



SEDDI



# Developments in Digital Engineering for Textile Product Design

Caitlin Knowles, Ph.D.

*Advanced Functional Fabrics of America (AFFOA)*

Matthew Trexler, Ph.D.

*Under Armour*

Graham Sullivan

*SEDDI*

Advanced Textiles

**EXPO**

# Introduction to the Panelists

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**Caitlin Knowles, Ph.D.**  
E-Textile Device Engineer  
**AFFOA**

SEDDI



**Graham Sullivan**  
CEO  
**SEDDI**

  
UNDER ARMOUR



**Matthew Trexler, Ph.D.**  
Director of Materials Science  
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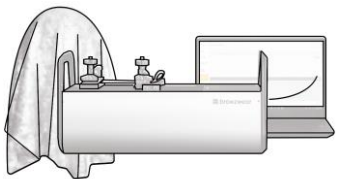
# What is **Digital Engineering**?

**Digital engineering:** “an integrated digital approach that uses authoritative sources of system data and models as a continuum across disciplines to support lifecycle activities from concept through disposal” – *DoD Digital Engineering Strategy, 2018*

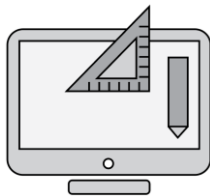


## Standardization

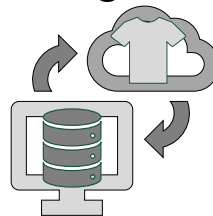
### Digital Materials Library



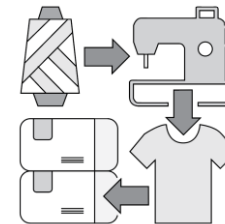
### Digital Product Development



### Digital Lifecycle Management



### Transfer Data to Manufacturing



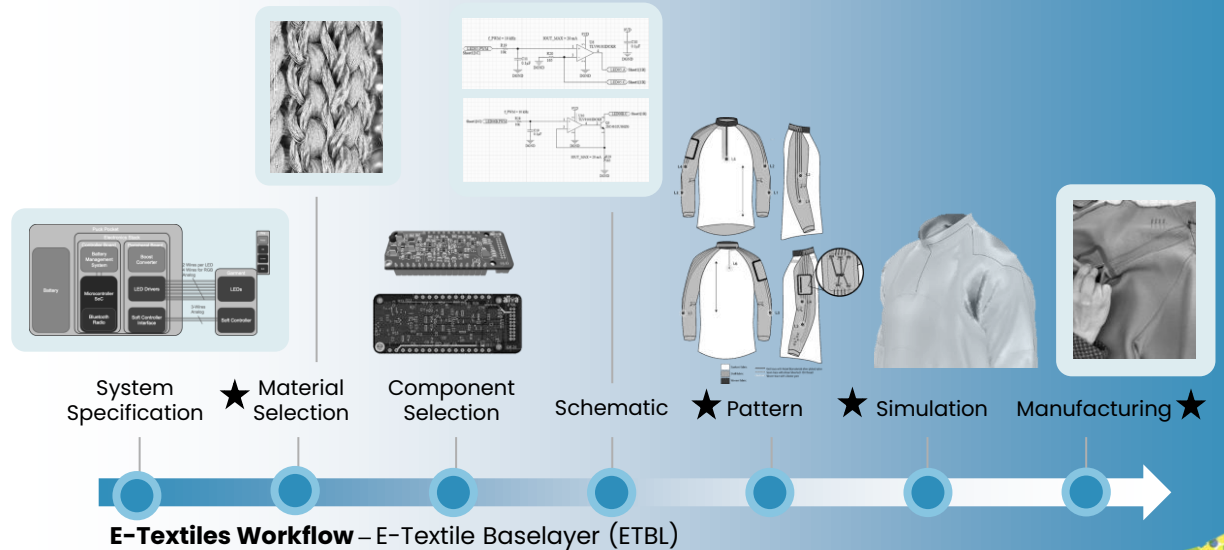
Main focus of today's session

# Digital Engineering for **Advanced Textiles**

There is no current **digital workflow** for e-textile products.

Why?

- Digital engineering for textiles is **not as advanced as other industries** (e.g., electronics)
- Textile tools lack **interoperability, standardization, engineering-level simulation, and consideration of manufacturing**

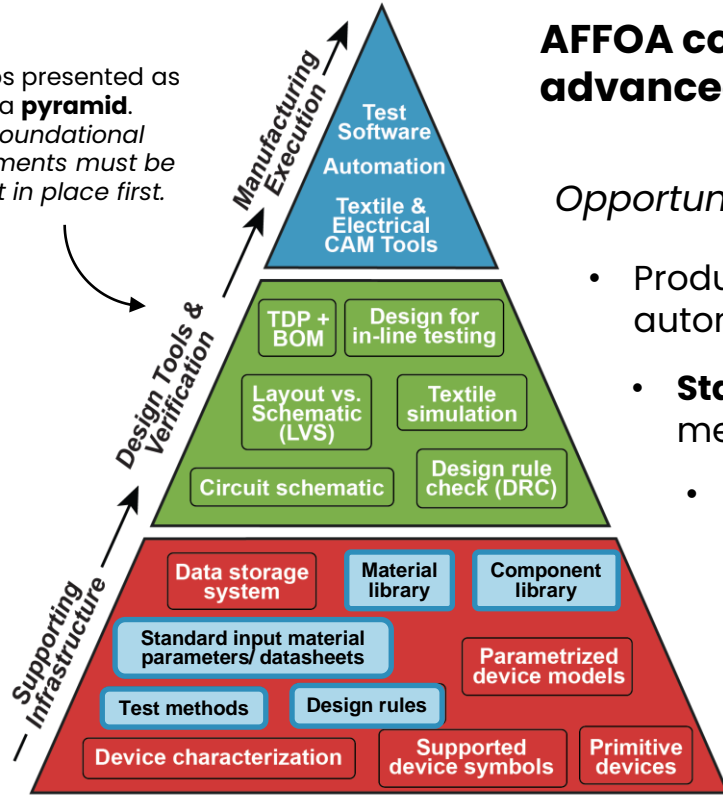


→ Advanced textiles rely on **physical prototype iteration** and **lack trust** in digital representations.

# Why Doesn't This Work Today?

Gaps presented as a pyramid.

Foundational elements must be put in place first.



**AFFOA completed a gap analysis for digital engineering of advanced textile products.**

*Opportunities for development include:*

- Product creation in a **digital 2D/3D environment** with automatic Tech Pack generation
- **Standardized data in a standardized format** (test methods & processes)
- Comprehensive **material library** development including relevant fabrics, yarns, and trims.
- Textile process **design rules** to reduce costly physical iterations.

# What AFFOA's Doing to Help

Advanced textiles lack **digital design tools** to produce scalable, robust products.

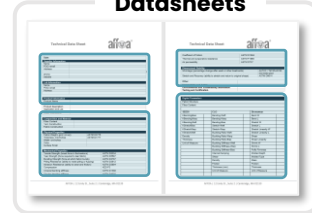
What we're doing:

- **Customer discovery** with 30+ stakeholders in digital design to identify tool gaps
- Virtual **workshop** with industry, government, and academic leaders
- **Infrastructure development** such as fabric digitalization, material libraries, design rules, & standardization

## Customer Discovery + Workshop



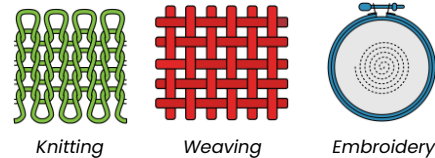
## Datasheets



## Prototyping Digital Workflow



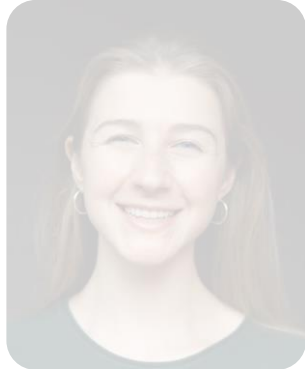
## Defining Process Design Rules



Knitting

Weaving

Embroidery



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# Digital Product Development

Graham Sullivan, CEO, SEDDI Inc.  
November 2, 2023



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# What is “product development” for apparel and textiles?

Ideation / Concepts

Visualization / Iteration

Technical Design / Samples

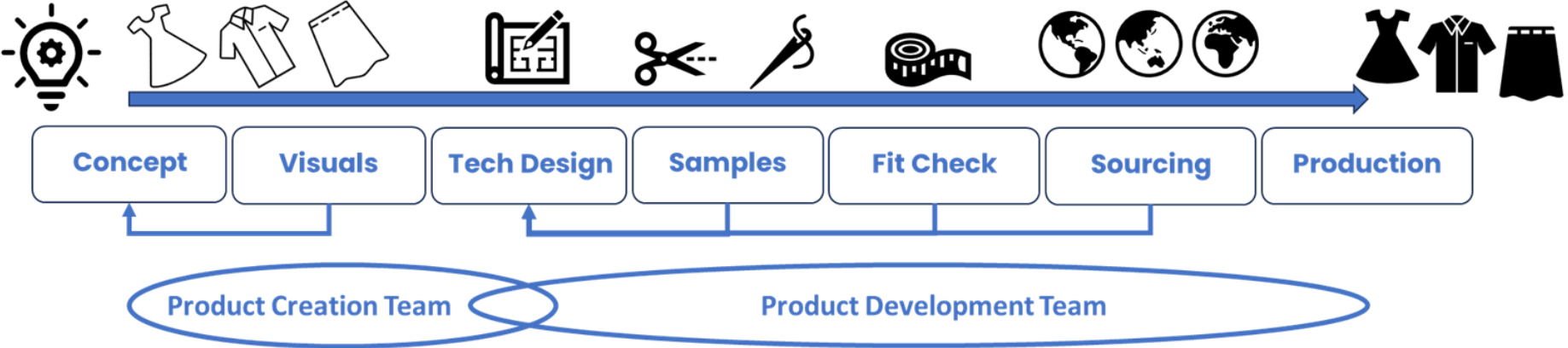
Fit Checks / Iteration

Sourcing / Iteration

Production



# The Traditional "Product Development" Flow



2 teams with complementary but very different skills, expertise, and tools



# Digitalization of Apparel... what is taking so long?

*Every other industry went digital long ago...*

## Impact

- Rapid innovation
- Lower cycle times
- Reduced risks
- Increased quality
- Lower complexity
- Greater sustainability



## Revenue Growth

- Offer more products
- Launch more right products
- Faster time to market

## Cost Savings

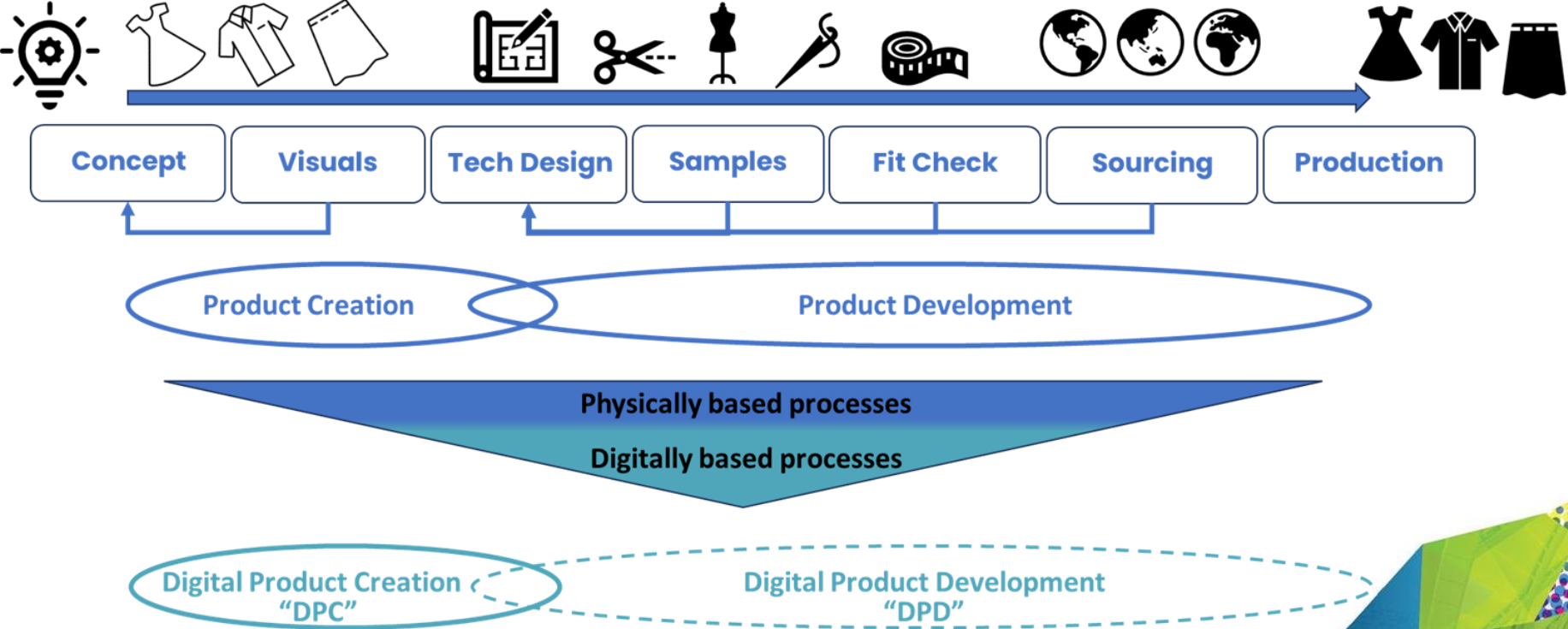
- More efficient NPD
- Fewer physical samples
- Less waste & overproduction

## Sample Product Development Metrics from Other Industries

- |                             |                              |
|-----------------------------|------------------------------|
| ● Development time          | 7x reduction                 |
| ● Overall product cost      | 2.5x reduction               |
| ● Changes after MFG release | 123% more likely to decrease |
| ● % successful NPI          | 33% more likely to achieve   |

Source: ANSYS

# Long, Slow Adoption of Digitalization in Apparel



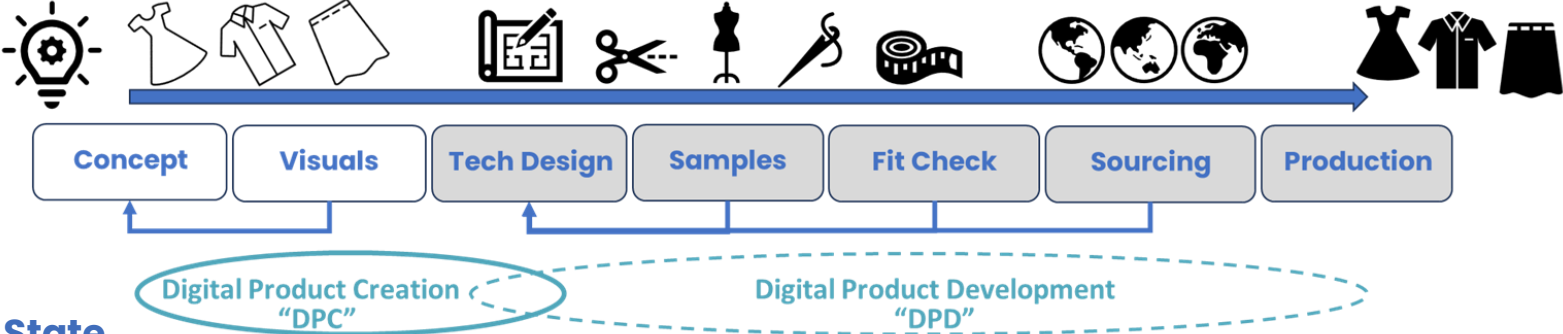
# Digitalization requires great tools for both DPC and DPD

DPC delivers great product concepts; drives revenue and competitiveness

DPD delivers great execution; lowers costs, increases speed, improves sustainability

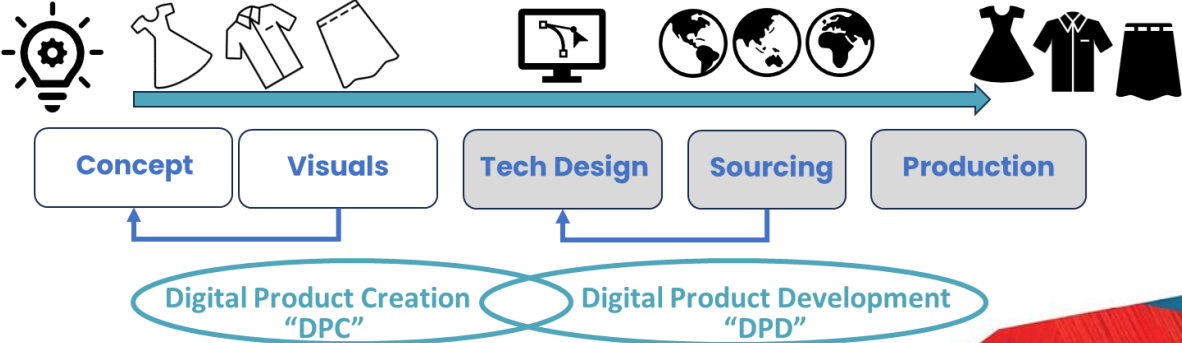


# Apparel Industry lacks DPD tools to realize digitalization benefits



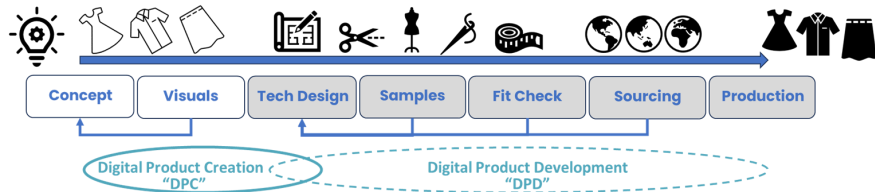
Current State

Future State

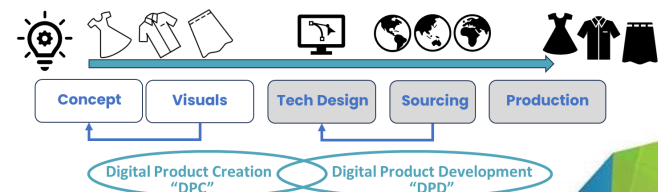


# Summary

- No meaningful, widespread digitalization of apparel today. Companies make do.
- Good DPC tools are available but few DPD tools; industry remains largely stuck in the past.
- Digitalization will happen when product creation and product development teams both have great digital tools. Until then, significant benefits are far and few between.
- Industry and academia need to support development of great DPD tools and better DPC tools similar to the tools long available in other industries.
- Great DPC and DPD tools are key to a more sustainable, inclusive, profitable future for fashion.



**Current State**



**Future State**



# SEDDI

Thank  
You!

Digital Product  
Development

Graham Sullivan | CEO, SEDDI Inc. | Nov. 2, 2023

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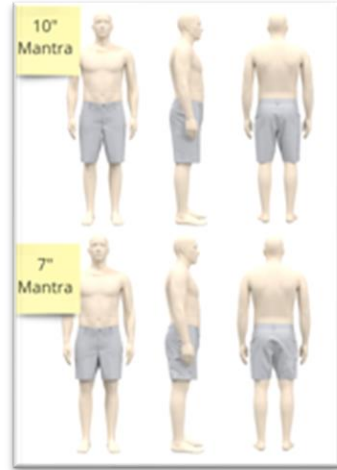
# UNLEASHING THE **POWER** OF VIRTUAL MATERIALS & ASSETS ACROSS THE SUPPLY CHAIN

**Matthew Trexler**, Director of Materials Science  
Innovation Research  
**Under Armour, November 2, 2023**

# Who uses virtual materials?



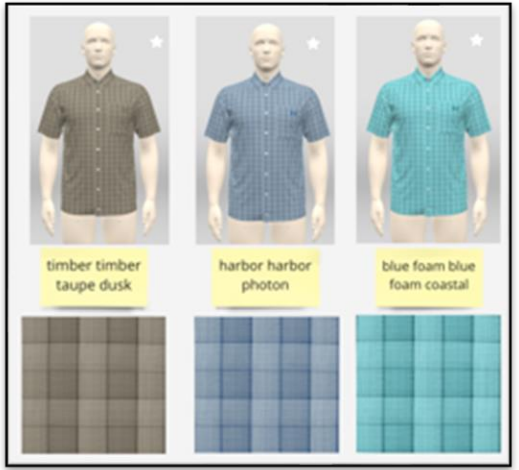
Digital Product Creation (DPC)



Design



Virtual Retail Platform (VRP)  
Sell In



Color team



# Advantage of VIRTUAL materials

## **QUALITY AND SCALE:**

Accelerate the design process, adding realism in designs with accurate drape and trustworthy visualization  
Ensure consistent workflow and quality across multiple suppliers

## **SUSTAINABILITY**

Reduce environmental impacts of physical shipping and sampling  
Ability to scale digital library with zero waste, speeding up our 3D workflow by reducing physical samples

## **DECISION MAKING**

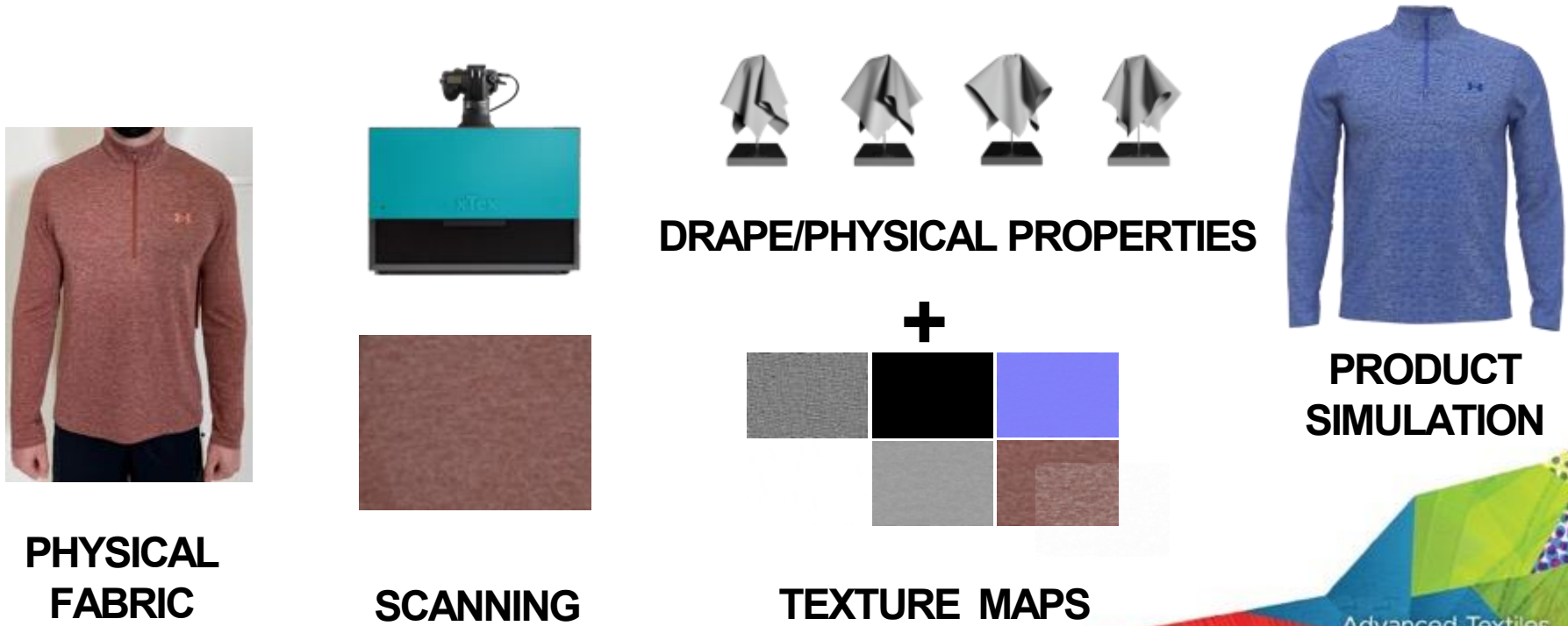
Visualize designs before starting production.  
Speeding up approvals and getting products to the market faster  
Produce realistic images and reduce reliance on product photography



Matthew Trexler | Under Armour | Nov. 2, 2023



# Current virtual material process





# Virtual Materials Standards Rollout

**Assess the  
need**

**Develop the  
standards**

**Communicate  
Standards**

**Offer Ongoing  
Support**

**Celebrate  
Success**

**Articulate goals  
and objectives**

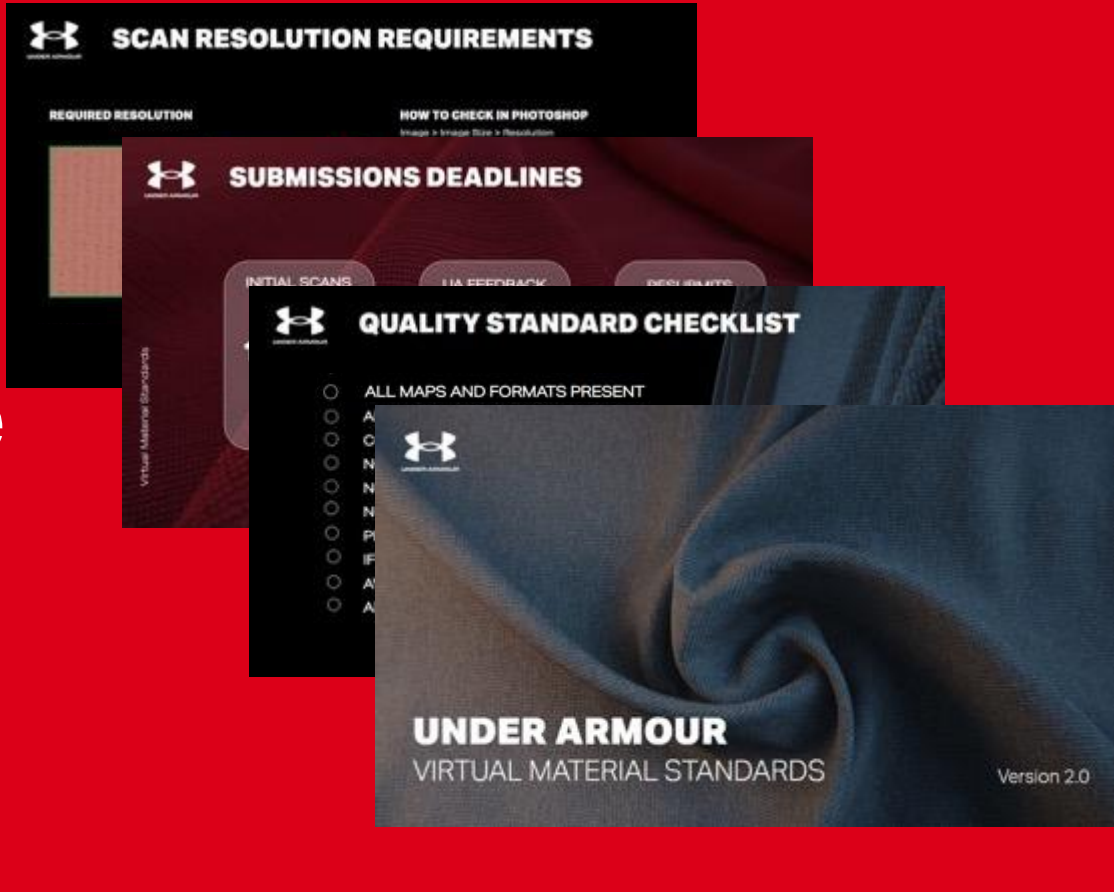
**Create  
Implementation  
Plan**

**Monitor and  
Evaluate**

**Continuously  
Improve**



# Streamline Through Standards





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# REAL OR FAKE?



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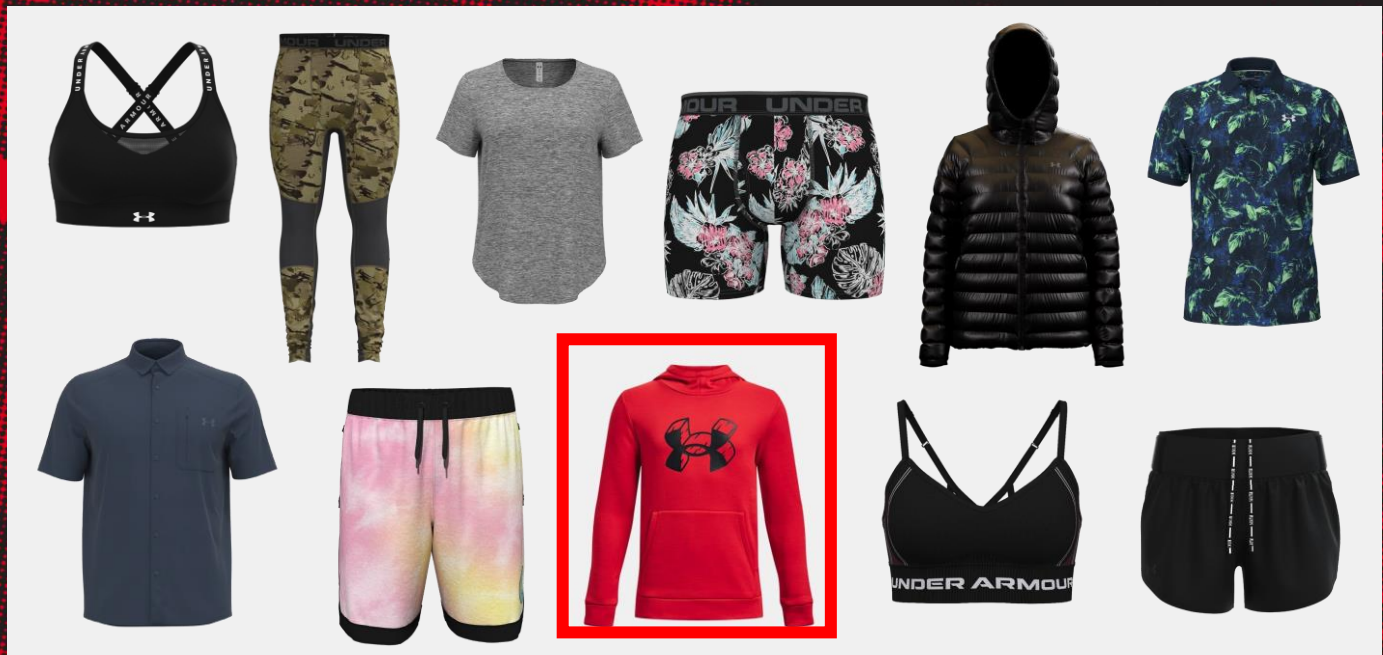
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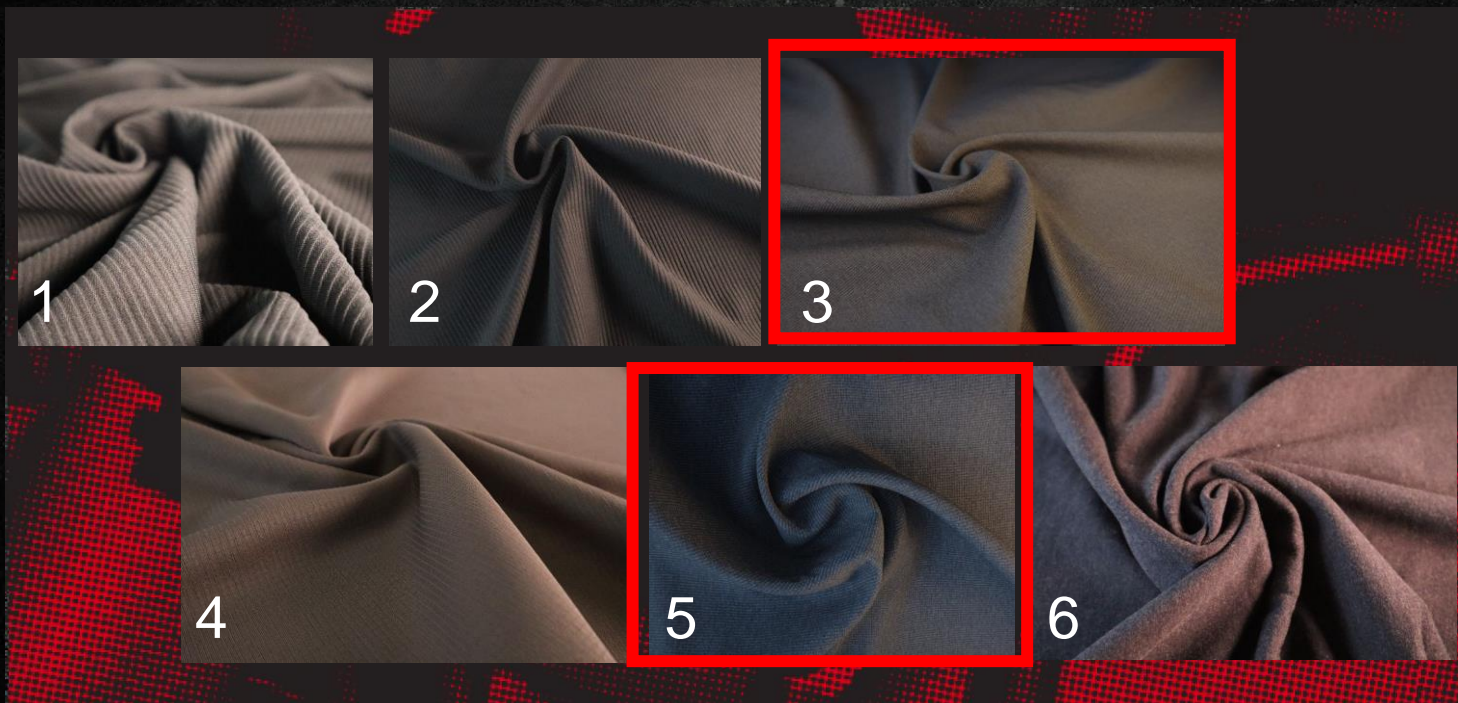


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## What's missing ...?

# Panel Discussion

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