Creative Cut 2016

Defining a Theoretical Model:

The Application of 3D Printing as a Disruptive Technology,

Explored Through the Analysis of the Process of Creative Garment Development

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Keywords: 3D printing, product development, pattern cutting, technology, theoretical model, computational fashion

Image source: http://www.obsessivelyobserved.com/2011/03/escapism-by-daniel-widrig-and-iris-van-herpen/

INTRODUCTION TO THE STUDY

Parallels may be drawn with the more familiar processes of fabric 3D draping and modelling, 2D and 3D digital garment visualisations and 2D pattern cutting to 3D garment realisation.

In contrast, 3D digital product modelling has its foundations in engineering and hard structure prototyping, sitting outside of the more traditional fashion discipline.

RATIONALE

The literature provides a grounding for those who wish to familiarise with 3D printing, a number of authors focus on the technology across non-fashion disciplines, concentrating on the materials available and their physical properties. Where fashion is discussed, the literature often cites supporting case studies.

However, the literature lacks a fashion product development perspective, where designers and product developers navigate unfamiliar process, language and materials.

DISRUPTION

The boundaries of the fashion body and textile cloth, 2D and 3D processes are uniquely a potentially entirely digital process from concept through to product manufacture, impacting those currently involved in the process.

AIM & OBJECTIVES

To establish a framework from which to explore 3D printing within the context of creative garment development & realisation

1) Analysis of garments where 3D printing has been applied.

2) Exploration the role of 3D printing integrated within garment development and realisation

3) Identify factors affecting implementation of 3D printing

*The outcome of the research is the proposal of a **theoretical model** to inform teaching and learning*

Iris van Herpen & Daniel Widrig
https://i.materialise.com/blog/2010-the-year-in-3d-printing

THE RESEARCH PROCESS & DATA COLLECTION

Inductive approach as line of inquiry - exploratory research

Literature review & attendance at discipline specific event
Analysis of examples of 3d printed objects for fashion
Initial experimentations of the process & multi-disciplinary collaborative experimentation
Inquiry of student attitudes towards 3D printing

Image source courtesy of the 3D Print Show http://disruptivemagazine.com/case-studies/685-2/

http://www.wired.com/2016/01/3-d-printed-garment-shape-shifts-based-on-an-onlookers-gaze/

3D PRINTING: DEFINITIONS IN CONTEXT

layering and bonding successive layers of materials

DIGITAL PROCESS 3D to 3D

(parallels with 3D knit)

2D to 3D (flat pattern to toile)
3D to 2D to 3D (modelling/draping to 2D pattern to 3D garment)

METHODS OF MANUFACTURE

Lipson & Kurman (2013) site 3D printers as **machines,** which can **make 'almost anything'** and where the shape of objects are controlled in an unprecedented manner

1) SLS® - powder based (laser melts/fuses in bed of powder)
2) FDM® - heats filament/extrudes (dual material available, process of build & support)

3) SLA Stereolithography – beam of ultraviolet light focused onto the surface of a vat of liquid polymer
4) Bio printing – layers of living cells with support of dissolvable gel or collagen 'bio-paper'
5) Hand held heat/extrusion of materials to build 3 dimensionally

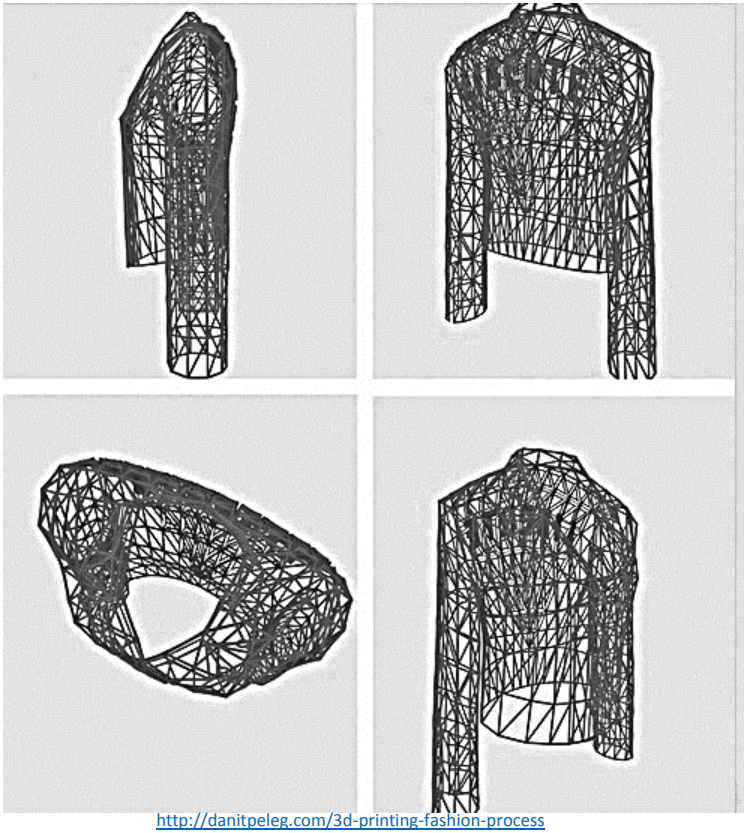
INITIAL INVESTIGATION

Is this a form of creative pattern cutting?

How the technology is *applied within garments*

1. A review of literature, and physical artefacts enabled the identification of common characteristics

2. A review of product development/realisation processes & roles



http://danitpeleg.com/3d-printing-fashion-process

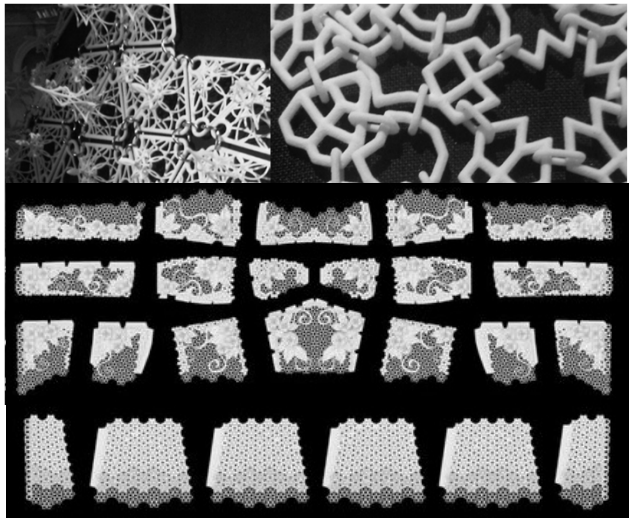
INITIAL FINDINGS (A)
Study of Artefacts & Categorisation

A1: STRUCTURAL/SCULPTURAL

KEY ATTRIBUTES:

Hard/minimal flexibility, rigid
Typically forming sculptural/architectural aesthetic in relation to the body

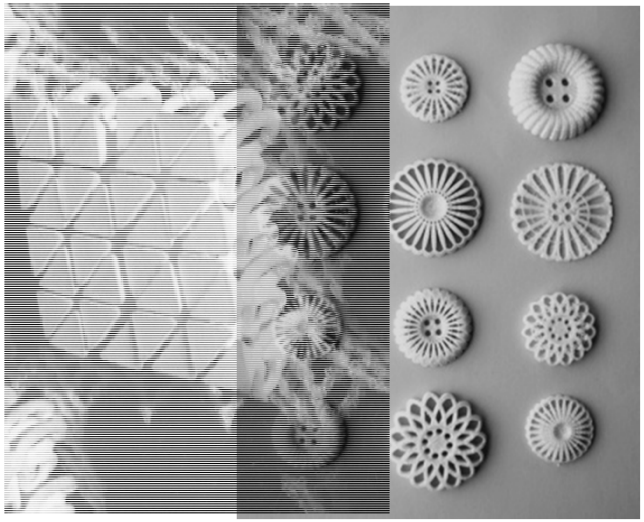
A2: 'MATERIAL LIKE' (FABRICATIONS)



KEY ATTRIBUTES:

Flexible – articulated (joints)
Chain-mail or particle based
Auxetic properties
Inspired by traditional techniques, knit, lace, chainmail, crochet

A3: COMPONENTRY (TRIMS)



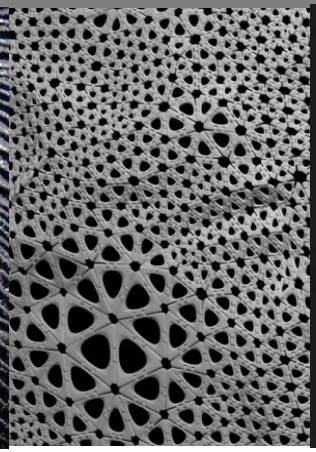
KEY ATTRIBUTES:

Based on traditional trims:
buttons, toggles,
items applied decoratively

http://www.niccolocasas.com/MAGNETIC-MOTION

INITIAL FINDINGS: VARIABLES(B)

Hybridisation/Combinations
Layers of Complexity



http://www.wired.com/2016/01/3-d-printed-garment-shape-shifts-based-on-an-onlookers-gaze/

http://3dprint.com/105075/3d-printed-wearable-apparel/ Masahuru Ono

Lidewij van Twillert

- Multi property/characteristics and multi material printing
- Meta materials – incorporating wearable technologies, smart fabrics, responsive materials

- Hacked Process –DURING the printing process - challenges the recent/traditional 3D printing process
- Applied to manufacturing/production processes – using multiple print machines

- Could also be used for the creation of tools – eg molds for silicone, felting

THEORETICAL MODEL 1

Categorisation of 3D Printing for Garment Realisation

A1: STRUCTURAL/SCULPTURAL

KEY ATTRIBUTES:

Hard/minimal flexibility, rigid

Typically forming sculptural/architectural aesthetic in relation to the body

A2: 'MATERIAL LIKE' (FABRICATIONS)

KEY ATTRIBUTES:

Flexible – articulated (joints)

Chain-mail or particle based

Auxetic properties

Inspired by traditional techniques, knit, lace, chainmail, crochet

A3: COMPONENTRY (TRIMS)

KEY ATTRIBUTES:

Based on traditional trims: buttons, toggles, items traditionally applied decoratively

B: HYBRIDISATION

Multi variable property/characteristics and multi material printing

Meta materials

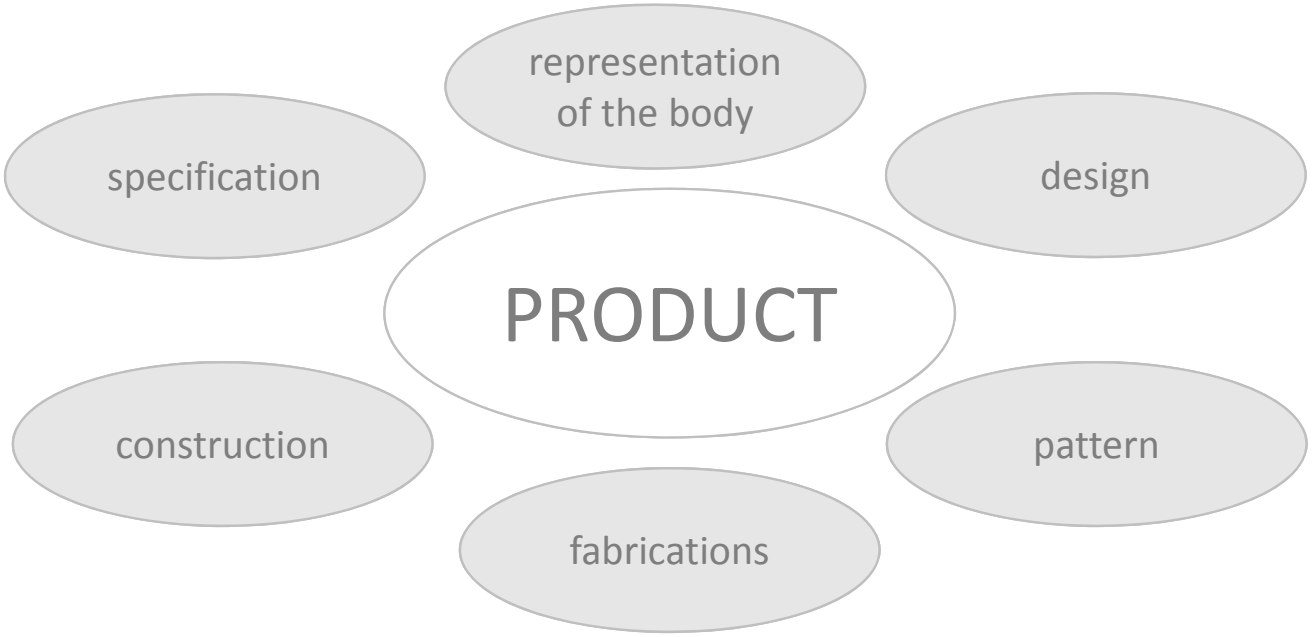
C: PROCESS

Hacked Process

Manufacturing/production processes

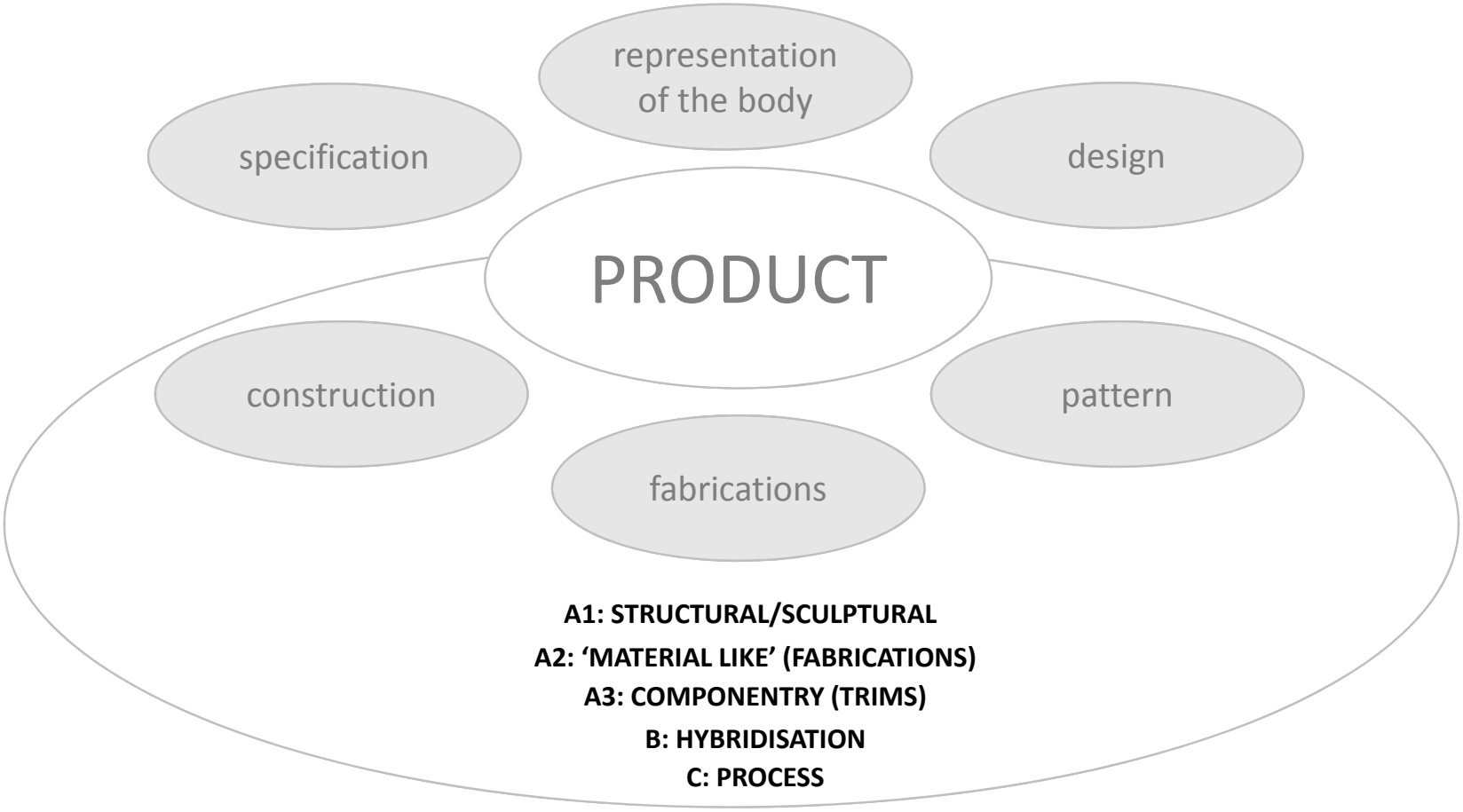
Preparation process: tool creation

KEY ELEMENTS REQUIRED TO PRODUCE/REPRODUCE A GARMENT



Model 2: 6 Key Element Requirements in Garment Realisation

Model 2: 6 Key Element Requirements in Garment Realisation With Applied Categorisation of 3D Printing for Garment Realisation



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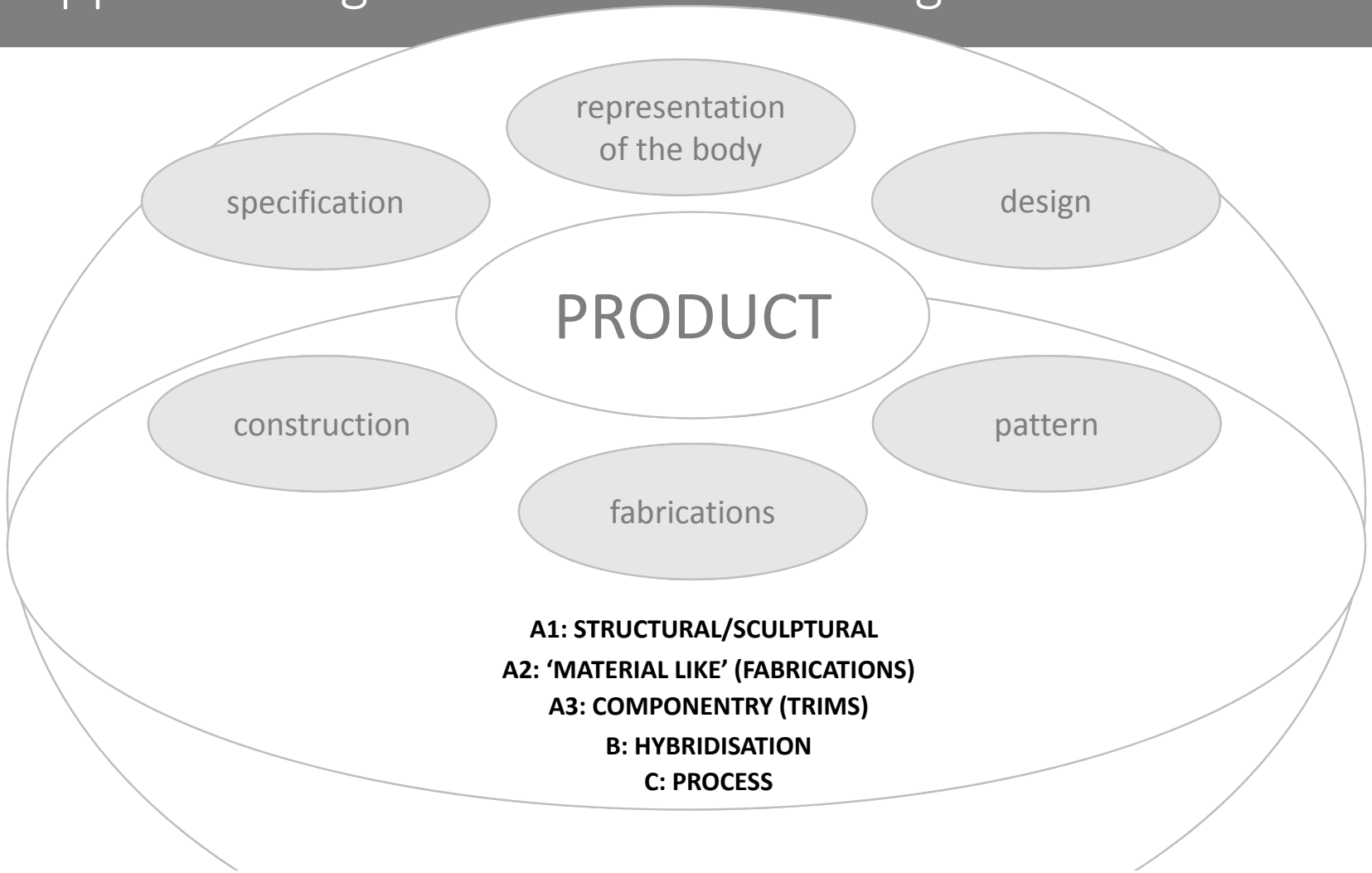
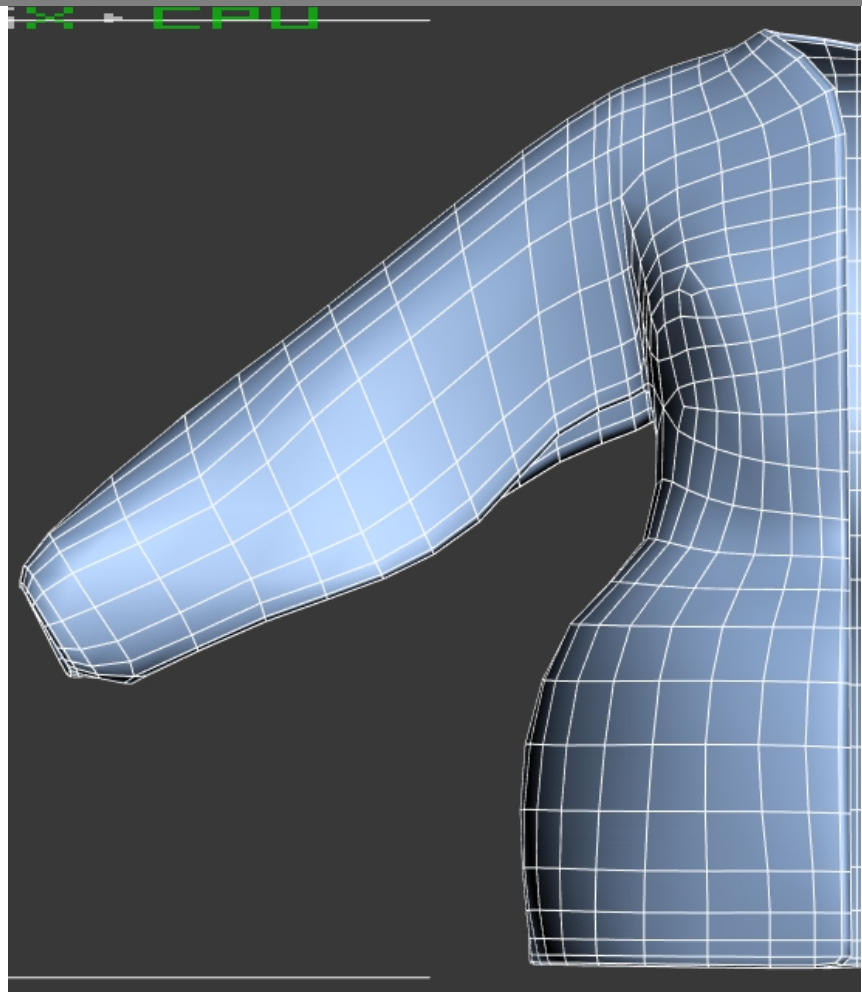


FACTORS AFFECTING INTEGRATION OF 3D PRINTING

Multi-disciplinary collaborative experimentation

- Language (terminology) barriers
- 3D to 3D (sampling important)
- Digital skills – 3D visualisation and digital pattern creation
- Base materials knowledge & limitations
- Machine capability/build size
- Process awareness (sampling, setup, post processing, timing and costs)



FACTORS AFFECTING INTEGRATION OF 3D PRINTING

Questionnaire

- 75% believe 3D printing to be relevant to them when they go into the fashion industry
- 56% preferred methods of pattern creation is modelling /draping on a mannequin, least was using avatar technology
- 90% believe it could be used to create accessories, 75% for trims, 50% new types of fabrications
- 87% wanted actual samples, like fabric hangers/swatches
- Taught lessons on the software to create shapes, less keen to experiment individually

http://www.shapeways.com/blog/archives/22226-new-york-fashion-week-3d-printed-garments-debut.html?etId=54759678&utm_source=sw-email-2&utm_medium=email&utm_campaign=20150924&ca=email&ct=20150924

REFLECTIONS & CONCLUSION

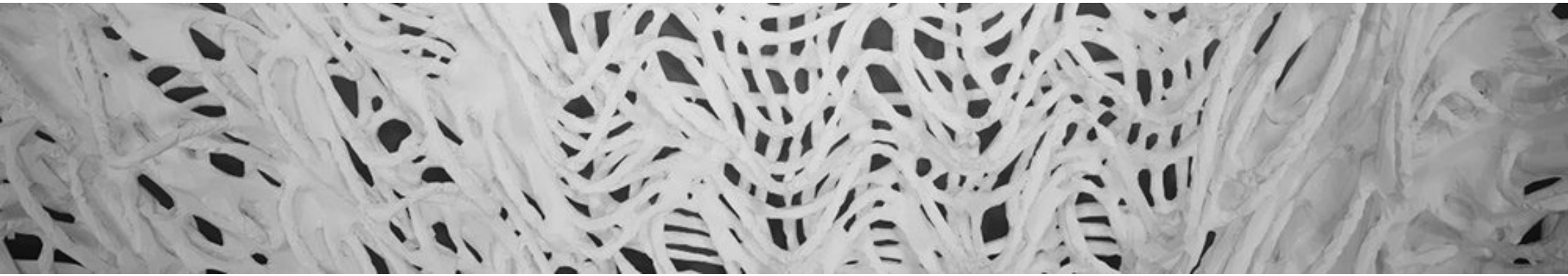
Proposal of a theoretical model defining the ‘fit’ of 3D digital modelling and 3D printing allows the user to underpin their explorations with more familiar terms and processes

Small project based workshops to apply each element of the theory and build examples

Knowledge of materials and machinery

The importance of digital skills and confidence

Collaborative approach to explore



THANKYOU!

Questions & Observations

We welcome your thoughts

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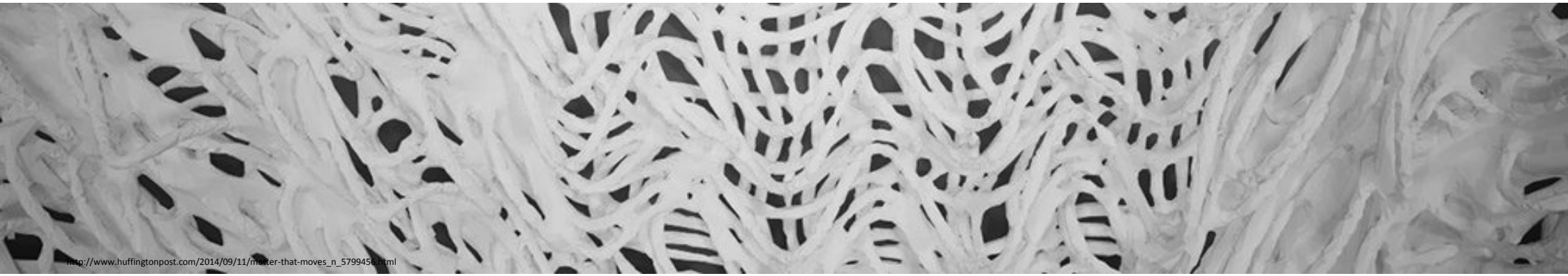

Abstract

With fashion brands such as Pringle and designer Iris Van Herpen utilising the technology to create innovative garments, 3D printing in fashion is playing a pivotal role in the reinvention of both material and structural processes (Braddock, Clarke & Harris, 2012). Whilst the technology itself is not new, its use within commercial fashion is more recent, where typically the approach to design is through collaborative partnerships, reaching across other non-fashion disciplines. This project was initiated through the research and development of learning materials for undergraduate Fashion Design and Technology students, who are new to this process. A model was developed with the aim to facilitate students understanding of how the technology can be applied within, across and outside of the boundaries of creative pattern cutting, including experimentation using 3D software. The factors affecting implementation of conceptual knowledge is discussed and applied to the model. The role of 3D printing integrated within creative pattern cutting, design, product development, textile design and product modelling/engineering is explored. The outcome of the research is the proposal of a theoretical model to inform teaching and learning.

Keywords: 3D printing, product development, pattern cutting, technology, theoretical model, computational fashion?

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