Radically Relational: Using Textiles As A Platform To Develop Methods For Embodied Design Processes

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Abstract

This position paper builds on textiles as a metaphor to explore the experiential knowledge observed through embodied design processes. In order to build understanding, we have tailored our tools and methods to support our explorations so far. As literature shows articulating our sensory experiences with materials is a challenging task. In order to support our investigations, in this paper we present a reflection on our diverse approaches to introduce tools that support us in interrogating how designers relate with materials, particularly textiles, and use their sensorial body to experience them during the creative process. We build on our previous research that identified relevant embodied process to textile selection, and reflect on how we have explored how sensing technology can augment and empower each of these phases, to support the design process. We conclude by discussing the learning outcomes from introducing such tools, in order to reflect on the future of our research.

Keywords

Embodied processes; Experiential knowledge; Immersive; Augmented; Mediated

Articulating our sensory experiences with materials is a challenging task (Obrist et al., 2013; Atkinson et al., 2016), but it is crucial for the creative process to unfold. Here we focus on a specific type of material, and we chose textiles, because as suggested by the iconic fashion designer Yohji Yamamoto "the fabric is alive and the real thrill lies in taming the tail of a living thing." (Yamamoto, in Salter, 2014). Even before the possibility of developing alive, active and adaptive materials emerged, textiles were already performing and relating in such manner. Textiles are soft materials that respond actively to being touched or otherwise moved, and are generally worn close to our bodies, adapting to it. In this paper we use textiles as a metaphor to explore the experiential knowledge observed through embodied design practices.

The human race historically makes with their hands, and the level of specialisation of hand sensitivity and skills has been studied from diverse perspectives, such as philosophy (Noë, 2004), phenomenology (Ingold, 2013; Flusser, 2014), cognitive sciences (Kirsh, 2013), crafts (Sennett, 2008; Lederman & Klatzky, 1987), and more recently in human-computer interaction (Atkinson et al., 2013) and design (Petreca et al., 2015), just to mention a few. Particularly in the case of textiles, a framework has been proposed to look at the textile experience (Petreca et al., 2015), which is formed by 3 main touch behaviour types (*active hand*, *passive body*, and *active tool-hand*) and 3 tactile-based phases, as follows:

Situate describes the first experience with the material, it is the initial experience where designers, through a combination of touch behaviours, using hands and sometimes other parts of the body, first attempt to grasp a material's properties.

Simulate is when designers after comprehending the material, start to play with the fabric in a creative manner. They put the material to a series of tests to explore different concepts. The body, or parts of it, is used as a platform for such simulations.

Stimulate characterizes the phase in which the designer goes beyond the physical properties of the material and initial concepts. At this moment the designer starts to envision complete new possibilities for the material. This phase involves the use of the entire body and the creation of metaphors to externalize more poetical and powerful material becomings, as well as subjectivities.

Here we build on this framework showing how we have explored how sensing technology could augment and empower these embodied processes. The prototypes included here are not yet a final solution, but experiments that show a proof-of-concept, which is that tools can be brought in to support the design process through enhancing and empowering embodied processes. Hence, results are not reported here[1], because the point is to reflect on how these tools help to understand and investigate the textile experience, by experimenting with these embodied processes previously identified.

This paper shows how with the tools we have selected what to represent about the fabric and about the body, and how these are tailored according to the level of focus that we wanted to work at: the finger, or the arm, or the whole body. These have happened mainly through two types of strategies:

1. Focusing: on the body part, on the characteristic of fabric you've decided at that moment, on the textile interaction (which may change – shift the focus by stressing one part or another), and/or on who is generating (myself, or another person).
2. Representing Sensation: in the projects we present here we have mostly prioritised one sensory modality, specifically visual, tactile, or auditory.

[1] Results can be found in discrete publications about each tool presented in this paper, namely: (Petreca, 2016; Yu, 2016; Saito, 2015).

This compilation of works show diverse approaches to introduce tools that supported investigations on how designers relate with materials, particularly textiles, and use their sensorial body to experience them during the creative process. With this, we complete the framework that was introduced with the 3 tactile-based phases of the textile experience, by saying how technology can empower that exploration. Finally, we discuss the learning outcomes from introducing such tools, in order to reflect on the future of our research.

The Pocket-Tool

Tactile experiences with textiles differ largely between individuals and the embodied processes (i.e. sensory and affective) by which designers select textiles are categorically overlooked by both designers and the industry, in favour of technical textile knowledge (Petreca et al., 2015). In the textile area, the sensory experience is crucial, especially for designers, who base their material choices heavily on feeling and tacit knowledge, that is, sensorial awareness build through experiences. We aim at further understanding this rich experience by investigating touch behaviour. We have developed the Pocket-Tool with the context of a textile fair in mind, as this is an intense moment of textile selection, where the number of textiles at display is overwhelming, and to make matters worse designers cannot take home samples from the fair, and have to wait until suppliers send them later. In this scenario, what do designers need to remember about the textile feel when back in their studios to share with their teams or to select a textile to order?

Device

To investigate further the touch behaviour when handling textiles we designed a research tool, the Pocket-tool (Petreca et al., 2016). The Pocket-tool (Figure 1) is built with Arduino-based technology and it comprises a set of six force sensitive resistors (1.75x1.5" sensing area), and correspondingly six different textiles (all white or cream to reduce variables and avoid colour effects on the experience) shaped in the form of a small pocket) within which the resistors can be inserted. As participants interact with the pockets they visualize lines being plotted (one corresponding to each textile pocket) on a display, which reveal the amount of pressure applied and captured by the resistors as they touch.

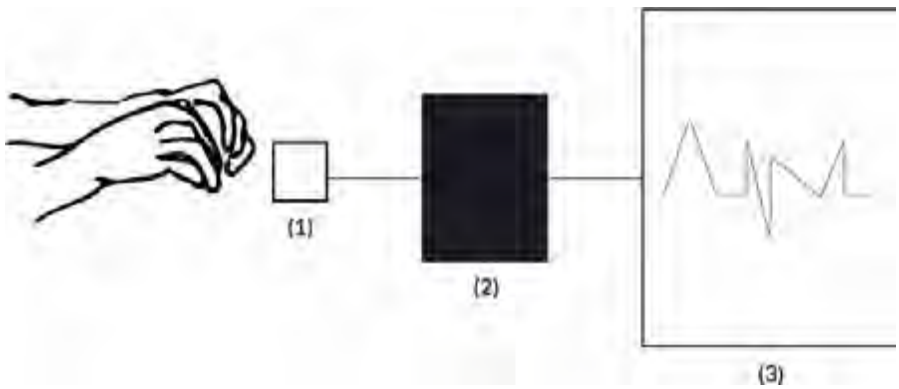

Fig 1. Schematics of the Pocket-Tool interaction, where (1) is a force sensitive resistor (“pressure sensor”), with 1.75x1.5” sensing area and is covered by a fabric pocket, (2) is the box holding the Arduino board and (3) represents the lines plotted as a result of the interaction.

In studies using this tool, participants were asked to find the fabric pocket that better represented a property defined by a verbal descriptor, which was suggested by the researchers. The verbal descriptors

used were: smooth, rough, soft and hard.

Discovering what the body does

As reported previously (Petreca, 2016; Petreca et al., 2016), the use of the Pocket-tool was revealing in the sense that it allowed us to disrupt the way designers normally interact with textiles and helped in facilitating conversations around this experience, as they enabled the articulation of aspects that generally remain unspoken or unconscious. The use of the Pocket-tool contributed to our understanding that the textile touch is a multisensory experience, going much beyond the tactile appreciation with the hand manipulation only, and that this is a very complex experience to communicate (Petreca et al., 2016). Also, it revealed the importance of tacit knowledge in experiencing a textile during selection, as much of the aspects that remain unspoken are determinant for the decisions that designers make.

With the Pocket-tool designers revealed a focus on their bodily experience, which led to reflection and understanding of what they were doing. The mechanism of the Pocket-tool was based on the sensor measuring the interaction and providing a focused attention on the part of the body that is measured, as well as the feedback provided, which facilitates the understanding of the body part that is engaged. Hence, the Pocket-tool provided at the same time a top down and a bottom up process; top down because the person sees the graph and realises what the body is doing, and bottom up because as one focus on a body part being measured, there is reflection on what the body is doing, discovering what the body movement leads to in terms of emergent understanding from the interaction – about the fabric and about oneself.

This is related to the ‘Situate’ tactile-based phase, which is about the understanding one gets from the fabric and from oneself, and is emergent from the interaction between both. The Pocket-tool contributes to enhance those internal feedbacks that we have, the proprioceptive feedback that are very subtle, as if it was creating, or rather enabling a 6th sense of the experience, which comes from this focused attention. Finally, there are many possibilities in which this type of interaction could be further explored, since in terms of how the body is moving, one could work gradually (up-down) to explore how the body is experiencing from the local part to the full-body level.

The Haptic Sleeve

Online shopping for fashion has recently seen rapid expansion, but it is still facing the challenge of translating tactile experiences in an online environment (Perry et al., 2013). Textile-based products are classified as a high-involvement product category that needs to be evaluated through multi-sensory channels (i.e. touch, visual) (Workman, 2009). Touching fabrics is a multi-sensory, emotional, and psychological experience, which is of particular importance for both experts (Petreca et al., 2015, 2016) and non-experts (Atkinson et al., 2013, 2016; Cary, 2013) to appreciate and understand fabrics.

In efforts to understand how the textile touch might be mediated, previous research (Cary, 2013) tried to identify the gestural language that reflects the experience of textile touch. The main objective of this experiment was to see if people are able to tell from someone else manipulating a fabric how a fabric feels. Six gestures identified through interviews (Rubbing, Stroking, Squeezing, Lifting, Scratching and Pressing) were used to produce video clips. These were used to verify if the gesture does communicate the perception of a property of the fabric (e.g., communicates softness), using fabrics viewed digitally. *From looking at the person handling the fabric on the video, can you judge how the fabric feels?* Four gestures only were investigated to study if they would affect the ratings of “Smooth”, “Hard”, “Light” and “Rough”. The gestures selected for analysis were: stroking, pressing, lifting and rubbing. The study showed that smooth ratings for the slow stroking gesture are always statistically higher than the smooth

ratings for any other gesture. Hence, the slow stroking (caress) gesture did increase the ratings of a smooth fabric property. Hard ratings for the pressing gesture are always statistically higher than the hard ratings for any other gesture, except from rubbing.

Outside the textile realm, research showed that the haptic channel enhanced or enriched mediated communication and provided the capability to exchange contextual and nonverbal cues (Chang et al., 2002; Chang et al., 2001; Rovers & Essen, 2004; Rovers & Essen, 2005). By adding the touch channel, the amount of information transferred is increased (Chang et al., 2002; Chang et al., 2001). Studies investigating similarities between real and mediated social touch (Hertenstein et al., 2009) have used vibrotactile stimulation successfully, which indicate that this is suitable for touch-based activities (Huisman & Darriba Frederiks, 2013).

Considering both approaches reported above, tactile feedback generated by vibration motors were considered an appropriate means for simulating a touch gesture for perceiving textiles and, in order to bridge the gap between the digital and physical textiles, a Haptic Sleeve was designed to explore how the haptic feedback affected and/or altered the way people perceive textiles in mediated communication.

Device

This haptic device consists of two modules: an automatic module and an interactive module. The automatic module includes a haptic layer and a heating pad layer that provide haptic feedback and warmth respectively through computer control. The interactive module is the one that users can play with to explore more haptic patterns by themselves. The haptic sleeve is made of viscose fibre in-between a layer of sponge. It consists of two layers, one layer is a 3 by 2 grid of pancake style eccentric rotating mass (ERM) vibrotactile motors which is attached horizontally to the inner surface of the haptic sleeve using Velcro (Figure 2). The ERM vibrotactile motor used in this study is 10mm in diameter and 3.4mm in height. Every vibration motor was wrapped by kinesiology elastic tape and sewed to Velcro strips, which were in turn attached to the sleeve (Figure 2). It can generate different haptic feedback to render touch gestures presented in the video. The other layer consists of one DC powered electric heating pad and one temperature sensor (DS18B20), which can work as a temperature controlled heating pad to provide users with feelings of warmth. An Arduino UNO drives the ERM motors, heating pad, and temperature sensor.

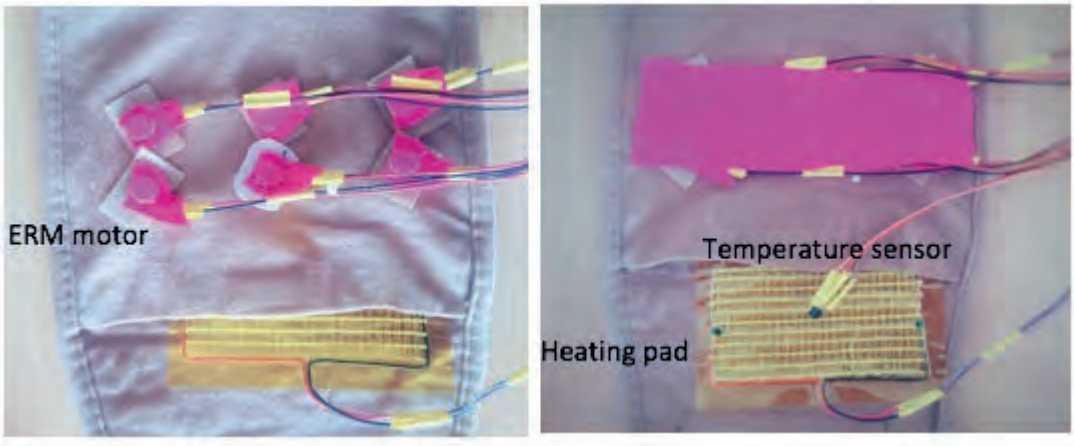

Fig 2. The haptic sleeve (including ERM motors, a heating pad and a temperature sensor)

In terms of touch behaviour patterns, people's perception depends upon the frequency, amplitude, vibration and duration of each motor, overlap of vibration duration between subsequent motors (OSM), and the distance between two subsequent motors (Diehl et al., 2013; Oakley et al., 2006). Through

controlling these five parameters, diverse haptic feedback can be formulated to render different feelings for people. For the feeling of warmth, a heating pad and a temperature sensor were used to provide a controlled temperature of 42°C for people to receive the sensation of warmth (Ciesielska-Wrobel and Van Langenhove, 2012).

To allow for interaction, a regulator that consists of three potential meters was used to adjust the value of three key parameters of ERM motors: intensity of vibration, vibration duration, and overlap of vibration duration between subsequent motors (OSM) (Figure 3a). Through manipulating three adjustable dials, participants can understand how different parameters could contribute to haptic feedback and the perception of fabrics (Figure 3b).

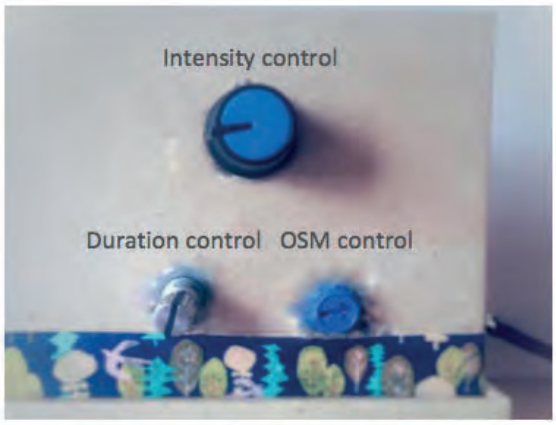

Fig 3a. 3 potentialmeters for interaction with Haptic Sleeve.

Fig 3b. Haptic Sleeve.

Fig 3. Devices for interaction with Haptic Sleeve.

Research on developing a touch language for experiencing fabrics demonstrated that touch gesture does communicate the perception of softness and smoothness of a fabric (Cary, 2013). This is not surprising as work on affective body expression had previously shown thorough an unsupervised approach (De Silva et al., 2005) and body feature analysis (Kleinsmith et al., 2005) that a subtle affective body language exists. However, this prototype enables us to better understand and design for these body experiences. This haptic sleeve enables to deliver haptic feedback that simulates these touch gestures generally used to touch textiles that were smooth, rough, soft or hard. This included haptic feedback simulating gentle caressing and rubbing. Participants wear the haptic sleeve that outputs various feedback types synchronised with the video clips showing someone interacting with a fabric (Figure 4).

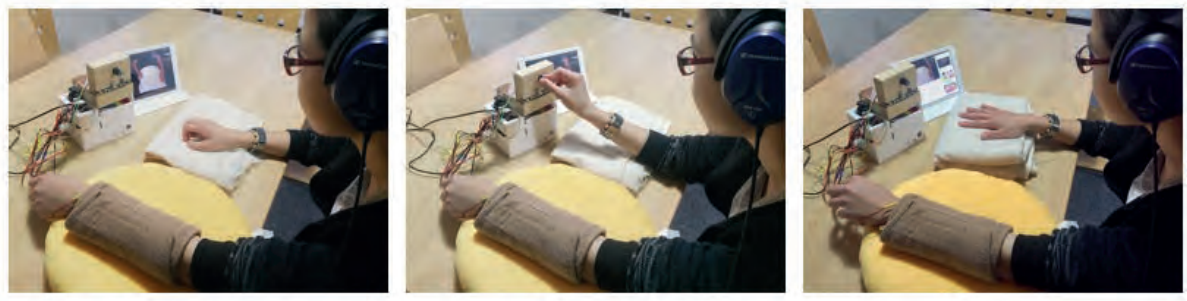

Fig 4. Participant interacting with the Haptic Sleeve.

Exploring different properties of textiles and experiences remotely

A majority of participants feel more connected to the textiles and enhances the activity of experiencing them. When participants were asked to interact with the haptic sleeve through three regulators and explore more haptic feedback (Figure 4), it was noted that this approach can help them better understand not only how the haptic feedback can contribute to the experience, but also how the textile and touching experience are related.

The interactions provided by the Haptic Sleeve allow enhancing the Simulate and Situate phases of the experience. The Simulate comes from the fact that one can change and try other parameters, which enables the exploration of different properties of textiles and experiences. The Situate is rather a co-Situate, as the Haptic Sleeve allows one to situate with someone else, as you try to share subjective experiences about the feeling of a textile. When interacting with the Haptic Sleeve, you are changing the parameters, or somebody else is moving the toddle, that is, Simulate on you someone else's feeling.

Here there is partially Situate and partially Simulate, as people could touch and feel what is happening on the other, or receive a caress adjusted by someone else, and we want to see how the body feels that. People explore it, and use different parameters. By changing the parameters, they were playing with different perception, through the different touch they would receive. It is interesting to see how other people Situate, so it could be a device for communication between designer and consumer.

The Hyper Textile

The context of this research was the advent of computational design and rapid prototyping as the body becomes a new support for innovation, and how fashion has been explored by engineering under the umbrella of wearable technology. Moreover, while many engineers are engaged in the development of wearable technology at high-level research, few fashion practitioners are involved. Fashion is a discipline that due to its proximity - and intimacy - to the body, can create knowledge to bridge object (dress) and subject (body), material (cloth) and immaterial (discourse). The current debate about the usage of digital technologies to mediate the design process brings an interesting discussion on new possibilities to rethink the role of the practitioner and embodied modes of practices. Building on previous research on the role of tactility in the design process, that revealed how complex touch behaviours are at both cognitive and subjective levels (Petreca et al., 2015), the Hyper Textile proposes to empower design practices that are relational and augmented. We argue that embodied knowledge and values can be transferred to digital by addressing a gap between traditional handcraft work with computational processes. The Hyper Textile resides in bonding different areas of endeavour, as a first attempt to propose a framework to create forms in which designers can actively engage with digitally aided processes rather than passively design through software and fabrics separately.

Device

The Hyper Textile was composed of three different fabrics cut in two meters each (Figure 5). The fabrics were connected to vibration sensors that captured when people touched the surface of the fabric and amplified the vibrations in real time, amplifying the original sound of each textile (Figure 6). Each fabric also played additional audio files, which was generated by vibration sensors connected to an Arduino board and controlled by a Pure Data command. There were three different audio files, which contained specific speech excerpts, each related to one of the three subdivisions of the research.

The design process was an attempt towards weaving design statements and practices together. Fabric selection, cutting and sewing weren't parallel practices to sound recording, code writing and cable arrangements. For this work the practice was expanded, it is augmented. The technological aspect gave

support and enhancement to the other more crafty aspects of the installation. In the same way, the fabric properties - its touch, sound and feel - were equally essential to the technological functionality of the Hyper Textile.

Fig 5. Hyper Textile installation

Fig 6. Hyper Textile installation in use

Discover how you and the textile work together

This device enables an augmented exploratory experience through the relationship that both amplifies the senses and blurs the boundaries between the physical material and its digitally augmented properties, both the design practice and for the viewer. This augmented interaction creates a scenario for a more thorough and expansive material experience, which allow for possibilities that cross and go beyond its material properties.

The Hyper Textile is an enhanced representation of the interaction between a person and a textile sample. In this scenario, not only the sample is considerably larger, which encourages full-body interaction, but you also have an additional augmented sense which in this case the sound - something that is always there, but that is not so easily perceived. With that it enhances and augments Stimulation,

which is facilitated by creating an extra channel of communication with textiles – not touch, or visual, but in this case sound, which makes the interaction much more vivid and inviting. Consequently, people go and really stay there and explore the textile. In participants' observation, we can notice them interacting more because the textile in movement "talks" to them; their interaction is sonified.

Here we select what to represent about the fabric, and about the body. This creates an engaging interaction with the fabric, and by inviting interaction it may lead to "Stimulating" experiences. In this case the sound was used, and that is just an example, but one could think of how that Stimulation phase can be enhanced by making the interaction with the body and textile, being enhanced through this representation, but using other channels. And also Stimulation can be empowered by the fact that you engage more, and discover more.

Discussion

Throughout our research we have developed diverse tools and methods to investigate and support designers in experiencing (Petreca et al., 2016; Atkinson et al., 2016; Yu, 2016; Saito, 2015) and selecting textiles (Petreca et al., 2015; Petreca, 2016). In this process we have realised the importance of developing our own means to engage with this experience, in order to aid designers in focus, elaboration, articulation, and communication of the experiences they have through and with textiles. We have done this using mainly two types of strategies, which are about focusing (on the body part, on the characteristic of fabric you've decided at that moment, on the textile interaction, and/or on who is generating) and representing sensation. These are summarised in Table 1.

Table 1. Diverse tools to support embodied design processes.

STRATEGIES		**POCKET-TOOL**	**HAPTIC SLEEVE**	**HYPER TEXTILE**
Focus	**Body part**	Fingers	Arm	Full-body
	Textile interaction	Physical properties (e.g. Thick – Thin, Stiff – Flexible, Warm – Cool, Rough – Smooth)	Physical properties and textile-based concepts (related to design application)	Meaning-related characteristics (metaphors, associations, etc.)
	Person generating	Oneself	Oneself or another person	Oneself
Representation		Visual	Tactile	Auditory

As can be seen from Table 1, by testing how technology can empower embodied processes, we have completed the initial framework proposed, based on the 3 tactile-based phases Situate, Simulate and Stimulate. Reflecting back at these proposed tools, we realise that these strategies also led to particular ways in which we have structured our approach, and which could be taken forward as themes to be further explored for the development of other tools.

The devices presented in this paper demonstrated three main routes to focus on the embodied experience:

Immersion in experience - by developing and delivering the means (tool or method) for designers to have an immersion in their own touch experience of a textile. The effect noticed was that when designers have the agency to navigate their experience, they will focus their attention on aspects that emerge as relevant during its course;

Mediating the experience - since in our current context touch experiences with textiles are sometimes lacking, for example in digital design or online shopping, and by receiving a mediated touch (in this case through a haptic sleeve), participants feel more connected to the textiles and their experience is enhanced;

Augmenting the experience - by purposely focusing on certain qualities of an experience that are heightened to provoke and evoke reactions, and the effects observed are of a more playful interaction, that keeps the designers actively exploring and engaged in the experience of involving the whole body in such explorations.

These three approaches - immerse, mediate and augment - show possible and fruitful paths to further our understanding of the embodied experience with textiles, through investigations on touch interactions. As we are progressively entering spaces where our processes and products will increasingly inhabit blended spaces, between physical and digital, if we are willing to create more alive, active and adaptive materials, we believe further exploring the roadmaps we have proposed through this paper will have a disruptive impact on the design field - of designing with our materials, with our whole bodies and contexts engaged.

Building on the framework described above, we can open up the discussion to propose some following concrete applications that may benefit from the findings from the three projects presented:

1.Design Education and Practice: There is an underexplored potency in this approach, that is to promote an *"ecology of knowledge"* (Santos, 2007) in design research and practice. This would lead to a recognition of an epistemological diversity of knowledge and its actors within design, in particular to the theme of this paper, the validation of tacit knowledge as opposed to hard sciences only. Within this mindset, here there is an opportunity for development of tools to support designers or design teams - local extension, for personal use or sharing - that facilitates processes of articulation and communication on a tacit basis, i.e. relying on the designer subjective experience and experiential knowledge.

2.Co-Design: The devices described in this paper deal with both personal and shared material experiences, as well as the use of data representation and collection as non-verbal relational tools. Such affordances can support co-creation practices, as they might benefit from new possibilities for remote communication between multiple stakeholders.

3.Commercial/Industrial Settings: Radically relational approaches to design offers opportunities to explore commercial contexts within online and offline environments (local or remote). It is safe to affirm that when both environments are explored in a hybrid manner, this can lead to more seamless user experiences. We could easily see this working in consumer customisation settings, with services that combine in-store and/or online experiences.

Moreover, our research challenges current understanding of design practice, as these tools open up paths for investigations within a hybrid, interdisciplinary approach, which inhabits both physical and digital spaces. Finally, despite the emergence of tools that can directly capture how a person feels about textile (Singh et al., 2014), we argue that technologically aided material engagement and exploration can lead to exciting new radically relational developments in the ways we think and do design. In future work, we hope to further stretch the use of technology to explore material interactions with the support of augmented reality, virtual reality and haptic technologies.

Acknowledgements

Though the work reported is the result of a collaborate effort to bring three distinct projects together, we recognise the need to address author's contributions separately.

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Bruna Petreca

Bruna Petreca is a postdoc design researcher and practitioner. She holds a PhD in Design Products (Royal College of Art, London-UK), and a BA in Fashion & Textiles (Universidade de São Paulo, Brazil). Her research is currently based at the Materials Experience Lab, at the Delft University of Technology, in The Netherlands. Alongside, she is leading the project for structuring the 'Material BA.Z' at the Centro Universitário Belas Artes de São Paulo, Brazil. She is interested in our experience with materials, with a focus on textiles but not limited to, and investigates how to support designers in exploring and expressing the multisensory aspects of this rich experience. Bruna is engaged with the Micro-Phenomenology research community; this expertise forms the basis for Bruna's efforts in further extending her research into projects within the arts & design realm, which presently she does in collaborations with 'Projeto Co' and Morena Nascimento.

Carmem Saito

Carmem Saito is a design practitioner and researcher working with a wide range of different media. With a background in Fashion Design, she has graduated from the MA Integrated Design at the Hochschüle für Künste Bremen. Additionally, she received a grant to work as a Design Researcher at the Royal College of Art in London, UK. Her interests are in questions of materiality emerging of the integration of digital technology in design processes and understanding material potentialities in touchable and untouchable forms.

Xuemei Yu

Xuemei Yu is a user experience designer with three years' experience of user centred design. She graduated with distinction from University College London with a dual degree in Human-Computer interaction design and ICT innovation. Passionate about haptic media and emotional design. She is interested in understanding the psychological, bias, and motivation that drive users' behaviours and how to put emerging haptic technology into practice bridging the gap between the physical world and digital world.

Nadia Bianchi-Berthouze

Nadia Bianchi-Berthouze is a Full Professor in Affective Computing and Interaction at the Interaction Centre of the University College London (UCL). She received her PhD in Computer Science for Biomedicine from the University of the Studies of Milan, Italy. Her research focuses on designing technology that can sense the affective state of its users and use that information to tailor the interaction process. She has pioneered the field of Affective Computing and for more than a decade she has investigated body movement and more recently touch behaviour as means to recognize and measure the quality of the user experience in full-body computer games, physical rehabilitation and textile design. She also studies how full-body technology and body sensory feedback can be used to modulate people's perception of themselves and of their capabilities to improve self-efficacy and copying

capabilities. She has published more than 170 papers. She was awarded the 2003 Technical Prize from the Japanese Society of Kansei Engineering and she has given a TEDxStMartin talk (2012).

Andy Brown

Andy Brown (MA, MSc, PhD) is a Research Scientist with BBC R&D. His background is computer science, and he has several years of experience of research into HCI in both academia and industry. In its widest sense, his area of interest is exploring how people interact with information, and how to present information to best support users. This has covered several fields, including accessibility and new forms of media, and he is currently involved in research into immersive experiences and the authoring process for non-linear and object-based media.

Jasmine Cox

With a background in product design, Jasmine is involved in user experience and HCI at the BBC, particularly focussing on industrial, electronic, mechanical, and interface design. She has led work to develop physical devices for connecting people with BBC services, and is currently exploring the future of media production via IP networks, including producing & directing object-based experiences.

Maxine Glancy

Maxine Glancy (BA, MA, MPhil, BSc) Lead Research Scientist, BBC Research & Development. During her time at the BBC Maxine has been involved with development of BBC Red Button services, free to air services such as FreeView & YouView, and iPlayer. Her current areas of research include multi-screen experiences, new editorial & broadcasting formats, UGC frameworks, virtual & augmented realities, ubiquitous computing, and object-based broadcasting.

Sharon Baurley

Professor Sharon Baurley is Head of Industrial Design at Zürcher Hochschule der Künste / Zürich University of the Arts (ZHdK), Switzerland; Visiting Research Professor at the Royal College of Art, London, UK; and Fellow of the UK Higher Education Academy. Sharon has a track record of leading interdisciplinary research - materials' engineering, electronics and computer science, biological sciences – funded by Research Councils UK to explore how users can be involved in the design of things and experiences. Projects include: The Emotional Wardrobe (Designing for the 21st Century); Digital Sensoria (Digital Economy); User Innovation Communities (Digital Economy); Artefact Café (Horizon Digital Economy); Stories of User Appropriation (Creative Economy); Prototyping Open Innovation Models for ICT-Enabled Manufacturing in Food and Packaging (Future ICT-Enabled Manufacturing); Makespaces in Re-Distributed Manufacturing (Re-Distributed Manufacturing). Sharon's current research is focused on advanced human-centred design methods - embodied design - to gain insights into the visceral aspect of the human condition and human culture, to develop a new generation of product cultures and cultures around design and production that enable personal/user transformation as a strategy for the Fab City vision (locally productive/globally connected). She believes that these product cultures could help to build new socio-economic 'realities' that will enable societies transition to a more sustainable existence.