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Introduction
Welcome to the first edition of Digital Fabrics For Fashion Brands, the book that’s written especially for fashion brands that want to go digital but haven’t a clue as to how to start or where to begin.

Do you often feel like your brand creates too many samples, and thus creates a lot of waste materials? Are you frustrated because production lead times take too long, due to the time it takes to correct mistakes and fix adjustments of samples? Are you fed up harming this planet and are you looking for sustainable solutions within your company? You need a 3D digital transformation!

Or maybe you already did your research in 3D technologies, but just can’t wrap your head around digital fabrics. Just when you thought you had figured everything out about simulating digital garments, you realize you are not up-to-date on all features yet.

Either way, you’ve found the right book. Help is here, within these humble pages.

This thin and compact book talks about digital fabrics in everyday terms. The language is friendly; you don’t need a graduate education to get through it. The goal is to bring the complex and unknown information of digital fabrics down to earth where you can touch them and squeeze them and say “Why did I wait so long? I can do this!”

Icons used in this book
Those cute little pictures (or: icons) in the margin aren’t just there to pretty up the place. They also have practical functions: they supposedly draw your attention to various features or help you decide whether something is worth reading.

This icon means that either technical details or information from scientific studies are coming up. Read only if you’re interested, you can skip it if you’re in a hurry.

Pay attention! This icon let’s you know that some particularly useful information is at hand - it could be a shortcut that saves you lots of time.

This icon is there to emphasise the importance of the information coming up. You better find a nice spot in your brain to store the information for later use.

Danger! You don’t want to skip these parts in the text, because the information given may help you avert disaster.
Getting started with digital fabrics
The digital era seemed quite frightening for many of us for quite some time. However, it also brought us many things that we can't even think of living without these days: smartphones, laptops, a Siri or Alexa that answers any of our questions, life has been made a lot easier. And even though 3D Design immersed in the early 1990s within the automotive, aeronautic and furniture design industries, the fashion industry continued working the traditional way. Luckily, over the past decade, advances have been made within 3D programmes, which has made the use of 3D technology more accessible for fashion houses.

What is 3D technology?
Maybe it is good to first explain what 3D technology is all about before diving into the subject of digital fabrics. Collins dictionary describes the term as follows: “3D Technology refers to a variety of technologies that provide a real-life 3D visual appearance that is displayed in print (in a computer), in the movies or television”.

In the fashion industry, we speak about two terms: CAD, which means computer-aided design and CAM, which means computer-aided manufacturing. At this moment in time, there are quite some different software programmes that offer CAD and/or CAM. When designing virtually, first a digital pattern needs to be created. Afterwards, this pattern can be tried on virtually on a digital avatar to check the fit of the pattern. A virtual garment simulation will take place. This is the crucial and most difficult part because only a true representation of the virtual model, 2D pattern and the digital fabric makes for a successful virtual garment simulation (see figure1).

Another important term is ‘3D virtual prototyping’. It means that prototypes are not, like traditionally common, made physically, but that the prototyping process is done fully digitally. Mistakes and changes that need to be made to prototypes can be done within minutes or hours, whereas traditionally this would take weeks, as comments need to be given to the factories and a new sample needs to be made and shipped back.
Implementing 3D technology

Many components play a crucial role when getting the 3D digital transformation started (see Figure 2). These components are all about the integration of 3D within your team, and not so much about what 3D is all about. So even though it is nice to give you this information, this book will not go into depth within all of these components. It would be an information overload and the focus will get lost. Still, it is good to keep these factors in mind when thinking about implementing 3D technology within your company.

Rather, I want to tell you about the importance of building a foundation for your brand. You need to keep four things in mind:

1. **The foundational libraries**: consisting of the avatar, material, and 2D pattern block libraries.
2. **Finding the right partners**: who can help me get to where I want to be? Think of factories, consults, brands, and technologies.
3. **Considering integration**: think of PLM, planning, order management, and ERP.
4. **Continually evangelize**: keep spreading positive words about 3D to get everyone on board. This can be achieved by showcasing through digital showrooms, teaching at schools and through management and leadership.

**Reasons to consider going digital**

3D virtual prototyping allows for:

- Fewer prototypes
- Fewer samples
- Less travelling expenses
- (thus) Less CO2 emissions
- Less sampling expenses
- Minimal fabric waste

*Image 2: Thought Provoking Consulting (2019) The key components of getting started*
The Foundational Libraries

Now that you know all foundations that need to be built in order to implement 3D within your company, we can focus on the one foundation this book is all about: the foundational libraries, and in particular the material library, and actually in particular, particular... the fabric library. Can you already tell how complex and versatile 3D technology is?

As mentioned in the previous chapter the foundational libraries are consistent of three parts: the avatar, material, and 2D pattern blocks (see Table 1):

<table>
<thead>
<tr>
<th>Avatar</th>
<th>Dress form</th>
<th>Fit model</th>
<th>Retail mannequin</th>
<th>Athlete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Fabric</td>
<td>Stitch</td>
<td>Graphic</td>
<td>Trimmings</td>
</tr>
<tr>
<td>2D pattern blocks</td>
<td>Pattern blocks</td>
<td>Lasts</td>
<td>Standard forms</td>
<td>Previous seasons</td>
</tr>
</tbody>
</table>

The pattern, the avatar and the digital fabric influence each other as well as the overall outcome of virtual simulations. The shape of the avatar needs to match that of a human body as precisely as possible. According to Lim and Istook (2011), this is to ensure the fit of the garment is represented correctly. See the next paragraph for more information.

Lim and Istook (2011) did a study on how the silhouettes of virtual garments are altered according to various virtual fabric properties when applied on virtual avatars. In the end, they found that fabric properties such as bend, thickness, weight, stretch and shear values affect the drape silhouette, stiffness, and fit of the virtual garment, and thus may be used for the realistic virtual garment technology.

The 2D pattern needs to be shaped according to the avatar and the virtual fabric on its own can change the entire look of the virtual garment (Luible, 2008).

In order to achieve a successful replacement of a physical garment, an accurate and exact representation of the virtual garment is key. The fashion industry relies on precise fabric mechanical and physical properties to achieve technical accuracy and aesthetics within the 3D virtual environment (Luible, 2008, p. 5).

This book will proceed focussed on the digital fabric, which is part of the material library. The digital fabric is one of the factors that determines the look of the 3D virtual simulation. The famous writer Thomas Fuller once said: “seeing’s believing, but feeling’s the truth” (Paterson, 2007). Traditionally, fabric drape is judged by combined senses; the eyes capture the shape and drape, while the hand registers the touch and weight of the material. The brain combines both to evaluate the fit and appearance of a garment (Kuijpers and Gong, 2017). Pierre Villey, literary scholar, wrote: “sight is long-distance touch, with the sensation of colour added. Touch is near sight minus the sensation of colour, and with the sense of rugosity (texture) added. The two senses gave us knowledge of the same order”. This is why the fashion industry struggles to rely singularly on a garment simulation. Thomas Teger mentions he often hears the comment “we are a company that relies on touch and feel”, as an excuse why a company has not yet transitioned into 3D (Hanson, 2018). These might be your thoughts aswell, that is why this book will inform you in the best way possible on the developments within 3D technology.
The physics and visuals of digital fabrics

Now it’s time to explain a bit more about fabrics in general and how we can transform a physical garment into a digital one.

Even though nowadays garments can be made of any material we’d like (think of Lady GaGa’s meat dress), it is safe to say that the majority of people prefer clothes to be made of textiles. These can be made out of natural fibres, like cotton, animal fibres, like wool, synthetic materials like polyester or maybe a mix of multiple, as in viscose. On a deeper level, we can divide textiles by their physics and their visuals.

Visual qualities
The visual qualities have to do with the look of a fabric. We can ask questions like: what does the texture look like? How transparent is the fabric? What is the color? Does it have a pattern? Is the surface smooth or bumpy?

When translating the visual qualities of a physical fabric into a digital one, all these factors need to be considered in order to make the translation realistic. It is a pretty difficult task to make all these factors correlate, but there are some handy tools to help you do this. At this moment of time, the Vizoo scan seems to be the machine that can help realize this (see picture below). The software offers intuitive and effective tools to make textures seamless. In addition, xTex calculates textures based on physical material information and up to 2000dpi resolution. The scanner’s programme is also well connected to 3D software programmes. This means that it creates a bump map, transparency map, normal map, and specular map. It makes the fabric look as real as possible on screen.

However, there are also other options if you don’t have the resources to get a Vizoo scan. You can create bump maps in Photoshop or websites like Crazybump. Getting a good visual outlook, with a smooth repetitive pattern is a difficult and time-consuming part within the translation from physical to digital.
Besides the visuals of a fabric, the physics are also part of a material’s properties. There has been a lot of research done in the area of fabrics and what factors make each fabric unique. Underneath a short history overview is displayed.

1930: Peirce made an important step towards the objective or quantitative assessment of fabric “handle” (or the feel) and quality.

The judgement of the “handle” of a material is made of sensations such as stiffness or limpness, hardness or softness, and roughness or smoothness.

1972: Kawabata and Niwa organised the Hand Evaluation and Standardisation Committee. The ‘primary fabric handle’ expressions were selected and defined and connected to the mechanical properties of a fabric.


1980’s: The CSIRO in Australia developed the Fabric Assurance by Simple Testing (FAST) system, after commercial limitations of the KES-F were recognized. The FAST system offered a simpler, and therefore cheaper, option that was still very reliable.

2007: 3D software specialist BrowZwear developed the Fabric Test Kit (FTK), which measures all fabric properties required for accurate garment simulation.

2017: BrowZwear improved the FTK and developed the Fabric Analyser BrowZwear (FAB) to give fast and more accurate digital fabric simulations.

2018: CLO developed their own fabric testing kit to realize true-to-life garment simulations, measuring the weight, thickness, bending and stretch.

NOTE

More instruments and testing methods have been developed, but this book will dive deeper in the methods displayed in this graph. That is because the KES-F and FAST were the first gamechangers in the industry and CLO and BrowZwear are current industry players, having developed testing methods very recently.
Today’s leading fabric testing kits

Now that you’ve got the bigger picture of the developments within the fabric measurement area, it is important to know which are the best options on the market today. All fabric testing methods on the market today measure the same things: the weight, thickness, bending and stretch. However, they all have their own way of doing this, and comparing the various methods based on their results is difficult. That is why this chapter will explain three leading fabric testing methods on the market today.

The Fabric Assurance by Simple Testing (FAST)

### FAST-1: Compression

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Symbol</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fabric thickness</td>
<td>T</td>
<td>mm</td>
</tr>
<tr>
<td>Fabric surface thickness</td>
<td>ST</td>
<td>mm</td>
</tr>
<tr>
<td>Released surface thickness</td>
<td>STR</td>
<td>mm</td>
</tr>
</tbody>
</table>

### FAST-2: Bending

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Symbol</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warp bending length</td>
<td>W1</td>
<td>mm</td>
</tr>
<tr>
<td>Weft bending length</td>
<td>W2</td>
<td>mm</td>
</tr>
<tr>
<td>Warp bending rigidity</td>
<td>B1</td>
<td>uNm</td>
</tr>
<tr>
<td>Weft bending rigidity</td>
<td>B2</td>
<td>uNm</td>
</tr>
<tr>
<td>Formability</td>
<td>F</td>
<td>mm²</td>
</tr>
</tbody>
</table>

### FAST-3: Tensile extension

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Symbol</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warp extensibility</td>
<td>E100-1</td>
<td>%</td>
</tr>
<tr>
<td>Weft extensibility</td>
<td>E100-2</td>
<td>%</td>
</tr>
<tr>
<td>Shear rigidity</td>
<td>G</td>
<td>N/m</td>
</tr>
</tbody>
</table>

### FAST-4: Fabric dimensions

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Symbol</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warp relaxation shrinkage</td>
<td>RS-1</td>
<td>%</td>
</tr>
<tr>
<td>Weft relaxation shrinkage</td>
<td>RS-2</td>
<td>%</td>
</tr>
<tr>
<td>Warp hygral expansion</td>
<td>HE-1</td>
<td>%</td>
</tr>
<tr>
<td>Weft hygral expansion</td>
<td>HE-2</td>
<td>g/m²</td>
</tr>
</tbody>
</table>

**NOTE:**

FAST-4 is part of the FAST system, but this test is NOT needed to create a digital fabric.

### Weight

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Symbol</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fabric weight per unit area</td>
<td>W</td>
<td>g/m²</td>
</tr>
</tbody>
</table>

Laboratory oven needed, not provided

Laboratory weighing scale needed, not provided

On the previous page, you can see all the machines involved when completing the FAST test. The FAST results are perceived as very reliable within the fashion industry. The results can be inserted into various 3D software programmes, however not all of them! So keep that in mind when considering purchasing the FAST machines.

All FAST facts you need to know in bullet points:
• Cheaper than the KES-F machines
• Well respected testing method within the industry
• Does NOT come with a laboratory oven and laboratory scale, however, these ARE needed to get all measurements.
• Measurements appear on screen automatically
• A lot of manual work needed when completing the tests; i.e. removing and adding weights and sliding the fabric during the bending test.
• Results can be inserted in multiple 3D software programmes, but not all of them!
• Machines take in quite some space, they are not very compact.

The Fabric Analyser BrowZwear

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass</td>
<td>g/m²</td>
</tr>
<tr>
<td>Friction</td>
<td></td>
</tr>
<tr>
<td>Thickness</td>
<td>mm</td>
</tr>
<tr>
<td>Bend (warp direction)</td>
<td>dyn*cm</td>
</tr>
<tr>
<td>Bend (weft direction)</td>
<td>dyn*cm</td>
</tr>
<tr>
<td>Stretch (warp direction)</td>
<td>N/m</td>
</tr>
<tr>
<td>Stretch (weft direction)</td>
<td>N/m</td>
</tr>
<tr>
<td>Linearity (warp direction)</td>
<td>%</td>
</tr>
<tr>
<td>Linearity (weft direction)</td>
<td>%</td>
</tr>
<tr>
<td>Linearity (bias direction)</td>
<td>%</td>
</tr>
<tr>
<td>Shear (bias direction)</td>
<td>N/m</td>
</tr>
</tbody>
</table>

Above you can see the Fabric Analyser BrowZwear and the measurements it makes. The BrowZwear measurements can ONLY be inserted in their own software. When you are considering investing in BrowZwear as a software programme, this fabric testing kit would make your results even better. However, this testing kit is not suitable for any other purpose.

All FAB facts you need to know in bullet points:
• Only one machine that can do all measurements. Very convenient and easy to store.
• Can only be used in combination with the BrowZwear software programme.
• It is unclear what happens with the measurements when inserted in the programme.
• Quick and easy in use.
• Measurements are automatically uploaded into the system on the computer.
• Tests are done automatically with a moving clamp. Only the fabrics need to be clamped tight by manual hand work. However, no mistakes can be made when the tests are done since the machine moves automatically.
Above you can see all machines involved when completing the CLO3d Fabric testing kit. The CLO measurements can ONLY be inserted in their own software. When you are considering investing in CLO3D as a software programme, this fabric testing kit would make your results even better. However, this testing kit is not suitable for any other purpose.

All CLO3D Test Kit facts you need to know in bullet points:
- Consists of four compact machines, including a weighing scale, that come in a black box, which can easily be stored in your office.
- Can only be used in combination with the CLO 3D software programme.
- It is unclear what happens with the measurements when inserted in the programme.
- Quick and easy in use.
- Measurements need to be observed and written down manually, they are not automatically calculated.
- Tests need some manual work, but it is easy and mistakes are not made easily.
All fabric parameters, or characteristics, make each fabric unique. It is important to measure these parameters because it influences the look and the quality of a garment. The influence of each mechanical property upon the quality and mechanical performance of fabrics is visible in Table 2.

<table>
<thead>
<tr>
<th><strong>Fabric mechanical property</strong></th>
<th><strong>Quality and mechanical performance</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Uniaxial and biaxial tension</td>
<td>Fabric handle and drape</td>
</tr>
<tr>
<td></td>
<td>Fabric formability and tailoring properties</td>
</tr>
<tr>
<td>Shear under tension</td>
<td>Garment appearance and seam pucker</td>
</tr>
<tr>
<td>Pure bending</td>
<td>Mechanical stability and shape retention</td>
</tr>
<tr>
<td>Lateral compression</td>
<td>Relaxation shrinkage, dimensional stability and hygral expansion</td>
</tr>
<tr>
<td>Longitudinal compression and buckling</td>
<td>Wrinkle recovery and crease retention</td>
</tr>
<tr>
<td></td>
<td>Abrasion and pilling resistance</td>
</tr>
<tr>
<td>Surface roughness and friction</td>
<td>Mechanical and physiological comfort</td>
</tr>
</tbody>
</table>


Yes, knowing the quality of a fabric through fabric testing is interesting. However, for you, the fashion brands, I believe it is more important to just know the reason behind the tests within the various methods. That allows you to make personal judgements in what extent you find the various testing kits reliable.
Creating garments with digital fabrics
This chapter will go into depth on the creation of the digital fabric within the 3D software programmes and how garments can be created using these digital fabrics. This chapter goes through three different 3D software programmes: Lectra Modaris, in which the FAST results will be implemented, BrowZwear and CLO3D.

**Lectra Modaris with FAST**

**Step 1:** Click on the fabric roll icon and then press the search icon. A new window will open in which you can insert the FAST material properties.

**Step 2:** Insert all your measurements.

**Step 3:** Press the brush icon and go to ‘Material Visual Effect’. Choose the folder your fabric texture picture is saved in and click on it to add this texture to your garment.

**Step 4:** Simulate your garment again and your new fabric will be applied.
**BrowZwear with the FAB**

**Step 1:**
Perform all tests with the FAB. In the end you will get a sheet looking like this. These are all measurements needed to create your digital fabric.

**Step 2:**
- Open V-Stitcher (BrowZwear’s 3D simulating programme). When clicking on the tab ‘Texture’ this field will appear.
- Now click on Physics to insert all measurements from step 1 (see next page).
- Under ‘Diffuse’ you can upload a picture of the fabric’s look.
- Under ‘Specular’ you can add the specular map picture.
- Under ‘Normal’ you can add the normal maps picture.

Step 2 (continuation): This is the pop-up that appears after having pressed 'Physics'. Here you fill in all exact measurements taken with the FAB.

Step 3: The digital fabric is done! You can now simulate your garment with your own fabric.
CLO3D with its own fabric testing kit

**Step 1:**
In the CLO programme, open ‘Emulator’ to start measuring your fabric.

**Step 2:**
Fill in all measurements you make with the CLO testing kit. When you’re finished, you can save the digital fabric to your computer.

**Step 3:**
Go back to ‘Simulation’ and go to the ‘Fabric’ tab. Click ‘Open’ to open your saved fabric. Underneath the tab ‘Material’ you can upload pictures of the texture and normal map. Also you can tweak your fabric a bit and make it look stylish more attractive.
Step 4:
The digital fabric is done! You can now simulate your garment with your own fabric.

All simulations next to each other
On this page all three virtual garment simulations are shown besides the actual physical garment. It is up to you to decide which one you find corresponding best.

Lectra Modaris

CLO3D

BrowZwear

The physical garment

Dress made with cotton poplin fabric
Okay... Now let’s try it again. Displayed on this page you can find the same dress, however this time made out of a different fabric. How are the comparisons now?

Lectra Modaris

CLO3D

BrowZwear

The physical garment

Dress made with cotton canvas fabric
Now, I want you to consider for yourself in what extent you trust the garment simulations on the previous two pages. Do you prefer one software over another?

It is difficult to decide on what kind of software you like best, so I want to show you some more examples of garments created within all three software programmes. However, this time you cannot see the physical garments besides them. You think about it for yourself, do you believe these garment simulations?

**Lectra Modaris**

*In their own words:*

Covering the entire production value chain from design to cutting room, Lectra’s product offer is the most comprehensive one on the market today. Our fashion-specific solutions have been developed by a strong R&D team based on 40-plus years’ experience of working with 21,000-plus renowned companies. Addressing all market segments from luxury to ready-to-wear, Lectra’s solutions have been used by retailers, manufacturers and brands worldwide.
BrowZwear

In their own words:
VStitcher is the industry’s leading 3D software for apparel design and development. With VStitcher, design garments through size ranges, graphics, fabrics, trims, colorways, styling, and photorealistic 3D rendering. With the comprehensive features, designers, technical specialists and pattern makers can create designs and take them to the next level with true-motion fit, pattern modification, grading, tech pack, and more.
CLO3D

In their own words:
• Unlimited design
• Real-time interactivity
• Easy to use
• Evolve how you design
• Accurate materials
• Streamline process
• Ultimate styling
Deciding on your brand’s 3D digital transformation

So... Yes, this is a book about the information on digital fabrics and on how to implement 3D virtual prototyping within your company. However, it is also a book that wants to test your trust. I am not the person to tell you what software or what fabric testing method is best. Do I have an opinion? For sure, but is that relevant for you? I don’t think so. At the end of the day, it is you and your team that have to work with 3D technology. So ask yourself: Do I really trust 3D at this moment of time? Or do I maybe want to wait until the software programmes are more advanced? If I AM ready, then what does my gut feeling say, and what does everything you’ve just read tell you? Think about it and do not make a rushed decision, because it takes time and dedication to make a 3D transformation!

If you would like a little more guidance to make your decision, maybe the YES/NO-chart on the next page can help you...
FIND OUT WHICH 3D SOFTWARE SUITS YOU AND YOUR BRAND BEST

Do I want my fashion brand to be more sustainable and efficient?

- NO
- YES

Seriously? Get up to date... Global warming is happening!

Of course there are more ways to achieve this, but really... Did my writing not convince you yet?!

Of course there are more ways to achieve this, but really... Did my writing not convince you yet?!

Of course there are more ways to achieve this, but really... Did my writing not convince you yet?!

Of course there are more ways to achieve this, but really... Did my writing not convince you yet?!

Of course there are more ways to achieve this, but really... Did my writing not convince you yet?!

Of course there are more ways to achieve this, but really... Did my writing not convince you yet?!

Do I see 3D technology as a possibility to achieve this?

- NO
- YES

Am I willing to put time and effort in a digital transformation?

- NO
- YES

Do I find 3D garment simulations realistic?

- NO
- YES

Do I want to build a digital fabric library?

- NO
- YES

Do I want the fabric test and the 3D simulating software to be directly connected?

- NO
- YES

Do I care more about styling or industry efficiency?

- styling
- industry efficiency

Maybe you should consider investing in the FAST method, which you can use in combination with for example Lectra Modaris, but also other software programmes.

I might disagree with you in this area (I did write this whole book about digital fabrics you know...). However, research more about the programmes and what standard fabrics they offer for you. 3D virtual prototyping might still be a good tool for your company.

Maybe they’re not up to the level you’d wish them to be. My advice is to keep up-to-date on the developments within 3D virtual technology. Maybe you’ll find them more realistic in a couple of weeks, months or years.

Maybe you should consider using CLO3D.

Maybe you should consider using BrowZwear.
The ten things of the 3D transformation investment that will cost you money

1. The payment of this book.
Or even multiple copies of this book. If you are convinced that 3D technology fits your fashion brand or the fashion brand you work at, you will want to convince your colleagues or your boss. The more they know through this book, the less effort you will need to put in convincing everyone verbally.

2. Scheduling meetings to discuss the 3D transformation.
There will need to be a lot of meetings, the whole team needs to know about the transformation going on. Of course, some departments will be more involved than others, but multiple staff meetings are unavoidable. And you know what they say... Time costs money.

3. The costs of the software programs
Depending on the software you pick to invest in and also depending on the number of computers you want to install the programme on, the prices will vary. This will probably be one of the highest costs you just have to hickup in a second. For example, for a small enterprise company, the software of CLO3D will cost you $600 monthly or $5,400 a year. These are pretty big numbers, especially considering these are for small enterprises. It is definitely a price tag you need to think about whether you can afford this investment.

4. The time it takes to install the software programs
I told you before... Time = money.

5. Possible computer updates or new computers
These software programmes ask for high-quality computers because the programmes are large, the files are large and you don't want your computer to get stuck or load for hours when one of the biggest benefits of 3D is in fact that it is fast and can improve the efficiency of your company.

6. The cost of the testing kit instruments
Figuring you want to take it all the way, which means you will want to create a digital fabric library, you need to pay for the fabric testing kit as well. This is something that does not automatically come with the software license. The costs of these machines are not published publicly, however, you can imagine it will not be cheap.

7. Retraining of your staff
As mentioned before, not your whole team needs to know all the ins and outs of the software. However, yes, there will be departments that need extra schooling. The structure of the company will change completely. There are possibilities for all software programmes to get training through workshops. This will make schooling easy and accessible.

8. Hiring new staff to help with the transformation
You might want to consider investing in maybe one, maybe a couple, or maybe a lot of pros. They will be able to teach the staff about 3D and can really help the transformation of your company go smoothly.

9. Considering your current factory partners
Either spend time talking to them about your new style of tech packs or find a new factory that is familiar with 3D simulations. Either way, depending on the factory you work with, this transformation affects this relationship as well.

10. Coffee, wine, chocolate or anything else that relieves frustration for you
Because I will guarantee you, there are some frustrating times ahead of you. It will pay off. Promise.
The ten things that you will gain with a 3D digital transformation

1. The knowledge you gained from reading this book

Isn’t it just great to pick up a book and by the time you are finished, your brain is just filled up with new knowledge and insights?!

2. (Eventually) happier staff, because you will give them a challenge and opportunity

You know how people get bored by doing the same things over and over again, day in, day out? Your staff might be confused and irritated at first, but think of the opportunity and challenge you give them. It is great to give your staff the chance to enhance their knowledge and learn them something new. They will potentially work harder because of their motivation to get the hang of this new thing.

3. A sustainable future for your company

There is a movement happening. It is a movement in which customers are seeking transparency from brands, they want to know how and where products are being made. You can give them this, you can give them the whole digital experience, and they will like it. Guaranteed. Because it is new and it is exciting and it is doing the planet well.

4. Fewer expenses on sampling

You won’t need to order as many samples as before, because all changes are made digitally. Think of all the time (= money) and actual money on samples you save.

5. Fewer expenses for travel costs

Fewer samples ordered obviously means less travelling costs of these samples. Isn’t that great?!

6. Fewer CO2 emissions

Even greater... Because of the fewer samples ordered, you also harm the planet a little less. Great job!

7. Minimal fabric waste

Wow... The advantages just keep on counting. Fewer samples also mean... less fabric used... This means less fabric wasted on samples that will never be sold in store.

8. More room for experimenting

Changes in garments can be made easily and super fast. This means you allow your staff to experiment within the programme. It could make for more creative creations and will definitely make your staff more creative, and thus happier.

9. An innovative approach that will impress competitors and customers

Oof... When all your competitors will hear about your big and impressive new investment, what do YOU think they will be thinking? Yes, you will make them jealous, and intrigued, and feeling like they are miles behind you now. Isn’t that a great feeling to think about? Moreover, you can communicate it to your customers who will be super fascinated and intrigued by this new movement.

10. The realisation that doing better makes you feel better in your everyday life

I don’t want to throw the whole “planet earth is being destroyed, global warming is happening, wake up people” thing again, but really, when doing things that are actually benefitting the planet, you will feel good. I’ve been there. And not only you will feel good, but your staff will be happy and proud of working for a company that does better. So take this one seriously.
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Image 1: Kuijpers & Gong (2017) Accurate and seamless interaction between key elements for virtual garment development


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Image 46: BrowZwear (2019) browzwear


