Digital Fashion Project

Collaborative Online International Learning in Digital Fashion

Report on Library of knowledge for virtual fashion design and technology

This project has been funded with support from the European Commission. This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein. Project Nº 2021-1-RO01-KA220-HED-000031150

Co-funded by the European Union

Report on Library of knowledge for virtual fashion design and technology

Project Coordinator: The National Research-Development Institute for Textiles and Leather –INCDTP Bucharest

Report Coordination: HOGENT

Authors:

Alexandra De Raeve
Joris Cools
Sheilla Odhiambo
Cosmin Copot
Andreja Rudolf
Tadeja Penko
Zoran Stjepanovič
Ion Razvan Radulescu
Catalin Grosu
Razvan Scarlat
Emilia Visileanu
Mihaela Jomir
Irina Ionescu
Manuela Avadanei
Alexandra Cardoso
Tânia Espírito Santo
Paula Gomes
Xianyi Zeng
Sébastien Thomassey
Xuyuan Tao

June 2023

Content

1. INTRODUCTION

A powerful "library of knowledge" on fashion design and technology is the basis of the online knowledge-based training. These are the databases behind the training platform of virtual fashion design and technology. All the partners have contributed in the creation of the databases and in fabric digitization process. The fabric digitization process is the basis for the virtual prototyping. The information collected into the database is: the concrete samples of garments both physical and virtual (3D garments), fabrics (both physical and digital fabrics), patterns, fashion images and themes, and fashion design elements. The databases have been created by systematically executing the following project activities:

R2/A2.1 Consultations with the partner's Fashion design and technology curricula used in face-to-face teaching, to identify common garments used in learning. Consultations with professional fashion designers associated with all the partners have been done in order to obtain general cognitive concepts on methods and principles of fashion design and general relations between design elements, materials, colors, and styles (fashion design elements).

R2/A2.2 Collection of concrete samples of fabrics and their important properties associated with visual appearance, feel, texture, structure drapability, composition, color, and design. Collection of finished garments (physical and virtual garments.) Collection of styles and patterns of the selected garments into a database.

R2/A2.3 Collection of fashion images and fashion themes into a database.

R2/A2.4 Organization of evaluations sessions so that designers generate fashion design elements (keywords) describing selected fashion images and finished garments. A questionnaire was made based on the selected garments/ fabrics/styles and rolled out to the designers associated with various partners who also evaluated them and generated the keywords.

R2/A2.5 Model of the relation between design elements and technical parameters: patterns, colors, and materials from previous learning data.

R2/A2.6 Establish a combination of the cognitive rules and practical rules of fashion design that predict technical parameters from fashion design elements with a set of tangible references or predict fashion design elements from technical parameters of existing finished garments R3 (Fashion and garment-making rules).

Thus the databases developed are: **Garment database** based on the project-selected garments, **Fabric database** (physical fabrics) with their properties that determine their visual appearance, feel, drapability, and some other important parameters required for digitization of the fabrics.

Fashion database (styles), various types of styles for the selected garments.

3D Garment database, based on the simulation of the selected digital fabrics that present the selected physical fabrics.

3D human database (selection). Based on Smartfit, a human database generated from a national measurement survey in Belgium. The database contains body measurements of more than 5000 Belgians, both women and men, with ages ranging from 3 years to 85 years. The measurement used in making the proof garments in the project was based on a common size across the countries of the project partners. The library of knowledge is to be built into the training platform as presented in *Figure 1*.

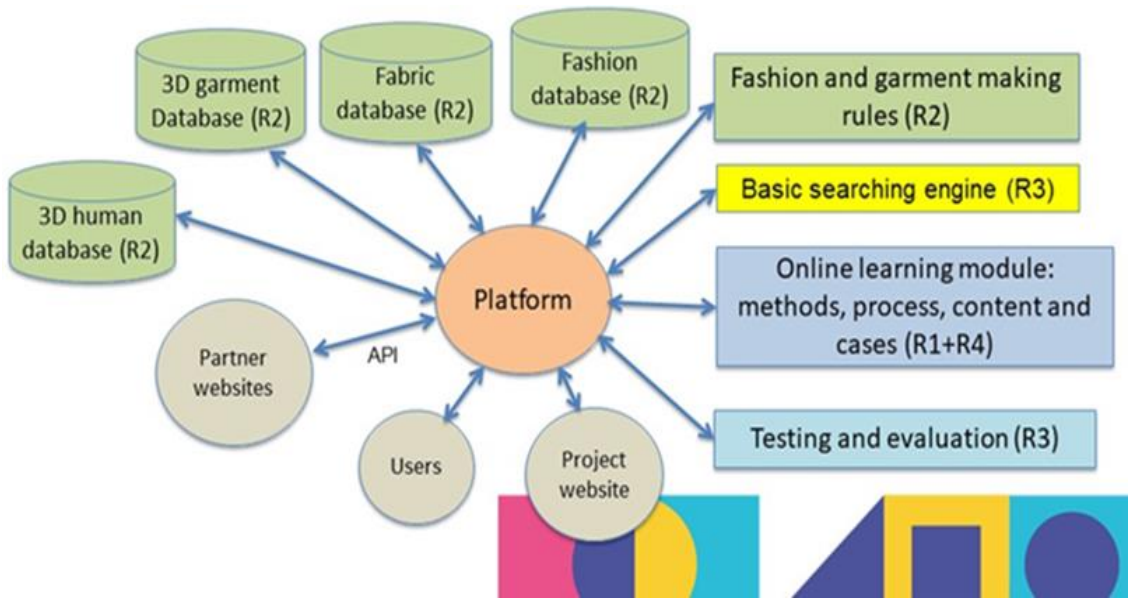


Figure 1 shows the databases developed as part of the inputs of the online training platform

At the beginning of the project, it was important to first develop a glossary of terminologies related to the creation of the databases to set the base language of terminologies given the diversity of the team. The following words were redefined with respect to fashion design and technology.

Garment: piece of clothing (also known as clothes, garments, dress, apparel, or attire) worn on the body and typically made of fabrics or textiles.

Style: the unique form of clothing (fashion) or garment model.

Fashion drawing or design sketch: expresses design ideas and presents the garment mood and stimulate emotions, gives the sense of proportions, fabric‘s color, texture and/or pattern.

Technical drawing: often referred to as “flat drawing”, which converts fashion drawing into a usable product with all needed details to construct garment pattern pieces.

Garment pattern design: Constructed pattern pieces of a garment.

Fabric samples: materials knitted/woven of about 50 cm by 100 cm.

Fashion design elements: line, form, shape, space, texture, color.

2. DATABASES

2.1 Garment Database

The garments selected for the project (common to all the partners curriculum) are: man shirt, man trouser, woman blouse and woman skirt. The partners were also asked to provide the following additional information in relation to the selected garments.

Questions 1 (R2 A 2.1)

For the selected garments, (which styles do you learn your students (MAX 10 PER GARMENT).

Questions 2. (R2 A 2.2)

Which specific **fabrics** are used for which specific **garments and style**? (Minimum of 2 fabrics PER GARMENT).

***Questions 3. (R2 A 2.2**)*

Please provide us with 2 fabric samples (about 50cm by 100cm) for each garment. You can bring the samples in the transnational meeting in Belgium in September (2022).

The partners provided a minimum of 10 styles per the selected garment. (Most garment styles are described in ISO 8559-2:2017, *Table 1*, first column). Graded patterns were collected for the styles, (depending on the style, for some styles 2 or 3 patterns were enough, for other styles, for example blouses, 4 or 5. In total styles of 20 man shirts, 24 man trousers, 21 woman blouse, and 28 woman skirts were collected into the database.

2.2 Fabric database

Fabric samples of each garment type were collected from the partners. Each partner presented at least 2 fabric types that are commonly used in their region for the selected garments (man shirt, man trouser, woman blouse, woman skirt). Therefore, each partner provided at least 8 fabric samples of size (50cm by 100cm) which they brought to Belgium in the transnational meeting in September 2022. *Figure 2* shows a sample filled-in template for the fabric details requested.

PR2: Library of Knowledge

Fabric Samples

Sample 1

Item	Description
Fabric code	**Pânză 45-998**
Used in which garment /style	**Shirts, blouses**
Image	
Colour	**Pink, 2153**
Material exact composition	**75% viscose, 25% cotton**
Construction description: weave/knitted/other	**weave**
Type of weave/ knit	**canvas**
The density of weave/ knit (warps/Wales cm or courses/cm)	**20/33**
Weight (GSM)	**75±3g/m2**
Thickness	**0.23±0.02 mm**
See through (yes/no)	**no**
Feel/touch (smooth, rough,...)	**smooth**

Figure 2 Example template for collection of fabric parameters for the database.

In total 49 different types of fabrics with different material composition and fabric constructions, knitted, woven, dyed/printed, were collected. This is a true representative of all possible diverse fabric characteristics/parameters that a designer may face. The collected fabrics were filed into a database according to the garments type. The datasets of the database are the fabric identity according to the numbers given by the project (F1-F49) and according to the identities given at source (partners numbers). Additional parameters are the fabric image, color according to Pantone or RGB code, material exact composition, type of weave/ knit, the density of the yarns in the weave/ knit, weight of the fabric, thickness, see-through- yes or no, and the feel and touch – rough or smooth (see *Figure 4*).

All the collected fabrics turned out to be from common material composition as shown in *Table 1*. The difference within the materials was in the % material mix composition and the fabric construction (the weave/knit design and the yarn size and the finishes: printed (multicolor), one color dyed etc. These fabric parameters contributed to the visual appearance, feel, and weight of the fabric.

Table 1 Summary of the collected fabrics

Garment	Styles	Materials Composition	Fabric Structures	Fabric weight(gm^{-2})	Finishes
Man Shirt	20	Cotton, polyester, Viscose, wool and in various percentage composition	Knitted/Woven	75-200	Stripped, checked, and plain colors light fabrics. Easy iron and easy care.
Man Trouser	24	Cotton, polyester, Viscose, wool and in various percentage composition some with Elastane	Knitted/Woven	206- 447	Mostly plain dyed in dark colors, visual and feel effects brough by fabric construction
Woman Blouse	21	Cotton, polyester, Viscose, wool, Tencel, lyocell and in various percentage composition	Knitted/Woven	60-145	Mostly Plain fabrics in different shades of white. Additional bright-colored printed fabrics, easy iron and easy care.
Woman Skirt	28	Cotton, polyester, Viscose, wool, lyocell, denim* and in various percentage composition	Knitted/Woven	114-404	Fabrics with multiple visual effects, single colored, multiple colored.

In consultation with the development of the training platform (Project result 3), a few important fabric datasets were paramount for the digitization of the fabrics. Some of which for instance fabric weight had already been collected, but some like drapability not and especially not according to the requirements of the fabric digitization. The main fabric parameters required are: fabric weight, thickness, material composition, structure, bending resistance, stiffness, and the draping image taken in a specified way.

Therefore the missing fabric parameters were determined in FTI lab in addition to controlling the existing parameters like the fabric weight, thickness, stiffness, and bending of all the 49 fabrics. These parameters were determined according to the following standards: **Fabric weight:** ISO 3801-1977 -Textiles — Woven fabrics — Determination of mass per unit length and mass per unit area, **Fabric thickness** ISO 5084-1996 Determination of thickness of textiles and textile products, **Fabric bending resistance and stiffness** in 2 directions (back and front). The results of each test were

filled in the fabric database. In case of the repeated measurements tests both the values given by the partners, and those obtained in the FTI lab+ were placed next to each other in the database. There was no significant difference between these values, since the partners also used the same standards to characterize their fabric, but there was need to control these parameters once more in a uniform way.

The drapability test of all the fabrics were performed in University of Maribor with the diameter of the drape meter support of 18cm and the diameters of the fabric sample of 30cm. The drape image was taken with a resolution of 1296x1025 pixels). The drapability test results (images and parameters) were presented in a separate file with an example of the datasets of the drape images presented in *Figure 3* and *Table 2*.

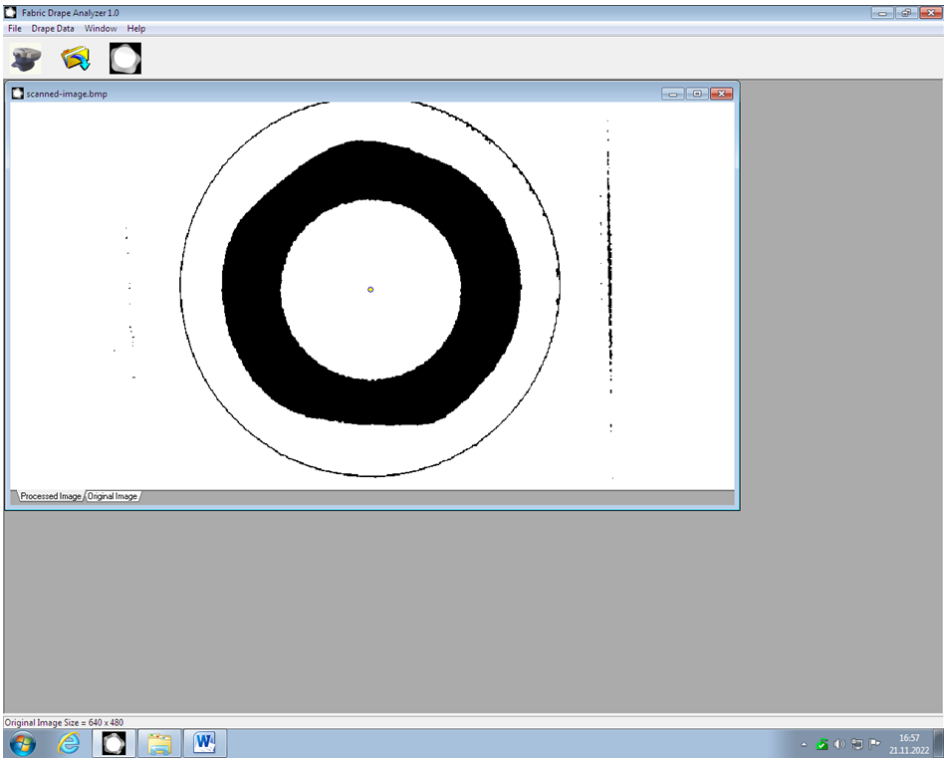


Figure 3 Drape image

Table 2 Drape parameters

Drape ratio	Node number	Wave amplitude (cm)	Wave length (deg)	Minimum amplitude (cm)	Maximum amplitude (cm)	Average amplitude (cm)	Variance (cm)	Fourier transformation / Original	Dominant / Original
0.875	9	14.77	40.00	13.28	14.88	14.38	0.17	100.081	99.976

2.3 Fabric digitization process

The fabric parameters required for the identification of the twin digital fabric of the physical fabric are: fabric weight, fabric thickness, material composition, the drape image and parameters, bending resistance and stiffness.

It was important to digitize all the collected physical fabrics so that the partners could use the digital version of their own fabrics in developing 3D garments and validate them against the physical garments of the same. The overall digitalized fabrics could then be confidently utilized in the online learning process. The fabric digitization process was conducted by ENSAIT as described below:

- For a specific real fabric provided by a user, we will first find a set of real samples in the Lectra handbook (swatch books) which are closest to it by directly comparing the basic parameters (weight, thickness, fiber composition) and appearance (weave type, warp and weft structure, …). From the codes of the real samples in the fabric handbook, we can easily find the digital fabrics in the Lectra fabric database and select the most relevant by comparing the real and digital fabrics through a draping experiment described.
- Next, the draping effects between the real fabric provided by the user and the digital fabrics that have been selected from the comparison of basic parameters and appearance were compared. The comparison of draping effects can be realized by human evaluation or measures of the geometric features. The human evaluation is carried out by a group of non-trained evaluators. For each comparison, each evaluator gives the dissimilarity degrees between the real and digital fabrics by taking values from {0 – very similar, 1 – close, 2 – medium, 3 – different, 4 – very different}. The final result of comparison is the average of the dissimilarity degrees for all the evaluators.
- The comparison of the geometric features was realized by considering the following criteria describing the shape of the final draping state: number of peaks, averaged, minimal and maximal distances from the edge to the center, etc. (see *Table 2*). The most relevant digital fabric should be the closest to the real fabric sample in terms of draping effects (mechanical properties), appearance and basic parameters. The selected digital fabric will be input into the 3D software for digital garment design.
- For generating a 3D garment, the related digital fabric was selected from a comprehensive fabric database associated with the 3D software according to the technical parameters of the real fabric proposed by the designer. However, these technical parameters are usually unknown to users and it was needed to identify them quickly without physical experiments. For a real fabric, the user (designer) firstly extracts its drape image using a simple drape meter and evaluates its main image features, then compare them with those of the drape images of the digital fabrics existing in the fabric database in order to select a digital fabric minimizing the difference with the real fabric in terms of drape image features. The technical parameters of the selected digital fabric will be input to the 3D garment software to generate the corresponding 3D garment and fitting effects. In the 3D CAD software (Modaris 3D Fit of Lectra), the technical

parameters of a fabric are considered as inputs to the garment simulation system. These technical parameters include a number of basic parameters (e.g. thickness, weight), optical parameters (e.g. texture (weft and warp structure) and color) and mechanical parameters (e.g. bending, shearing, tensile). In order to avoid complex fabric measurements, we use the fabric database of the Lectra 3D software (and its associated handbook in order to find the most relevant digital fabric for each specific real fabric. In fact, the Lectra fabric database is composed of a great number of digital fabrics with technical parameters (including the draping effects), which is capable of covering almost all ranges of fabrics used in garment design. The Lectra fabric handbook includes the real fabrics and associated explanations corresponding to the fabric database. Both of them are useful for fabric digitalization.

The digital fabrics of all the physical fabrics were identified according to the Lectra fabric numbers, which were then placed in the Fabric database as 'Lectra best match'. An extract of the fabric parameters presented in the database, including all the important fabric parameters plus their twin digital fabric is presented in **Erro! A origem da referência não foi encontrada.**.

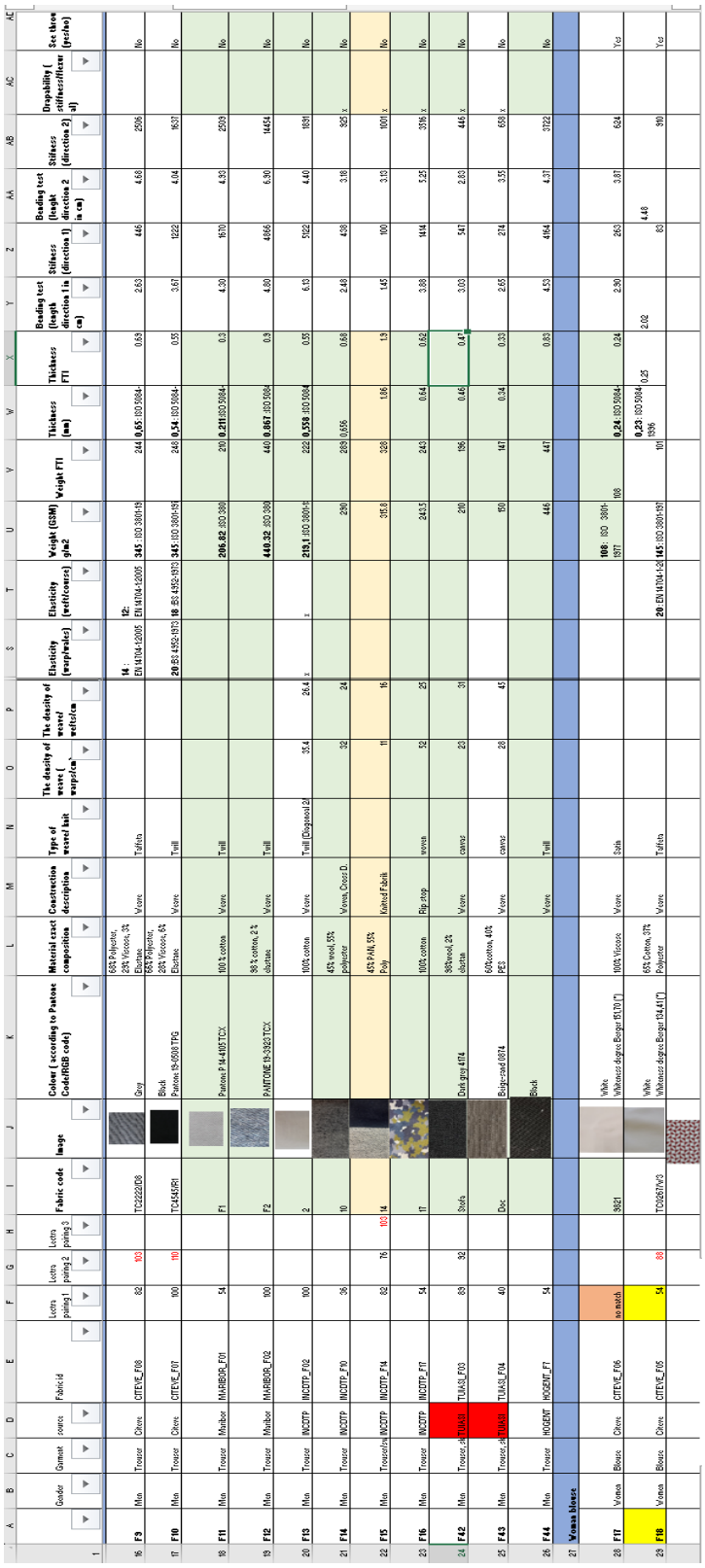


Figure 4 Extract of the Fabric dabase with their parameters.

2.4 Pattern

Each project partner provided patterns for a women’s skirt, a women’s blouse, a men’s trousers and a men’s shirt. The database contains 10 different skirts, 10 blouses, 5 shirts, 8 men’s trousers. Furthermore, the database was completed with 2 men's polo shirts, 1 men's shorts, 1 men's sweatpants and 1 men's T-shirt. As the project partners work with different CAD pattern systems, not all patterns have the same file format. Most of the patterns are available in a Lectra-format and some in DXF-format. DXF is a CAD data file format designed for sharing drawing data universally across CAD applications.

At this stage of the project, 2 patterns were chosen to make the first simulations: A women’s A-line skirt and a women’s blouse. The patterns are graded in 7 sizes, from 34 to 46.

The blouse has long sleeves, a collar and a little slit with a button in the back as a closure, *Figure 5*. The patterns of the blouse are illustrated in *Figure 6*.

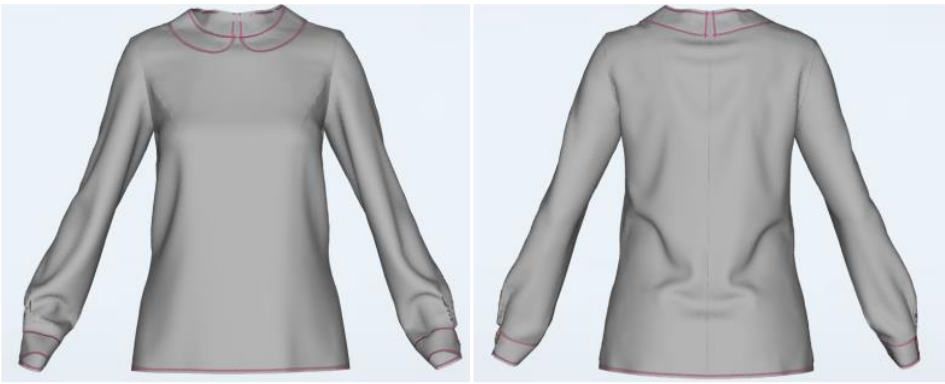


Figure 5: Virtual 3D prototype of the women's blouse

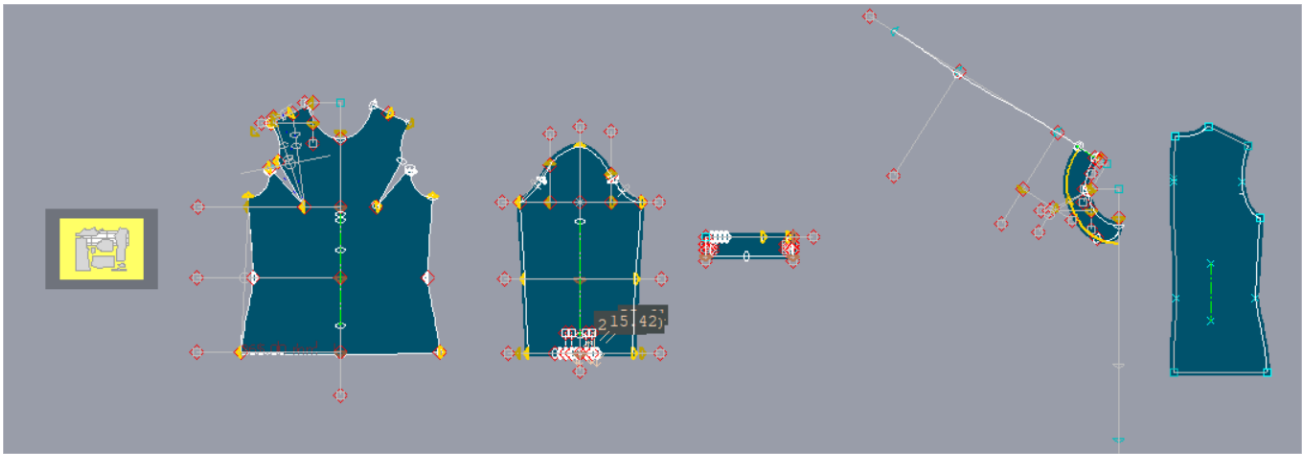


Figure 6: Pattern pieces of the women's blouse

The skirt has an A-line shape and has darts in the front and back and has a waistband. The closure is with a concealed zipper and a button in the back, see figures 7 and 8.

Figure 7: Virtual 3D prototype of the A-line skirt

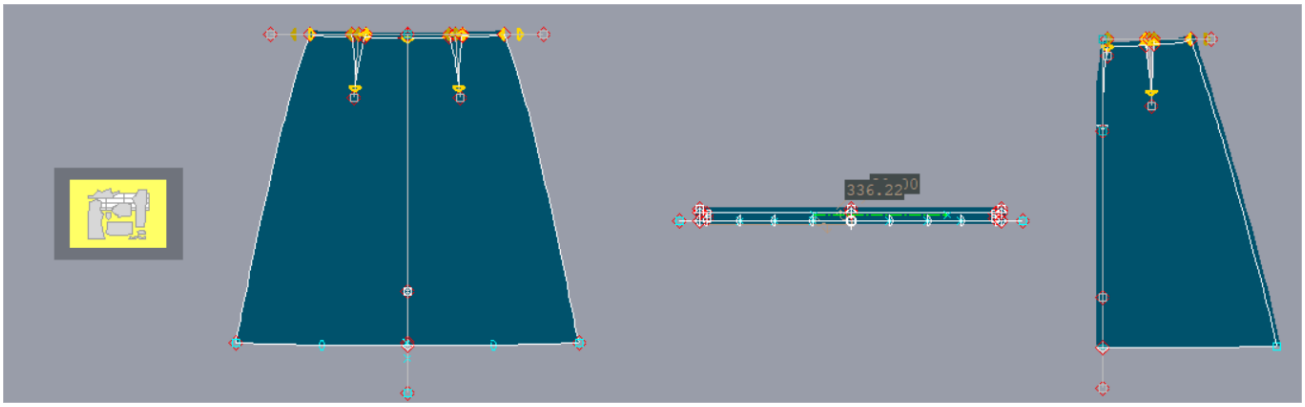


Figure 8: Pattern pieces of the A-line skirt

2.5 3D human model

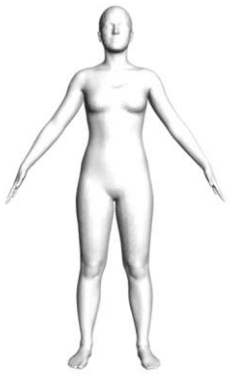
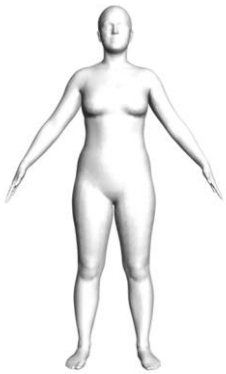
The virtual avatars are from HOGENT's Smartfit database. Smartfit is a national measurement survey in Belgium and the database contains body measurements of more than 5000 Belgians, both women and men, with ages ranging from 3 years to 85 years.

The avatars are available in OBJ-format. An OBJ file contains information about the geometry of 3D objects. The files are used for exchanging information, CAD, and 3D printing.

At this stage of the project, avatars of young ladies aged 18 to 25 years in (Belgian) sizes 38, 42 and 46 were chosen. The database may be supplemented later with larger

and smaller sizes, and ladies or gentlemen in other age categories. *Table 3* shows the avatars and the main body sizes.

Table 3: Female avatars and measurements

SIZE	38	42	46
bust girth	88 cm	96 cm	104 cm
waist girth	67.5 cm	75.5 cm	84.5 cm
hip girth	93.5 cm	101.5 cm	110.5 cm
body height	166 cm	166 cm	166 cm
front			
left profile			
back			

3 Validation of the Digital garments via physical garments

Two patterns: women's A-line skirt and a women's blouse were chosen from the data base to make the first simulations of the digital garment using the representative digital fabrics of the physical fabrics. All partners made a physical garment of women's A-line skirt and a women's blouse using the provided patterns and measurements, but with their own fabrics in the fabric database. The physical garments were brought in the 4th TP Meeting (CITEVE, Portugal) for a validation. All partners participated in the validation process. All the skirts made were dressed on the mannequins as presented in *Figure 9*. The garments were evaluated visually in terms of aesthetics, appearance (draping) and fit. All the skirts were confectioned in a high quality standards. Since different types of fabrics are used to produce the A-line skirts, there was a slight difference in the draping of the skirts as can be seen in *Figure 9*. In fact, there was realized that the skirts had to be ironed before dressing them on the mannequin, otherwise the 'travel crease' was interfering with their draping on the mannequin. Each skirt was compared with its 3D simulated digital garment, and the similarities and differences were analyzed. Additionally, the drapability of the skirts was compared between the physical garments and one on one with the 3D garments. The garment is observed from the front, left side, and right side. The back side was not considered in this analysis. The results obtained are presented in *Table 4*.

Figure 9: Physical garments on the mannequin

Figure 10 shows the fabrics used in the making of the skirts and their corresponding pairing of the digital fabrics. Most of the physical fabrics selected for the making the A line skirts were comparable to Lectra fabric number 30, except one of the fabric that was comparable to Lectra Fabric no. 100.

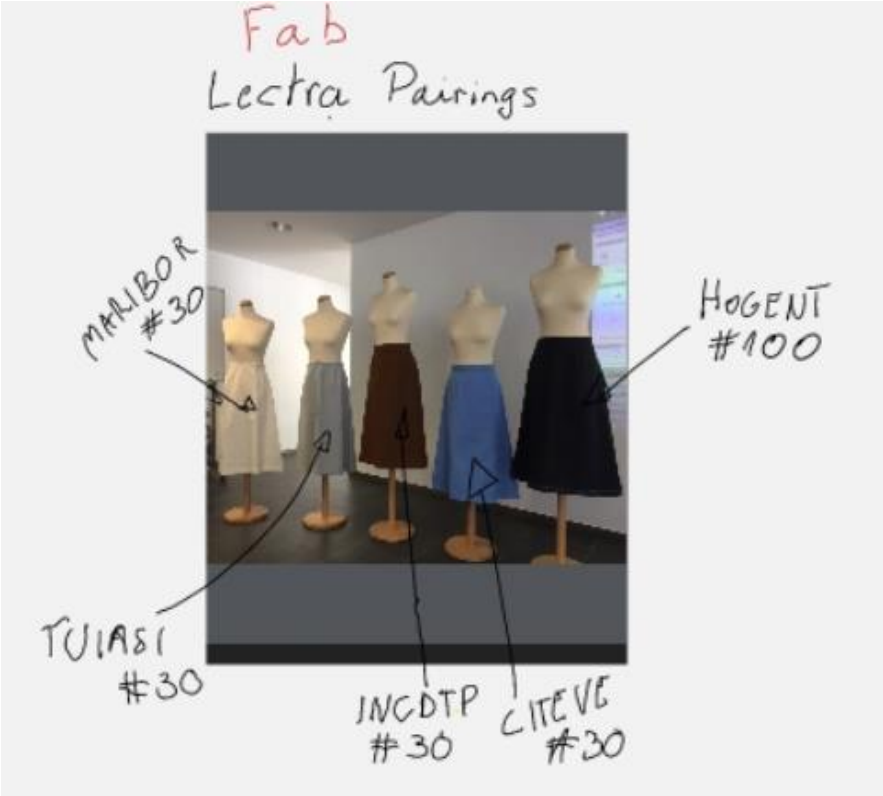


Figure 10: Corresponding pairing of Lectra digital fabrics used in making the A- line skirts.

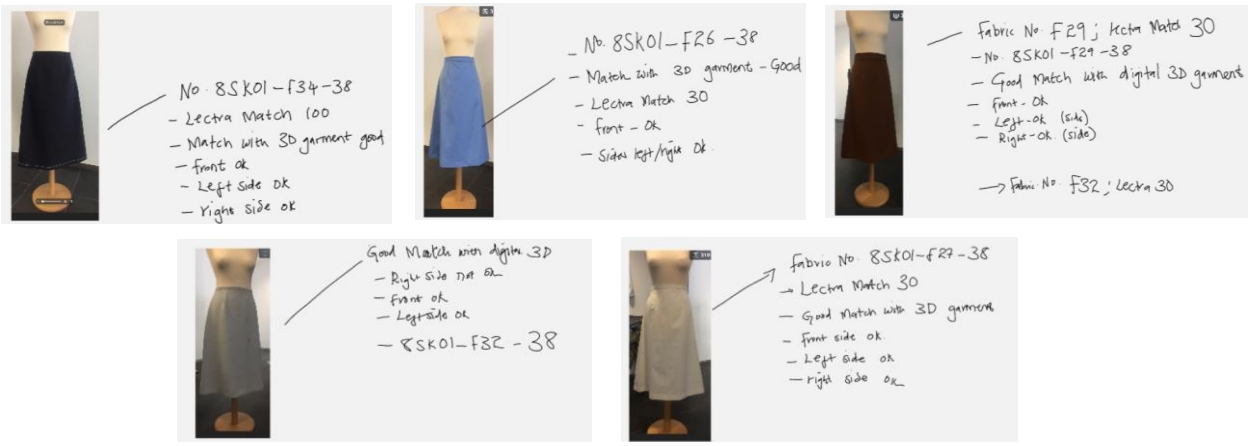


Figure 11: Validation of the physical garments

Figure 11 shows the actual score of each skirt as summarised in *Table 4*. These scores are based on the comparison with the simulated 3D A skirt made from the digital fabric represenattive of the physical Fabric.

Table 4 : Comparison of the Digital fabric/garment match to the physical garments

Fabric No.	**Fabric source**	**Lectra match**	**3D Match**	**Front match**	**Left side match**	**Right side match**
Fabric F34	HOGENT	100	Good	Good	Good	Good
Fabric F26	CITEVE	30	Good	Good	Good	Good
Fabric F29	INCDTP	30	Good	Good	Good	Good
Fabric F32	TUIASI	30	Good	Good	Good	Good
Fabric F27	MARIBOR	30	Good	Good	Good	Good

The validation activity of the digital garments in Lectra via physical garments was successfully completed by all project's partners. The physical garments dressed on the manequins while the digital garment was projetced in a big screen. Comments for each garment wer recorded digitally at acentral point for each and every garment. *Figure 12* shows an example of a digital page of the the garments vs their selected digital fabrics.

Figure 12: Digital page of physical garments vs their selected digital fabrics.

Conclusion

From the exercise it was concluded that the digital twin fabrics of the physical fabrics behaves more or less in the same way as the physical fabrics in terms of how it drapes on the body/ mannequin, thus confirming the robustness of process of fabric digitization process.

4 Questionnaire on Principles of Fashion Design

4.1 Questionnaire

Preamble: You are to design a casual collection of women's garments of age category 25- 40 years and of mid-price level (middle end fashion brand).

Q1. Referring to fashion design elements, which are the 3 most important ones that you will consider?

We have interviewed multiple designers and the most important fashion designs in their opinion are:

Color

Shape of the garment

Texture of the fabric

Current trends in choice of materials (sustainability, texture and color), shape (cut) and details (e.g. style of pockets, seams, addition of print artwork or decorative tapes or garment type specific finishes like stone wash on denim).

As this is a mid-price level collection, price is important. In general, the designer would be working together closely with the sales team and product managers in order to implement sales data and brand strategy to design clothes that would target our customer as best as possible, within the range of possibilities at our production facilities (available machinery, finishes, minimum order quantity).

When creating a collection of clothing for women aged 25-40 with a medium price range, it's important to consider their fashion tastes and preferences, as well as current trends. From my point of view there are three fashion design elements to consider:

Color - Colors can have a strong impact on how a piece of clothing is perceived. Bright and bold colors can draw attention, while neutral ones may be more suitable for basics. It's also important to choose colors that complement skin tones and popular seasonal colors. This way the collection must include the colors of the year, as statement pieces, because the clients are young, but also some neutral colors so that the garments will be worn for many years, for basic garments.

Texture - Texture can add visual and tactile interest to a piece of clothing. From my point of view, if the collection will pe presented in the stores, it is important that the material will give a pleasant feel when touching the material.

Shape - The shape of a piece of clothing can influence how it fits and looks. For example, slim or elongated cuts may be more suitable for tall and slim women, while straight or loose cuts may be more suitable for curvier women. It's important to consider different body shapes and create options that fit different body types, so that all types of clients will find something appropriate to wear.

Q2. How do you successfully combine the above-mentioned fashion design elements to create the aforementioned collection?

The materials will have a big influence on the shape and the finishing. It's important to select them accordingly. The selection of fabric will influence the full garment - a skirt in wool might need a lining, whereas a cotton skirt might not. Heavier weights will influence shape and look – Some designers would consider the cut of the style (e.g. A-line) compared to whether or not the fabric is suited for it. Adding too many details, trims, seams will influence the price. It's important to be selective.

Some other designers mention that the order to be considering for a successful combination is: 1st shape, 2nd colors, 3rd material, 4th sustainability and 5th dematerialization. Sketch the clothes (combining the 3 elements aforementioned in the first question).

Fashion forecast. Researching current fashion trends and determining what consumers will like. Based on the upcoming trends, designing mood boards. Checking out fashion shows, looking out for street-style fashion, and searching on-line the influencers on the media.

When designing women's clothing for the market, especially when the buyers are in the 25 to 40 age category and in the mid-price segment, it is important to consider fashion shapes and forms of outfits first and foremost. They want to wear trendy clothes where shape and form play an important role. Colors are also important, as is the functionality of the clothing, which also needs to be taken into account.

There are other principles that are important as synergy, such as lines that can change the outfit in terms of posture to elongate it or make it dynamic, and different textures of fabrics that bring more individuality when combined.

To create a cohesive collection, the designers will apply the elements of fashion design in a balanced and consistent manner. As mentioned above, the three key elements to consider are color, texture, and shape. From the designers point of view, these can be combined in various ways, including selecting a cohesive color palette, creating simple base pieces with interesting details, and incorporating different shapes and cuts to add variation. It is crucial to understand your client and create a collection that aligns with

their fashion sensibilities. By following these guidelines, you can create a successful collection of casual women's wear.

Q3. Can you apply a swot analysis to this design process?

At this question, most of the designers said that a SWOT analysis can be applied in the design process and can be used to meet the needs/expectations of the target public.

As mentioned in Q1 and Q2, designing a garment within the context of a brand, requires that the brand has a certain image, style, price point and target audience.

At the mid-price level, brands are less inclined to be fashion forward and will probably not experiment and take big risks.

The question will always be: will our customer like this style and will we be able to sell it?

Therefore, a SWOT can be made on each style - defining the strengths and weaknesses of a garment, and looking for opportunities (e.g. introduction of a new type of garment into a collection to diffuse and branch out and reach a new customer) and threats (are competing brands offering a similar style at a better price?)

Usually, the designer is focused more on his inspiration when creating a new collection, but a SWOT analysis can help identify the strengths and weaknesses of the design process and identify opportunities and threats from the external environment. This can help develop an effective design strategy and make informed decisions during the design process and market launch. At this point, the collaboration between the designer and the marketing people is of great importance.

Analyzing the weakness of a casual collection of women’s garments of age category 25-40 years and of mid-price level it can be said that the moderate price range may limit the materials and quality of materials that can be used within the collection.

But, as strong points, the market for women's clothing aged 25-40 is growing, which can provide opportunities for sales growth and market share.

The use of durable and sustainable materials can attract consumers who are interested in ethical and sustainable fashion.

The strengths of applying SWOT analysis are:

- Experience in designing garments; using the design software for sketches- EFI Optitex.
- Creating mood boards using the software.

- 3D visualization of garments. Understanding how the fabric behaves in terms of wearability.
- Good reaction to a new fashion trend.

The weaknesses of applying SWOT analysis are:

- Short time for developing a new model.
- Ecological requirements for the fabric and accessories (no forbidden chemicals allowed).
- Fast fashion implies price increase; short time for producing the garments, from the design stage to production.
- Price increase of raw materials.

Using the SWOT can open some opportunities such as:

- Gaining new set of skills and training by learning to use the latest software available.
- Consumers wish for new designs.
- Creating virtual "show room" without making physical samples.
- Making e-mail catalogues.

Some threats of the SWOT are”

- Low quality of the final garment when using alternative materials to keep the low price of the garment.
- Quick development of technology.

Some other designer mention that they would never start drafting SWOT analyses, but would rather start with the brand's "red line", trends and market analyses. Given the market situation, other principles only have the function of expressing some principles more than others. It would rather say the principles serve other requirements that need to be taken into account.

When trying to see the basic elements of design in SWOT analysis, it can say: The strengths of using fashionable elements that are new in trends are for the market that is ready to adopt trends.

Q4: What are the pitfalls (threats) when designing the garments?

The main pitfalls indicated here are:

- misjudging the quality compared to the shape: the drape might be different than expected and the finishing might need adapting.
- in the selection of color, shade is a very important aspect. Combining colors to make a well balanced collection, is often a difficult balancing act.

- sustainability issues: design for longevity and design for recycling requires knowledge and skill (know the more sustainability options when making the collection).
- Competition.
- public acceptance.
- relation quality/price.
- impossibility of competing with the foreign market. (Similar garment design being produced at very low cost using sub-standard fabric, trimmings and accessories, sewing thread).

If we follow fashionable and trendy elements (colors, shapes), that is no guarantee that we will sell the collection well. Maybe the market is not ready for certain shapes and styles, but we believe it is.

We still have the possibility to use fashionable elements that fit a certain market better than the elements of the trends. We can - or rather - have to adapt trendy elements to the market/buyer.

As threats it was mention the intense competition in the fashion industry that can affect the success of the collection.

Changes in the preferences of the clients, very fast in our days, can make the collection become outdated and unappealing. This is why, creativity, something special for every style and a fast response to the fashion changes are the key.

Fashion is influenced by external factors such as socio-political and economic events and in our days, by the sustainability issues. More and more people are asking about the fabrics provenience, the use of the chemical substances in the fabrics and so on.

Q5: Which texture of the given fabrics is most suitable for an A-skirt in the above collection?

In terms of range planning, the designers would try to optimize fabric usage over several more styles in the same quality and color - to balance out silhouettes that all go together. This will also increase the volumes in ordering fabric (as they will need more fabric if they produce more than one style in the same quality), which might also give a better price and better lead times (fabric suppliers choose to produce bigger orders before smaller ones).

The designers interviewed by HOGENT mentioned that they will never choose quality for one style - always keep the big picture of the collection in mind. Thus they made the following selection: HOGENT_F8 - more for a casual shirt, and/or summer skirt or dress; HOGENT_F5 - too supple, the A-line will not be visible. For classic or fancy blouses, lined dresses, or as a high quality lining; HOGENT_F7 - casual A-skirt in a heavier quality. Fit for mid-seasonal clothing or Winter when lined. This could also be suitable for a matching jacket / trousers. Might work for a classic blazer-style coat. Too thin for a winter coat;

HOGENT_F1 - casual A-skirt in a light corduroy quality. Fit for mid-seasonal clothing or Winter when lined. This could also be suitable for a matching jacket / trousers. Might work for a classic blazer style coat or fashionable utility jacket, but too thin for a winter coat.

The designers interviewed by CITEVE indicate that the fabric construction more suitable for the style/garment is the fabric CITEVE_F08. The shape, functional and emotional (what is the emotional chain in the relation to consumer). To functional for the function.

The designers interviewed by INCDTP mention that s stiffer fabric should be used in order to keep the shape of the A line skirt. To hold the shape of the garment the weight of the fabric must be above 300 GSM and construction to be woven

The designers interviewed by Maribor mention that fabric MARIBOR_F1 it is enough compact but also fabric MARIBOR_F8 could be used to design some lighter models.

The designers interviewed by TUIASI mention that an A-line skirt requires a more rigid and structured fabric to be able to maintain its shape and create the necessary volume. In the meantime, the draping of the fabric is of great importance. This is why, after examining the proposed choices, I think that TUIASI_08 fabric is the best, with a little bit of volume, but also with good draping. For summer collections, TUIASI_06 can also be used.

4.2 Conclusions

Based on the feedback we have received we can conclude that the design fashion elements are very important when designing a collection and that 3 most important elements are: Color; Shape of the garment; Texture of the fabric.

We can also conclude that a SWOT analysis can be applied in the design process and can be used to meet the needs/expectations of the target public.

5 CONCLUSIONS

The activities of project results 2 have been realized in good time thanks to the collaboration and enthusiasm of all the partners in the execution of the activities. The databases developed are:

Garment database based on the project-selected garments,

Fabric database (physical fabrics) with their properties that determine their visual appearance, feel, drapability, and some other important parameters required for digitization of the fabrics.

Fashion database (styles), various types of styles for the selected garments.

3D Garment database, based on the simulation of the selected digital fabrics that present the selected physical fabrics and **3D human database**.

Principle and key fashion design elements has also been established from the questionnaire and the Fabric and garment evaluation sessions by the designers associated with the project partner.

ERASMUS +

KA2
KA220 – HED – Cooperation partnerships in higher education
Grant Agreement: 2021-1-RO01-KA220-HED-000031150
Project duration:
01st February 2022 – 31st January 2025

INCDTP	Institutul National de Cercetare-dezvoltare Pentru Textile si Pielari **Romania**	www.certex.ro
ensait ROUBAIX ECOLE D'INGENIEURS TEXTILE | Université de Lille	Ecole Nationale Superieure Arts Industries Textiles **France**	www.ensait.fr
FTILAB+ HOGENT	Hogeschool Gent **Belgium**	www.hogent.be
University of Maribor	Univerza v Mariboru **Slovenia**	www.um.si
citeve	Centro Tecnológico das Indústrias Têxtil e do Vestuario de Portugal **Portugal**	www.citeve.pt
	Universitatea Tehnica Gheorghe Asachi Din Iasi **Romania**	www.tuiasi.ro