

# Crafting the Embodied Ideation of Future Wearables

*How will you go about finding that thing the nature of which is unknown to you? [9]*

**Danielle Wilde**

University of Southern Denmark, DK-6000 Kolding

wilde@sdu.dk

**Jenny Underwood**

RMIT University Melbourne Australia

Jenny.Underwood@rmit.edu.au

## Abstract

New materials and technologies offer the potential for highly innovative systems. Yet also challenge us to expand how we design. Methods and approaches are still emerging, though reflective design and craft-based approaches are acknowledged to be of value [12]. In this position statement, we describe an approach to the conception and development of next generation wearable technologies that builds on this emerging knowledge base. Using research through design [14], we have developed a range of *embodied ideation methods* to leverage scientific, material, and participatory innovation. These methods afford the imagining of wearables that are informed yet unconstrained by current knowledge. They enable discussion of difficult to articulate, often partially formed concepts; as well as the ethical, social, cultural, personal and political implications of what life would be like if yet-to-be-imagined technologies were real and readily available. Crucially, our approach has been designed to not only engage with the concerns and desires of a broad public. Our approach exposes researchers to the public's concerns and desires, in the form of intermediate research outcomes. These intermediate outcomes are used to extend the researchers' understanding of how to conceive and develop physically, materially and aesthetically sophisticated wearable technologies that leverage emerging science and manufacturing potential, while engaging with ecological and societal concerns.

The intermediate research outcomes take the form of: rough prototypes hand-made by participants, video interviews, and metaphorical *research cloths* that may be (metaphorically) *draped, folded or laid out* in ways that privilege different perspectives [12]. These outcomes result from cultural interventions with different publics, using partially formed prototypes and frameworks for embodied reflection. They inform and shape emerging scientific and design innovation, in an ongoing, reflexive process, by informing and enriching the researchers' thinking as the research moves forward. Yet at times our intermediate outcomes are as ephemeral and intangible as they are useful. This presents a challenge for us as researchers, even though the outcomes are enabling us to articulate wearables that go beyond thought experiments and provocations, to conceptualise future possibilities that are feasible, and include pathways for development. Research to date suggests that our approach will take wearables beyond current constraints [12]. Yet, the challenge remains to understand how best to frame our intermediate outcomes to the listening of the different fields we engage with: to coherently and productively share epistemological reflections, as well as design research processes and outcomes. This position statement reflects on what we bring to the consideration of intermediate knowledge generation in the context of physically and aesthetically engaging wearables; and lays out how we might productively contribute to the workshop.

## Background

As a field, wearables seems chained to and constrained by the digital possible, and caught in a cultural/engineering dichotomy. On one side we see a wealth of experimental projects exploring the cultural, aesthetic and poetic potential of wearables while remaining, for the most part, outside of the market – ensconced in museums, galleries and design spaces, operating largely as thought provocations (eg:[8,9]). On the other side are increasingly sophisticated technical offerings made by engineering-driven technology companies brought to market with minimal consideration of cultural meaning, social impacts or design aesthetics (eg.[4]). The failure of commercially available wearables to reflect and respond to broad ecological concerns stems from the fact that their design – with the accompanying technical issues and broader cultural/aesthetic questions – is largely led by engineers and technical experts whose development schedules and ability to deal eloquently with cultural matters may be radically out of sync with public opinion [10]. This situation is highly problematic, yet presents a rich space for design to intervene, and propose methodological shifts. Our approach results in intermediate outcomes for a new generation of wearables that will be free from the above constraints.

## Approach

Our research investigates how to craft materiality, research and public participation, at the interstices of fashion and textiles, participatory innovation and materials science. We develop conceptually rich design artefacts that engage participants in roles that design might play in bridging public desire and scientific innovation in the context of wearable technologies. To this end, we employ modified versions of Design Probes [3], In the Wild prototyping [6], and thinking-through-making [2] in an approach that enables us to foreground embodied participation and elicit designerly ways of knowing from participants who may or may not be trained in design (for more see [12,13]). This approach is supported by an underlying craft-based structure, and four craft-based perspectives – an *approach, expression, dialogue* and language – that we systematically cycle through to inform our thinking as the research moves forward:

- (i) An *approach* for working through research ideas and engaging with the full potential of materials we intend to use.
- (ii) An *expression* to materialise form and make tangible our research ideas for public testing, unconstrained by current technological capabilities.
- (iii) A *dialogue* with public participants enabled by emerging prototypes in a range of resolutions, further augmented by responsive crafting of additions and modifications in situ.
- (iv) A *language* to understand our emerging research structure and expand our vision for how it might evolve.

These conceptual lenses expand the research potential. They are leading us to greater insights and enabling us to better position ourselves to leverage the potential of material innovation, while delivering empathetic and responsive frames for engagement with participants. The resulting intermediate outcomes are rich and inspiring.

## Crafting research

Crafting research enables the creation of a continual feedback mechanism in a structure that is open, flexible and responsive, and leads to potent outcomes [5]. By treating craft as a research *process* it simultaneously serves as a means to explore, and to develop ideas into tangible *products*. In PKI, for example [12], we use textiles – with its richness in language and conceptual ways of thinking – to provide a coherent framework through which we can elicit responses to emerging prototypes, and arrive at intermediate outcomes. Research interventions are posited as a metaphorical loom. Experimental prototypes serve as the warp (the structural threads in the loom), and participant engagement serves as the weft (the varied threads of concern threaded through the warp to create cloth). As our intervention unfolds, we dynamically reposition our prototype-warp, respond to and guide participant engagement (the weft), and weave metaphorical research cloths. These metaphorical cloths serve as a reflective craft-based framework for the research, and may later be metaphorically *draped, folded or laid out* in ways that privilege different perspectives, to inform our thinking as the research moves forward. This approach supports alternative ways of working that are open and flexible in structure, yet robust enough to be trusted to lead to useful outcomes. The confidence this robustness engenders supports risk taking in the researchers, as well as, we believe, in the participants. Early indications suggest that the resulting *cloths* enable an expanded vision of how to move forward [12].

## Reflections

As researchers working with generative processes at the cusp of a number of disciplines, articulating new approaches is often beneficial. Yet validating new formulations within a coherent, disciplinary discourse remains challenging. Our approach thus far has yielded promising results. Yet the value of validation within the broader context of interaction research is undeniable. We hope to engage productively in the formulations of how such validation may be achieved.

We employ craft-based knowledge to scaffold open, responsive research structures that productively engage an un-profiled public, as well as scientists, engineers, designers and manufacturers, in a reconceptualization of future wearables. Our first objective is to gain intermediate outcomes that will lead to insights into how to: conceive and develop wearables that leverage the latest scientific and manufacturing advances, and ensure that the public, and other stakeholders, are integral links in the ideation process. Craft provides an openness of enquiry that permits using materials and tools to think with. It results in a continual feedback mechanism within the research structure that is open, flexible and responsive, leaving room for meaning-making – for participants, as well as researchers. These methods for generating intermediate outcomes have so far proven useful for designers and scientists working at the forefront of new materials and methods. They enable us to remain in a state of unknowing for as long as possible; they bridge scientific innovation with public concerns and desires; and afford unexpected outcomes. Relying on the public to provide intermediate outcomes frees experts from relying on tested methods that may not be appropriate to yet-to-be-concretised characteristics of the systems being developed and designed. Using digital technologies, for example, to prototype future wearables, might limit interactions and thinking to the *digital possible*. In contrast developing emergent prototypes and frameworks for thinking both acknowledges the challenge of giving form to things that are yet to be imagined, and opens up possibilities.

Our multi-faceted, multi-layered approach has so far resulted in rich intermediate outcomes of interest to scientists, manufacturers, designers and the individuals concerned with future wearables. The intermediate outcomes are expanding the research potential and, we believe, supporting innovation. The challenge remains to articulate a broader framework of interaction design that supports a discussion of the value of these intermediate outcomes.

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