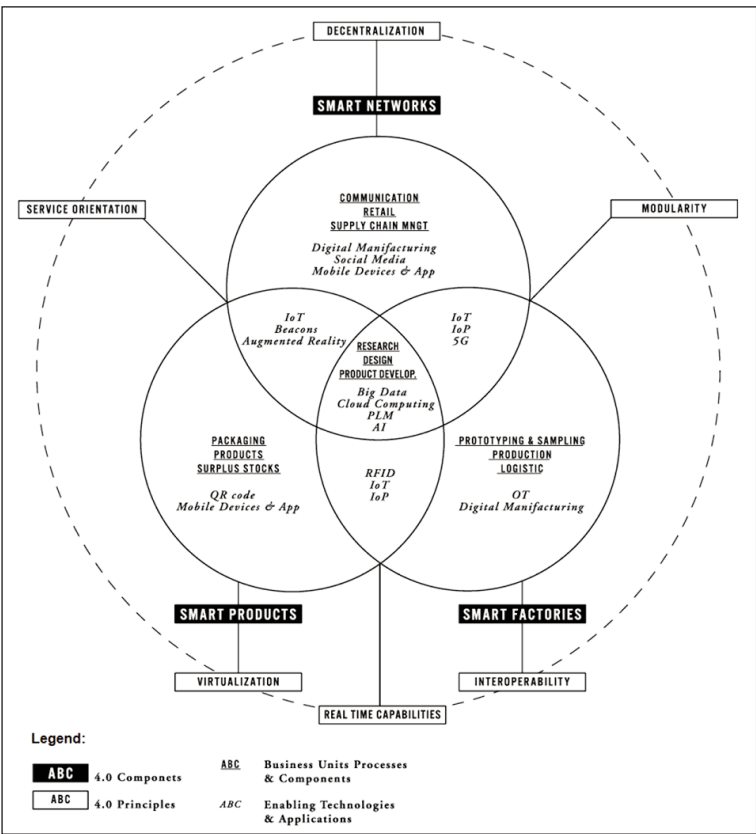


Fig. 1. The components and principles of a fashion business [15]

### 1. Design the patterns

The designer analyzes the details and structure of the model and the customer's requirements and decides which design solution is better for developing its patterns.

For the model presented in figure 2, the garment pieces are designed as 2D customized ones using the principles of the geometric method [17, 18]. In this case, the designer needs information about the customer's body shape (the values of the anthropometric parameters, conformation, posture), and their preferences regarding the features of the model (length, fitting degree, position of different decorative elements, cutlines, materials, colours or motifs).



Fig. 2. Dress model [16]

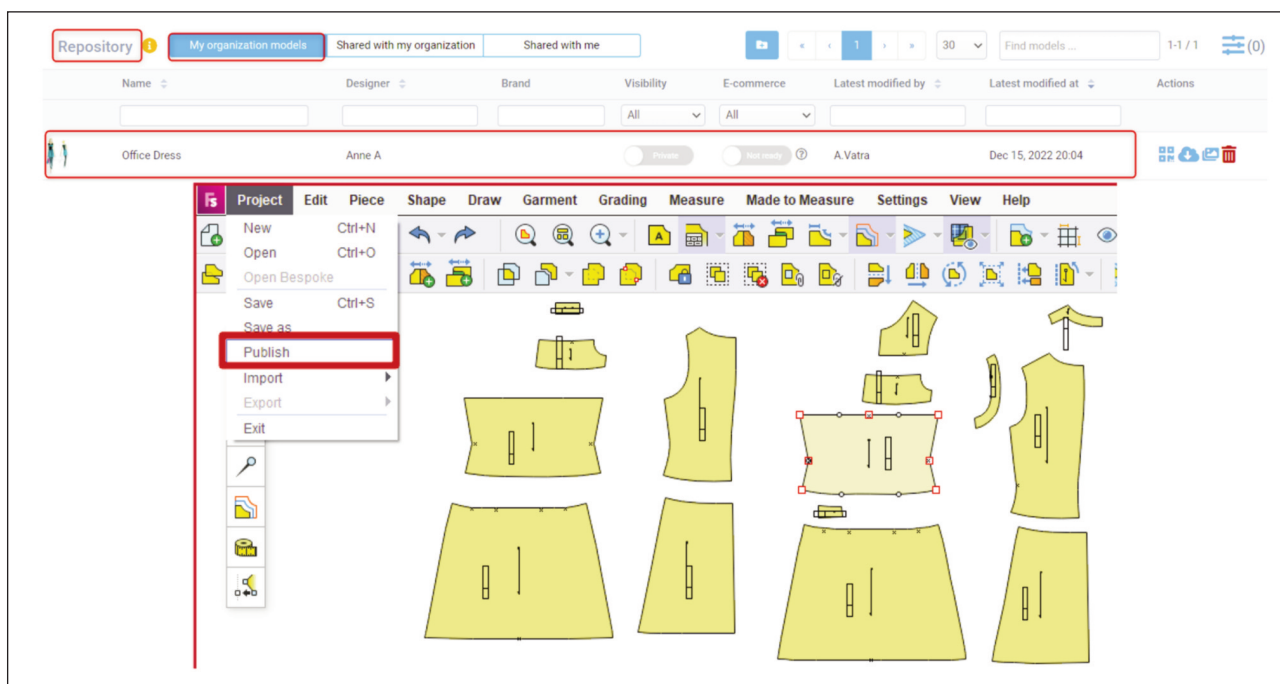


Fig. 3. The model patterns

The garment pieces are designed by using specific functions of Fashion Studio. Fashion STUDIO provides suitable options for the construction of the shapes, depending on the user's preferences: free, assisted, or parametric methods, or a combination. It provides one with the possibility to use native Bezier curve shapes, corner angle control, and other methods in its geometric platform for linked components while maintaining the freedom to move, rotate and flip the pieces on the digital workspace.

The model patterns that are saved and published in *Fashion Studio* are visible in the *Repository* list. In this section, the designer has the possibility to visualize further details of the developed model: its name, the name of the designer who drafted the patterns, the measurements, the styles (if defined for this model), and the decorative elements (if any have been applied) (figure 3).

Developed models can be found under "My organizational models". They can be shared with other technicians for their use or be kept visible only to the person who developed them.

## 2. Creating the mood board

A mood board is an important visual tool for any design and fashion project. It is a traditional design tool which depicts all the layers of inspiration needed for a design project (figure 4). It motivates the designer and serves as a project manual for all design teams.

Moodboards should be visually appealing, and easy to understand and they should illustrate design elements. The designer can develop mood boards from different angles and express their thoughts using a variety of materials.

The key steps in designing a mood board are:

a) Develop a Creative Idea That Goes Beyond Aesthetics.

Creating mood boards must be a stimulating creative process. This goes beyond simply compiling appealing images and arranging them without a solid, cohesive explanation. A creative concept is not a theme like "flowers", "sea" or "forest", but rather a combination of creative components from different sources, harmonized and adapted to create a stronger intellectual argument and greater aesthetic depth.

b) Choose a representative colour scheme for your project.

Every design project must include colours. They set the mood and give the mood board a certain "feel". Colours can influence inspirational images or vice

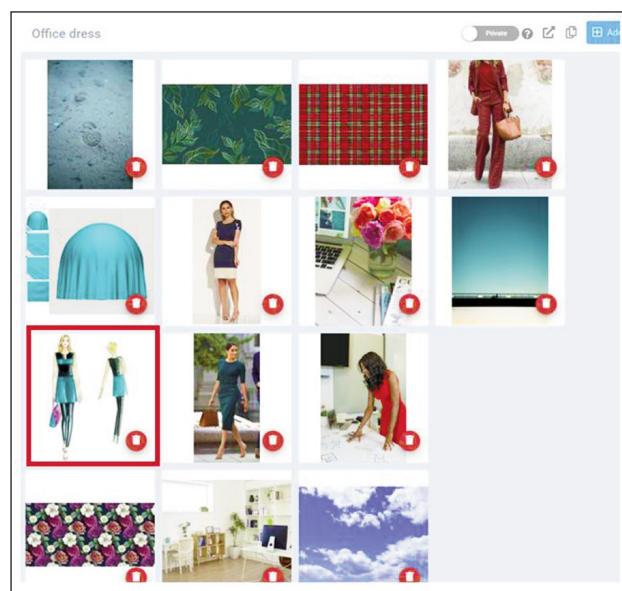


Fig. 4. Mood board

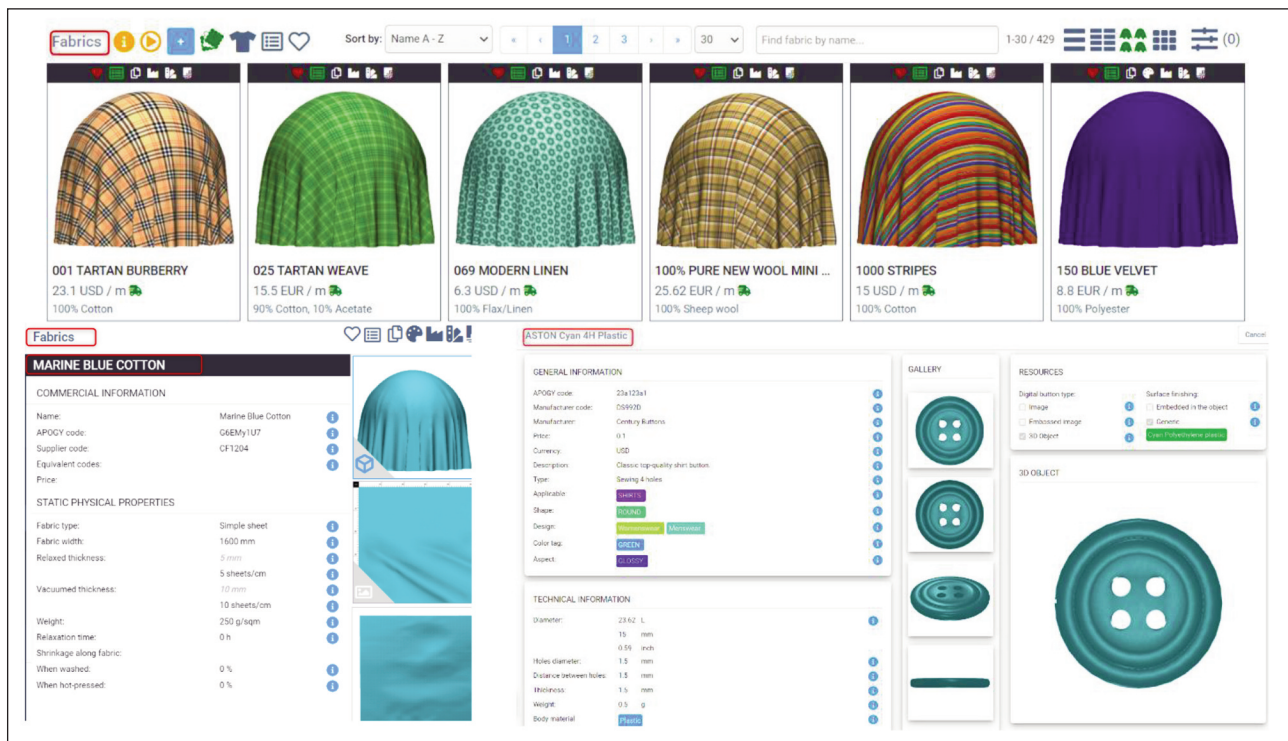


Fig. 5. Digital fabrics and accessories

versa. Colours can be changed during the development of the mood board.

c) Choose a typography series for each piece of writing.

For each graphic, logo and text element, use the appropriate typeface to convey the desired tone. Different typographic families interpret typefaces in different ways.

Include visual elements that match the chosen typography. In this way, one can ensure that the images and the typeface design complement each other and stay true to the original idea.

d) Create prints and textures in light of your colour scheme.

Mood boards can contain raw materials, finished prints and textures that enhance the final product. They are used to add depth and variation to a design presentation. Colour blocks are fantastic, but prints always add vibrancy and a new feel to a project.

e) Use inspirational images to tell a visual story.

The image will tell the 'story' of what the designer is trying to do. The designer will use inspirational images to inject emotion into the mood board presentation (use detailed images to zoom in and describe the sensations).

Working on a project with mood boards is both difficult and fun. A mood board is a versatile, highly creative tool that the designer can use to communicate concepts and show all facets of the project.

### 3. Create/enrich digital materials and accessories libraries

The designer can create or use the digital library of raw materials (*Fabrics*), materials and accessories (e.g. *Creative Assets Buttons*) within the company. Their digital format contains the following information:

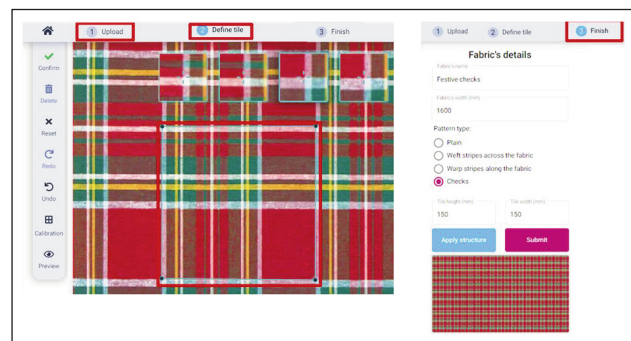


Fig. 6. Adding a new material in the digital library of fabrics

an image of the textile material/accessory, code, brand name, manufacturer, physical-mechanical properties (for textile materials), etc. (figure 5).

If the textile material that is going to be used for the development of a new model has a certain drawing ratio, the designer photographs an area of the material with maximum resolution and brightness, determines the size of the ratio, its physical-mechanical properties and enters the data into the digital library (figure 6).

The material that has been used to determine a certain drawing ratio can be used in developing new models (using the patterns of the reference model) with certain positional constraints for the components that ensure the continuity of the drawing ratio between two adjacent pieces (*Piece-to-Piece*) or *Piece-to-Fabric*. After selecting the material, the user sets the matching rule, and the created rule is applied to the selected parts (*Create matching rule*) (figure 7).

Depending on the ratio of the drawing and the region of the model that it depicts, the assignment rules can

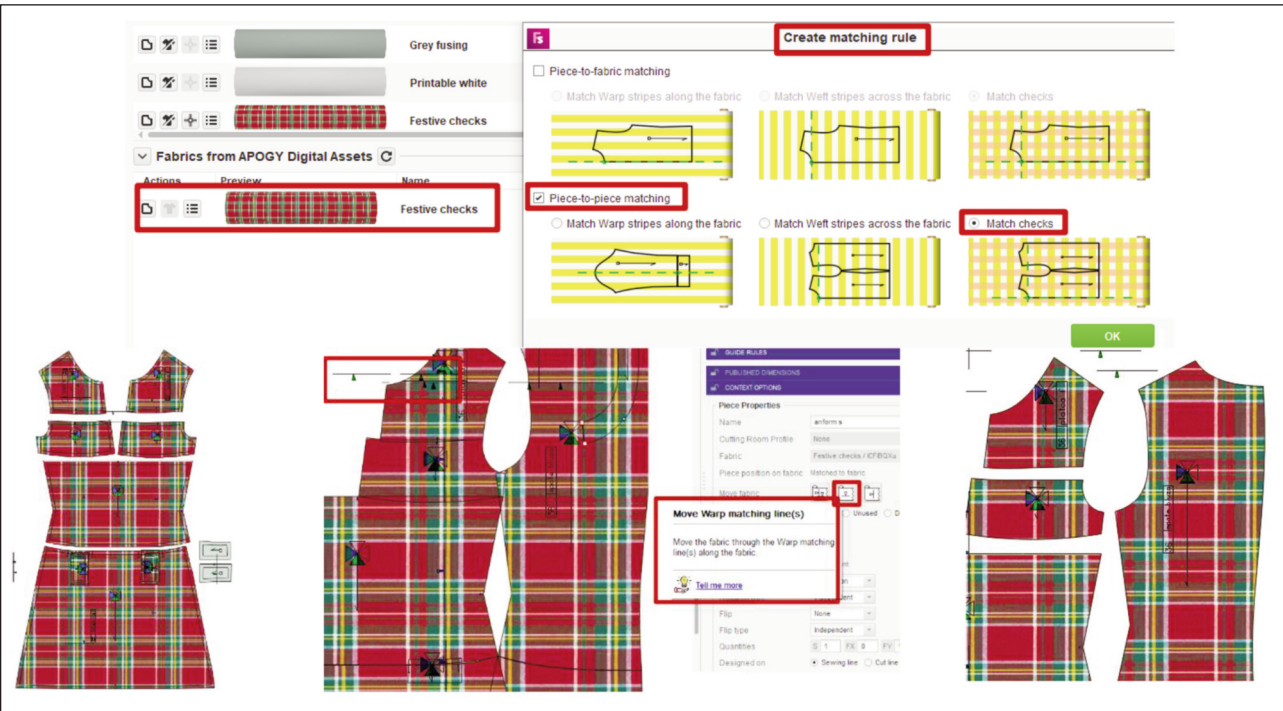


Fig. 7. Creating matching rules for adjacent pieces

also be altered (*Move fabric*) so that the two pieces get attached along the designated important areas (e.g. Piece-to-Piece). Another solution for developing new models is to share graphic resources on garment pieces. The

user creates the desired graphic model, saves it and manages it as an external resource. Select the graphic resource in the model, select the parts for which the graphic resource is to be shared and view the result (figure 8).

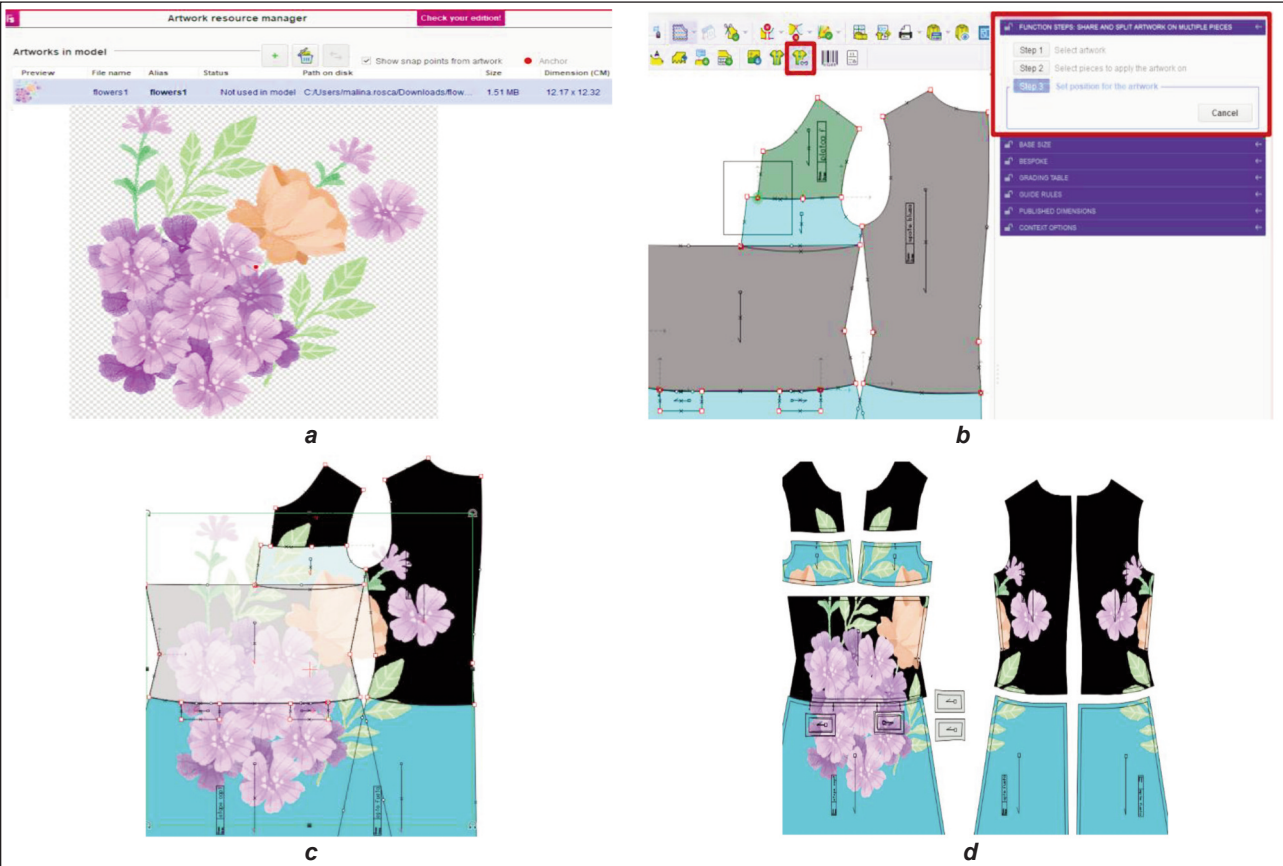


Fig. 8. Sharing graphic resources on selected pieces: a – design the wanted artwork; b – select the pieces where the graphic resource is distributed; c – the intermediate phase of the shared graphic resources on the selected pieces; d – final aspect

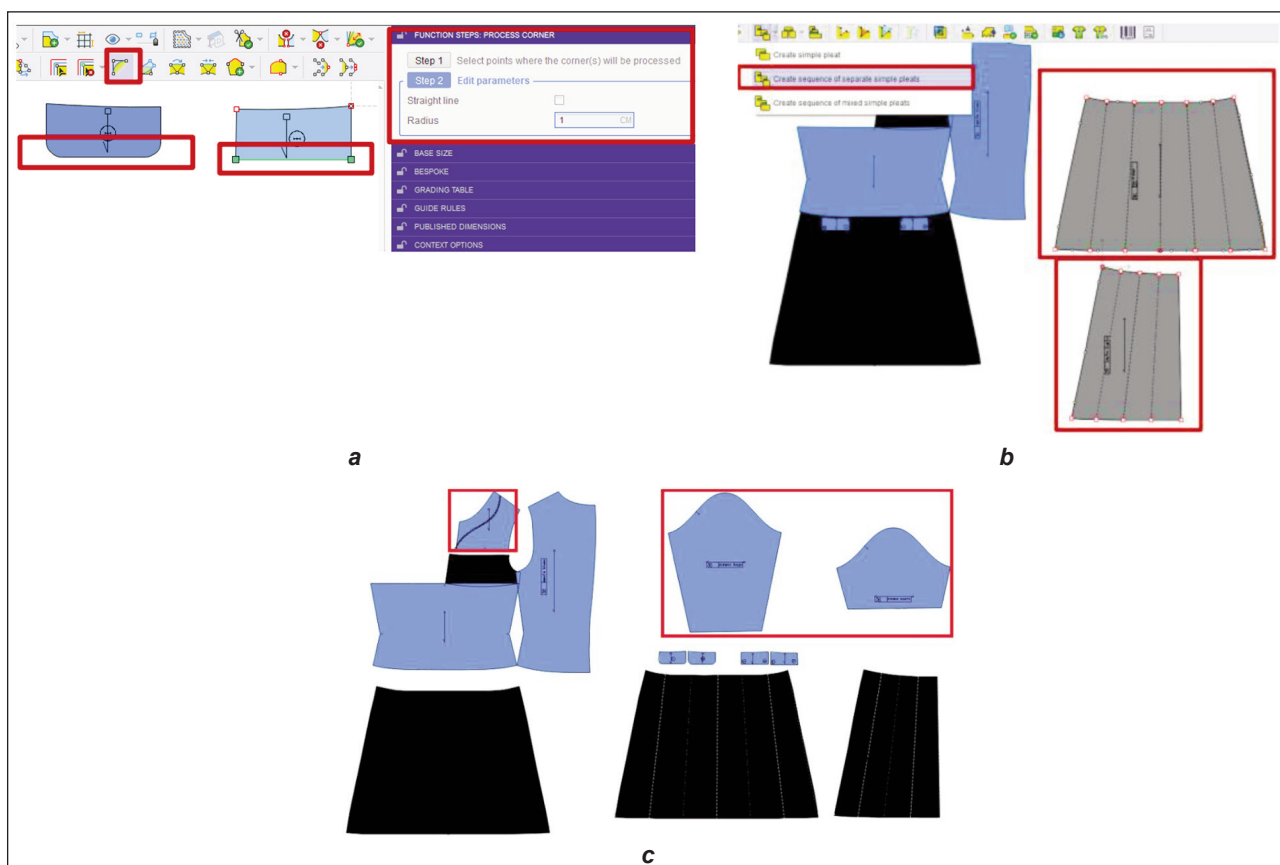


Fig. 9. Create new styles (Fashion Studio): *a* – *Shape mode* → change the corner shape of the flaps; *b* – *Industrialization mode* → create a sequence of separate simple pleats (skirt); *c* – *Pattern design* → design the sleeve patterns and *Industrialization mode* → adding decorative seams

Samples and product photos are necessary for brands and manufacturers to start marketing and selling in their physical or online shops. Brands that manufacture their products digitally will undoubtedly use digital materials. Digital textiles can easily be fed into a render pipeline to achieve consistent quality. Due to their scalability, 3D renders can replace actual photo shoots, saving significant time, resources and costs.

#### 4. Create new styles

The designer can change the stylistic features of the model. They can choose to alter the geometry of some parts (*Shape mode*) or their surface (*Industrialization mode*) (figure 9).

Starting from the reference model, the designer can draft the sleeve pattern (long or short) or add decorative seams (e.g. on the upper front part).

#### 5. Publishing models for online purchasing

Nowadays, consumers play the role of active trend makers rather than passive observers of culture. They are aware that fashion items are more than status symbols and objects that represent the ideals of the person who owns them, and they demand interaction and a product made to suit their preferences. For online purchases, the designer creates a form (Creation form) regarding which the user can specify certain preferences, either by selection or based on possible questions and answers (the customer personalizes the selected model) (figure 10). All possible options and all answers to the questions are entered into the form. Along with them, the number of com-

ponents corresponding to the selected option/the desired answer is inserted. The created models are published, so that they become available for online purchases (the models are displayed in the *Repository*, *Style Options* menu).

## CONCLUSIONS

Digital technology is a tool whose purpose is to address the real challenges of the garment industry. It does not solve problems by itself but can influence the direction of a business. To carry out a digital transformation and make the necessary changes, a company must go through numerous transitional stages. The base of the organization, the technological components and, of course, the customer base can be expanded according to the needs of the company after developing a strong infrastructure.

It is important to lay the foundations for the 3D implementation of the design process and to train staff to create a digitally skilled workforce. Once the teams are created and their members acquire the necessary skills, a framework is created in which digital product development can be effectively carried out. At this point, the organization can start sharing digital resources that can then be used on the consumer front.

The employees of the organization must be proficient in using specific tools for creating digital products and must maintain a collaborative environment between the stakeholders (from design teams to vendors).

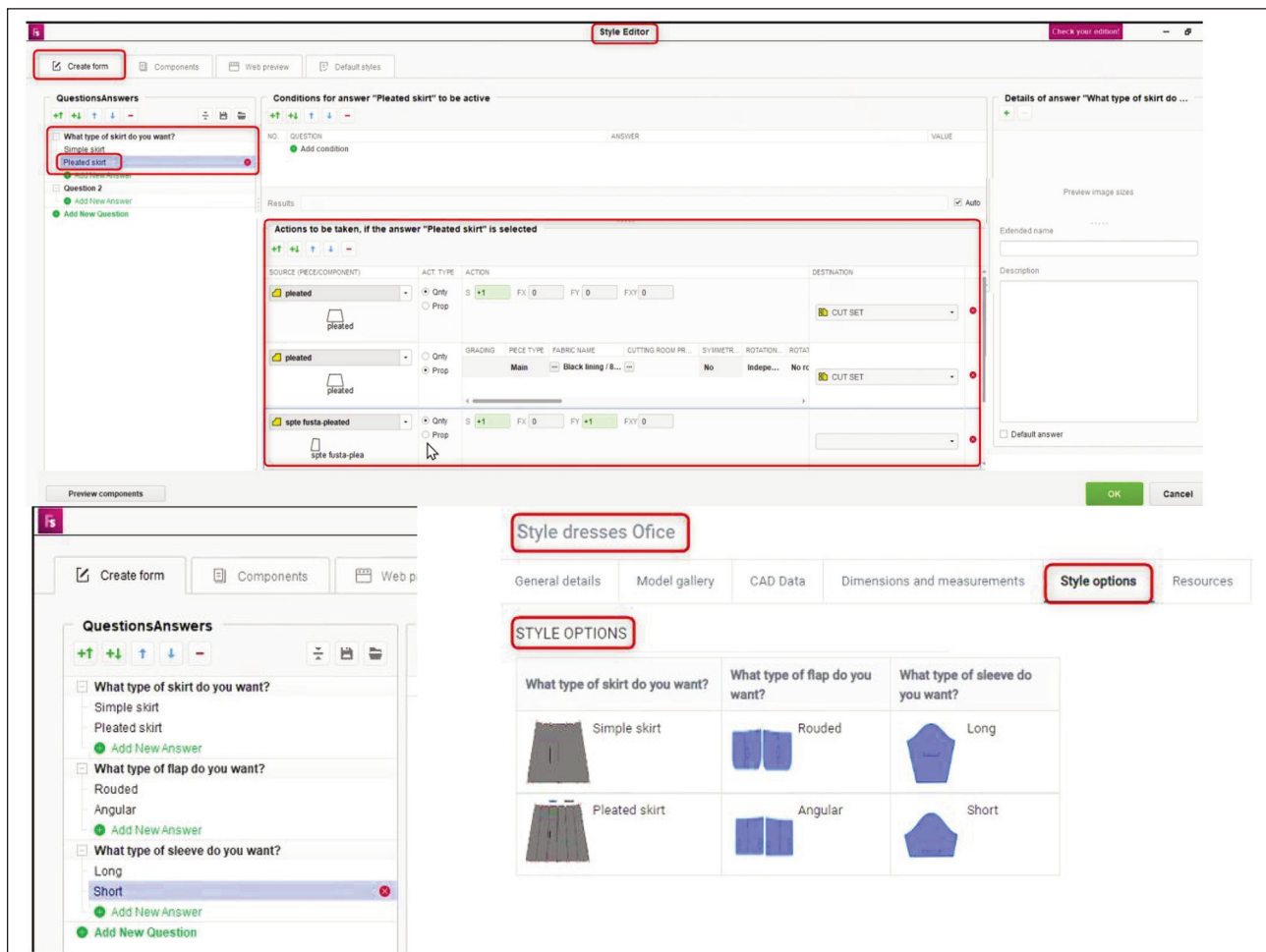


Fig. 10. Create a form for online purchases

Digital product creation must be focused on: prototyping (including the 3D virtual model), fitting (validating the size and the shape of the product about the shape of the customer's body, the details of the model, the interaction of the textile materials of the final product with the body), vendor cooperation (the vendors and manufacturers have to participate in the developing process of the product and understand the details of the 3D garment that they are going to receive) and sellability (digital tools provide a cost-saving estimation and prevent errors and waste). The specific tools used for designing digital fabrics, accessories, or trimming allow the designer to explore multiple combinations of colour schemes or motifs to prepare seasonal collections. In this way, the organization can plan how to meet the customer's demands before the physical products are made. Besides this, these digital assets can be used to create interactive catalogues or photorealistic showrooms as an end-to-end digital workflow from the design stage to the customer.

Digital products which are published on virtual platforms become accessible for online purchasing. The customers can personalize the selected model or contribute to its creation process (creation forms), enjoy a marvellous shopping experience, and in the end, the customer and the manufacturer will develop a business relation (customer fidelization). On the other hand, digital catalogues ensure a virtual alternative to in-person meetings, reduce the costs of physical sample production, eliminate additional costs, and mitigate risks.

The secret to success lies in building a consistent, cross-channel and synchronized system that coordinates physical and digital processes to deliver an interactive, engaging customer experience from the design stage to its acquisition.

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#### Authors:

MALINA ROSCA<sup>1,2</sup>, ANA-DIANA VATRA<sup>1,2</sup>, MANUELA AVADANEI<sup>1</sup>

<sup>1</sup>“Gheorghe Asachi” Technical University of Iasi, Faculty of Industrial Design and Business Management,  
29 Blvd D. Mangeron, 700050, Iasi, Romania

<sup>2</sup>S.C. Gemini CAD Systems, 2A Tudor Vianu St., 700490, Iasi, Romania

#### Corresponding author:

MANUELA AVADANEI  
e-mail: [mavad@tex.tuiasi.ro](mailto:mavad@tex.tuiasi.ro)