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Ultra Personalization and Textile Thinking in Interaction Design

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Abstract
Textile Thinking and Ultra Personalization are guiding the PhD research in wearable on body sensing in the creation of garments / accessories. Textile Thinking involves the superficial surface of a design process that attempts to create a point of view to reach new understandings in design and architecture. When applied to interaction design in the near field the garments that people wear can become an interface or expression for sensing and actuating. Specific ideas such as Fit are explored to aid in developing a more unique understanding of interaction on the body.

Author Keywords
Textiles; Wearables; 4D Printing; On the body; Material negotiation; Interaction Design; Fit; Near Field

ACM Classification Keywords
H.5.2. Information interfaces and presentation: User Interfaces:

Introduction
Fit has been the guiding subject of the PhD research of Troy Nachtigall. He is building on body sensors and creating personalized objects based upon that data. Ultra personalization is leading to a new class of products that goes beyond bespoke or Soft Weft design. The creation of garments and accessories that are calculated around the user dramatically increases the opportunity and complexity of near field interactions. Fit is a term that is used extensively in the fields of fashion and accessory design, but what does it bring to interaction design? When we can sense the body directly how does it negotiate the creation of the next iteration of the garments and accessories that the user wears. This is analyzed better by dividing it into the subcategories of Physical/Kinetic Fit, Material Fit, Behavioral Fit and Social Fit. This PhD is intended to explore the impacts of Fit in terms of textile thinking on Research through Design and the making of prototypes. The research is specified as Designing

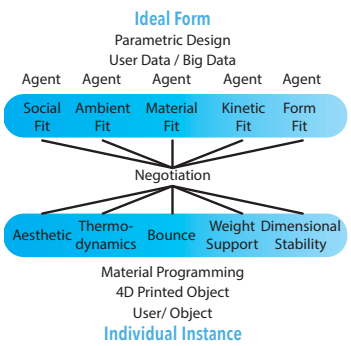

Fig 2. Negotiation of Fit needs of the individual and the Product Features of an on body artifact.

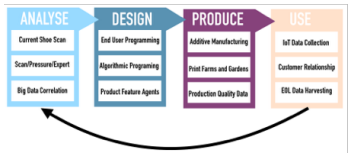

Fig 3. Product Service System of iterative design

adaptive and responsive clothing (fashion design). [1] On skin sensing would allow the comparison of the textile data to something closer to the body. This is particularly interesting in feet and shoes due to the dynamic aspects of motion.

Context and Motivation

The Perfect Fit Context

Ultra-Personalization requires a level of personalization achieved in the creation of a 4D printed garment whose material is programmed to the individual. It is made for the individual driven with gathered data. Every prototype is informed by the preceding prototype allowing for a precision in calculation. The research is looking closely at the shoe as it is a region of the human body that requires great function and aesthetic quality. Fit often goes beyond the simple physical requirements. Sensing the body and the textile provide corresponding data sets.

Figure 1 Early Mapping of concepts of fit.

Fit also expresses how the material functions, how this matches the behavioral fit of the individual and how fit functions for the individual on a social level. Early explorations into the creation of data driven shoes revealed that there are possibilities of creating artifacts unique to the individuals multiple fit needs. This leads to the need negotiate Fit and Product Features as illustrated in Fig 2. Greater understanding of the foot in these processes would lead to clearer negotiation.

4d Additive Manufacturing

Part of the research investigates the creation of objects on a mass personalization level and iterative research through design research is being performed into 4D additive manufacturing with flexible materials and new methods [2], [3] and [4]. On skin sensors can inform this process.

Ultra-Personalized Product Service Systems (UPPSS)

To fulfil the diverse fit needs of individuals a new level of personalization that goes beyond tailored. Bhomer describes it as "Ultra Personalization refers to a new class of products that move pass mass customization and are made for the individual in every instance" [5]

An iterative cycle [6,7] is needed to validate results and a product service system model, Fig 3, was created as a method to validate the research. My current research needs greater analysis of the Use aspects of an UPPSS and on skin technology provides new possibilities in data gathering.

Completed Research

The Research through Design method is used to analyze this system of Ultra Personalization. Figure 4 illustrates how the diverse aspects of the research are combining into a single service system as each exploration build an area of Analyzing, Design,

Research through design

Fig 5. Printed flexible high heels

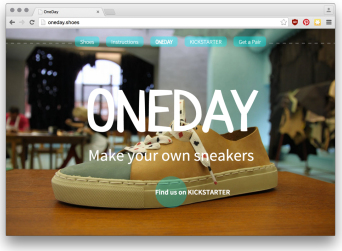

Fig 6. Oneday Shoes

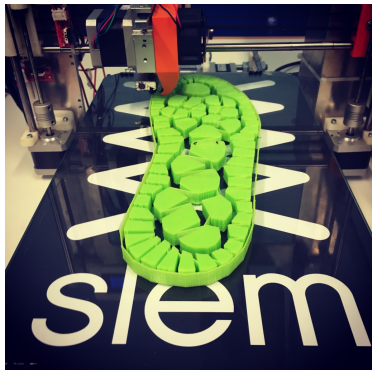

Fig 7. Solemaker

Production and Use to complete a full iteration of the shoe and inform the next iteration. Each of these prototypes would benefit from on skin sensing allowing for greater understanding of the UPPSS Use phase.

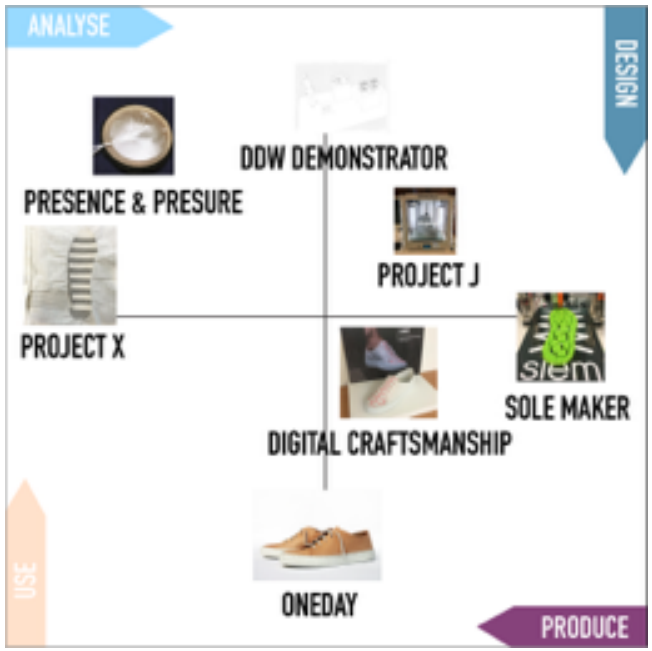

Figure 4. Completed research in relation to data driven Ultra Personalized Product Service Systems

Project J
The first exploration was a high heel that used 3D scanning, parametric design, additive manufacturing and material programing. Figure 5. The design explored material, form and behavioral programming in terms of fit. Six iterations were required to provide a proper fit.

Skin sensing could show where pressure and contact is made and have saved numerous prototipes.

www.Oneday.shoes
The Oneday toolkit was research into customization. As a successful Kickstarter campaign it allowed for qualitative research into user and society. Figure 6. As a prototype toolkit, the skin sensor could allow for dynamic foot position and add quantitative data.

SoleMaker
The SoleMaker Project combined the learning outcomes from Project J and Oneday. The personalization and individuality of the research from Project J was combined with the customization and mass appeal of Oneday.shoes for a fully digitally manufactured shoe. Figure 7. Skin sensing of foot pressure distribution would greatly increase the supporting fit capabilities of the sole and reduce the amount of rubbing on the foot.

Presence & Pressure
Working with Electrical Engineer Admar Schoonen, a method for of capacitive/resistive sensing in textiles was developed. Presented as a workshop at the 2016 eTextiles Summer camp, it would be fascinating to understand if a capacitive sensor could be built to see the presence of another person. The on skin technologies might enhance Fit in social interaction.

Beyond this, my research as a part of the H2020 ArcInTexETN explores the fields of Architecture, Interior and Fashion to provide research into the interaction of these diverse scales. If the skin is thought of as a membrane, then it is a textile in the way it behaves and reacts. Although the skin is not a textile, using the traits of textiles to conform, cover, breathe and interact

with the body allows the use of textile thinking to be employed.

Conclusions: Motivations for UnderWare

The motivations for applying to the UnderWare workshop come from a desire to sense more in depth into the body. Currently the sensors produced in the research can measure the area between the foot and the sole with relatively accuracy. Yet problems such as shifting of the shoe on the foot decrease reliability of data. The soft tissue between the bone and the epidermis remain difficult as CT and MRI photography is needed which is complicated by the dynamic nature of movement. This workshop not only offers an opportunity to explore the nature of sensing in ultra personalization, but also allows for the application of Textile Thinking in a new and interesting way.

Acknoledgements

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