Body As Starting Point 4: Inbodied Interaction Design for Health Ownership.

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ABSTRACT

This Fourth Body as a Starting Point workshop investigates how to design interactive health technologies that assist users in developing insourcing abilities and then assist users in letting go of the same technology—in other words, supporting a transition from health technology dependence to independence. By making explicit two inbodied design continua of (1) ownership, from "outsourcing" to "insourcing" and (2) engagement period, from "single", to" cycle", to "permanent", to prototype and reflect on interactive technology that takes the body as a starting point.

CCS CONCEPTS

• **Human-Centered Computing - Human Computer Interaction (HCI)**;

KEYWORDS

Inbodied Interaction, Wellbeing, Human Performance, Motor Learning

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1 INTRODUCTION

What is an interactive health technology supposed to do? Does it maintain ownership of the process, and manage all aspects of a health practice for a user, for all time, or does it over time build skills/ownership? In a similar vein, how long is the engagement with the technology supposed to last? Is it a single bolus, a series of cycles, perpetual? These questions about *ownership* and *engagement period* are often left ambiguous in interactive health tech design. In this Fourth Body as a Starting Point Workshop, we propose to make these attributes explicit; that by doing so, we can then use those properties with intent in our designs, and that use will open up the interactive health tech design space with more options to better support more people. To facilitate this exploration, the Workshop invites participants to contribute working papers and prototypes that incorporate explicit consideration of these two continua of Ownership and Engagement Period in the context of Inbodied Interaction. The goal of the workshop is that through these shared explorations, we will have evidence for the broader community of how and where these continua can add value for health tech design.

2 CONTEXT AND MOTIVATION

The This workshop is the fourth in the Body as a Starting Point series. The series approaches interactive Health Tech design from an Inbodied Interaction perspective, with the goal of deepening that approach. Inbodied Interaction focuses on aligning how we function physiologically in order to inform design that supports human health, wellbeing, performance, quality of life - what we elsewhere have called "wellth" [9]. It brings together both the Inbodied Process - our internal physiological states and processes - with what it frames as the Circumbodied - those physical, environmental processes that affect each of our Inbodied processes.

Over the past three workshops, several key themes have emerged to underpin this approach [21]. One of these is the interactions between what we call Inbodied Continua that focus on our engagement with the volitional ways we can interact with our internal operation from its physiology to neurology. These are the "inbodied5" (Move Eat Engage Cogitate Sleep) [16] and the "cicumbodied4" (Air, Light, Microbiome, Gravity) [14, 17] . For example, a continua in Movement is between stillness and action; in Eating, between fasted and sated; or in Engaging, between aloneness and being with others. We talk about wellth as a process of "tuning" [18] these continua: how much we eat and when, relates to continual interactions with the other in5; and is supported by interaction with the C4. With each of these continua and their interactions, there are therefore also associated knowledge, skills and practice that support *how* to tune any parameter relative to current context and desired state.

Arguably, one of the most powerful processes of human physiology is to maintain homeostasis across health challenging contexts [10]. Our bodies exhibit strong, clear signals when this homeostatic balance becomes disrupted, but those responses can be far more subtle – potentially imperceptible – without building self-knowledge around these nuanced signal changes. Therefore, Inbodied Interaction proposes designs that support our innate ability to feel through bodily interoception [6, 8] and help us learn to respond appropriately to attain wellbeing and perform as we desire.

A fundamental approach in Inbodied Interaction has been that health designs should help users develop inbodied literacy by supporting informed decision making. These decisions may optimally

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be based on self-knowledge about personal performance, rather than only or predominantly encouraging prescriptive uptake of generic "healthy" habits or behaviors. Walking 10,000 steps may be a useful habit, but it often builds a reliance on external devices or rote habit, rather than usable awareness and knowledge of internal state. That missing internal awareness might help a person understand if they have moved sufficiently for wellbeing; knowledge may provide options when weather prohibits the habituated walking. Inbodied Interaction fundamentally focuses on building both knowledge of the body as a whole and its surrounding context, and the skills and practice necessary to build health, wellbeing, and performance awareness.

Our aspiration in the Inbodied Interaction community is to design tools that support tuning. The previous three workshops [5, 19, 21] and ACM SIGCHI Inbodied Interaction summer school [25] have focused on developing expertise in the in5 and C4 attributes. Last year's workshop leveraged associated themes such as designing for the whole body, adaptation as a constant, context as a dependent variable for tuning [21]. Select papers submitted to that workshop are part of a forthcoming special issue in *Interacting with Computers*. For this workshop, **selected papers will be invited for full submission to a special issue of *Frontiers in Computer Science*.**

3 OPENING THE DESIGN SPACE: INSOURCING TO OUTSOURCING; SINGLE TO CYCLES TO PERMANENT

In this fourth workshop, rather than foregrounding only how to design to support the physiological continua of the in5/c4, we propose to more deliberately consider the two meta-continua proposed above for ownership and temporality, in terms of making explicit the relationship of the tool with the person, and the time of use of the tool with the person to support inbodied interaction knowledge skills and practice.

META-CONTINUA for Inbodied Interaction Design - Explicit thinking about the Imagined Engagement with the Tool.

To help participants think through their contributions for the workshop, we will offer some example cases below, but first, we detail a little more about the core terms and focus for the workshop.

First, by Meta-Continua, we frame insourcing and cycles for example as Meta, because they are about the assumptions in or the aspirations for the design itself rather than what the specific intervention is about. With these continua, we are asking ourselves to make these always implicit parameters explicit both for our design questions, and our evaluations of those designs. In the ownership meta-continua, we are asking multiple questions around knowledge, skills and practice ownership. In the engagement period continua we are asking about the length of the engagement for effect. Let's unpack these terms a little further.

3.1 Ownership Continua - Insourcing — Outsourcing.

Outsourcing as a term is familiar in work contexts, where we *outsource* some requirement outside ourselves to a third party. Most of us outsource vegetable gathering to grocery stores, who themselves work with outsourced produce production. We may also outsource meals to restaurants and delivery services.

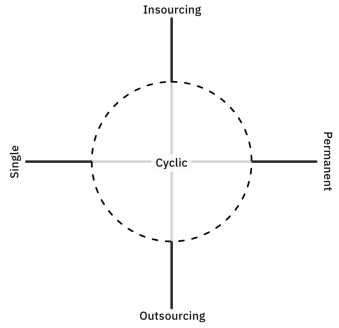

Figure 1: The intersection of the "ownership continua, insourcing to outsourcing" with the "engagement duration continua, single, cyclic, permanent", which offers a design space to further develop inbodied practices that support the design of technology

In many health trackers and associated apps, the default design seems to be outsourcing. We outsource our fitness plans to a third party, to tell us what to do when, whether this is to walk 10k steps a day, or spin on a stationary bike for 30minutes with a remote instructor and fellow sufferers. Within HCI research, many designs in health also regularly gravitate to outsourcing (Hong's stuff for example?? REF - Sean's the workout plans)

Recently, we proposed the term "insourcing" [20] - where the interaction focuses on fostering an internal awareness and the associated knowledge, skills and practice, to cultivate a self-sustainable health practice. In other words, to design a technology that builds a person's self-sufficiency and ability to eventually leave the technology behind.

3.2 Engagement Period - Single – Cycle – Permanent

A related meta-continua is Engagement. The goal here is to use the continua to make explicit where we are situating the intervention. It seems for many tools, that quality is not really considered: how long does one attend a virtual yoga class? Wear a health watch? With an early wearable step counter, use lasted until it went through the wash, having been forgotten in a pocket. In many physical contexts, there are cycles in training and skills development, including periods of recovery/change. There are also interventions that may be single use, like a pregnancy test or getting a cast. Our goal in this workshop is to see how designs may sharpen efficacy by considering duration and frequency of engagement, explicitly.

3.3 Value Judgement

There may be a tendency towards value judgements in these continua. For example, there may be an inclination to suggestion Insourcing is Good or Better than outsourcing - but as one of last year's workshop themes stressed, there is very little that is either Good or Bad related to the inbodied/circumbodied; efficacy is in finding the optimal balance or ratios among these ranges. This

unwinding from value judgements is another motivation for framing these dimensions or parameters as continua, rather than as dichotomies, or oppositional forces. Similarly, the thesis this workshop seeks to test is that: by making these continua explicit, we can better situate our designs to evaluate both our intentions for their effects and whether or not they have achieved those outcomes.

Given the dominant paradigm currently leans towards OUTSOURCING, in this workshop we would like to encourage contributions that explore INSOURCING in particular, that use the in5/c4, and that have some sense of an explicit Exit Strategy (e.g., to design in a state for Phase Complete or Cycle complete). Again, this is not to say these are optimal continua, but that we wish to push on these as design challenges, as exploratory constraints.

3.4 Related Theory: Motor Learning

There may be a significant opportunity for Inbodied Interaction Designs to draw on principles of motor learning for insourcing how Movement affects wellbeing. For example, designs to build proprioceptive awareness or skills (i.e., becoming aware of self-movement and body position in space), is a foundation of motor learning for performance. There are well-developed theories of engagement period in motor learning of explicit performance skills. For example *when* to offer what type of feedback, such as visual, auditory, haptic or multimodal augmentation [11] [26], *where* to focus attention - internally or externally [24]and in what context . Motor Learning also offers guides for framing what kinds of information to provide as part of an insourcing process and when in a cycle to provide it, such as, knowledge-of-results (KR), knowledge-of-performance (KP) [23]. Whether or not skills work is singular or stacked is also part of motor learning consideration as per random to blocked [7]. An opportunity for a contribution would be to draw on motor learning strategies to underpin the INSOURCING of a MOVEMENT INSOURCING progression that could be realized across a set of phases, and where completion/success of that insourcing could be self-assessed. Such approaches also may also open the door to new kinds of evaluation, like development and sustainability of neural plasticity in practice [1, 11, 17, 23].

4 MOTIVATING SCENARIOS FOR CONTRIBUTIONS

We invite workshop participants to consider 2 types of contribution. The first option is to propose, pilot, or prototype either a novel design featuring an in5 or C4 attribute or combination (stack) that leverages the INSOURCING end of the ownership continua and the CYCLE part of the engagement period continua. A second approach is to re-imagine how an existing tool or concept might be re-contextualised again within an INSOURCING/CYCLE framing. We offer a few examples, below:

Example ONE: Re-imagining EATING SUPPORT - How do we use the principles of ownership and engagement period in designing interactive technology that helps us better understand how we eat now, relative to how we feel, and where food may help us feel and perform better, rather than only keeping track of our energy consumption? Examples of guiding questions could include: what knowledge is associated with healthy eating, and how can that knowledge be contextualized and conveyed, when? How do we feel when we have *this* amount of food vs. *that* amount of food? What feedback types, timing, and persistence would be helpful to build better awareness and understanding about links between what we eat and how we feel, and for how long? All these questions could bring new insights into designing inbodied interaction with an emphasis on constructing better self knowledge [18]. In terms of cycles, a key query would be: what is the goal state that would enable an exit strategy? While building awareness, what skills do we build, in what phases? How long are these phases? When do we no longer require the tool's support?

EXAMPLE 2: HOW MOVE FROM TRACKING IT TO FEELING IT? An ameteur runner trains 5-6 days a week by running on trails in the local community. With current technology, during every run, the runner faithfully tracks distance, heart rate and pace. Several wearables (eg Garmin's ForeRunner series) and apps (Training Peaks) feature telling the runner how much recovery they need, or when they may be overreaching in their workouts. An INSOURCING & CYCLE target may be to help the athlete more explicitly correlate what they feel with these notifications from the algorithm. But what is the combination of data and qualitative responses that helps to build resilient awareness of state? In terms of an Engagement Period, might there be both a Success phase that builds a level of insourced, independence from the tools awarenes, and perhaps an Interrogation/watching phase, that steps in from time to time when at perception of under or over doing recovery or action? What inbodied knowledge would a designer draw on to help support such designs? How confirm that the approach builds interoception? BONUS: C4-STACK. In running outdoors in natural light, integrating light, elevation (muscular effort changes due to gravity), air quality and (urban) enviroment viz potentially microbiomic diversity may also play a role in the efficacy of insourcing approaches, and attentional foci in a cycle.

EXAMPLE 3: Insourcing SOCIAL INTERACTION skills. Inbodied interaction frames ENGAGEMENT with each other as one of the in5 for which we are physiologically wired. In the time of COVID in person interaction is challenging and precious - we are negotiating new obstacles, on top of coping with personal challenges of interoversion or extravesion as gross-level markers. We may have a highly tuned sense of what social situations make us uncomfortable, but have far less experience or opportunity to (1) understand these responses (2) have skills to address them so that we can thrive in social encounters. How do we design tools to INSOURCE what skills? How create phases of practice to build those skills? What is success? BONUS : in5+C4 STACK - Is insourcing of skills enhanced by cylces of walking with another, or having a coffee outdoors, in daylight?

5 WORKSHOP OVERVIEW

Overview The workshop has been designed from the outset to facilitate online engagement for constructive collaborative sharing of ideas and work sessions to advance state of the art understanding. We will be taking full advantage of Zoom's capabilities to have both plenary and breakout group sessions. We are also ensuring that we have significant breaks – with suggested activities for refreshing – to respect multiple timezones and qualities of sustained attention when online. Towards these qualities we

will be engaging in preliminary work as well as work on the day, described below. We have piloted these strategies throughout fall 2020 in various 90minute morning/90 minute afternoon seminars using this online approach to insure workability.

5.1 Pre-Workshop Plan

We will leverage the Inbodied Interaction community built over the last three years. Our organizing team is distributed across four continents; as such, we can reach out to local universities, SIGs, and various SIGCHI conferences. We have co-developed this proposal with that community. We have also been doing pre-work meetings with design and engineering graduate communities to help build up new members for our workshop engagement. Demand is high: the previous workshops and summer school resulted in waiting lists, which highlight not only interest in the approach but also a people who are keen to engage in this workshop, and grow the community. All accepted position papers will be posted on our website prior to the workshop.

5.2 Workshop Structure

The workshop will be a one-day event totaling 3 hours, divided in three 50-minute blocks with 15 minutes in between blocks rest; each block will consist of 15 minutes theory, 10 minutes guided exercises and 25 minutes discussion and ideation.

5.2.1 Block One, 10-10:50 - Situating the inbodied continua in relation to participants' work. Attendees will be pre-organised in groups of four, based on the focus of their contributions for the workshop. They work towards presenting a point of view on the inbodied continua that will be explored in this workshop; this exercise will also serve to introduce the participants to each other. It will be followed by 10 minutes of inbodied activities guided by our certified movement, neurology and nutrition workshop member relating to the continua and conclude with open discussion and ideation. For example – the rhythm and sync exercise – where we have a guided movement and listening break where participants can test out how "remote syncing together" feels when then listening to presentations and when collaborating together.

15 minute break

5.2.2 Block Two, 11:05 – 11:55: Exploring the intersection between "ownership continua, insourcing to outsourcing" with the "engagement duration continua, single, cyclic, permanent" as a design space. In the first 25 minutes in teams, participants will discuss and draw how they imagine health sensing technologies that consider the different quadrants of the continua intersection (Figure 1). We will particularly consider the transition from outsourcing to insourcing to design 'build and support' and 'exit strategies'. In the subsequent 15 minutes, teams will share their drawings and reflections. The session will conclude with 10 minutes of guided exercises, such as peripheral attention for checking fatigue and attention in order to explore attention quality during sessions.

15 minute break

5.2.3 Block Three, 12:10 – 13:00 - Knowledge gathering and summarisation towards a publication plan. In the first 15 minutes, we will co-summarise insights in a shared document with video and images from the day. This will be followed with a design thinking exercise towards deriving preliminary themes for inclusion in the upcoming publication. The last 10 minutes of the session will focus on outlining a publication plan and ensuring everyone has access to the tools.

Post-Workshop Plans - Underway

After the workshop, ***beyond the Special Issue for Frontiers in Computer Science***, we will release the workshop artefacts via our website and social media, sharing short videos taken during the workshop, overviews and brief video reflections in a similar format to that of a podcast interview with participants. The collaboration between attendees will continue and focus on fulfilling the publication plan to advance the insights from the workshop and make a lasting contribution to our broader community.

Call for Participation

Inbodied Interaction focuses on devising interactive design approaches that recognize the body's internal operation as physiological and neurological systems, in order to make tools more effective at supporting human performance and wellbeing. For this 4th Inbodied Interaction workshop at CHI 2021, we invite participants to express their interest by submitting either: a position paper, pictorial, or poster in relation to the Inbodied Interaction continua presented in this proposal and on our website wellthlab.ac.uk/inbodied4

The main goals of this workshop are to:

1. introduce participants to the design continua (ownership and engagement period) as a UX paradigm where we design to build insourcing abilities and support users in eventually letting go of technology.
2. explore the potential design space that the continua offer to prototype technology focused on workshop participants' research topics and further our community's understanding of applying inbodied thinking to timely use cases.
3. have fun while advancing inbodied knowledge towards a publication outcome and continued momentum for this important HCI research topic.

Inbodied interaction is an emerging area in HCI that offers participants the opportunity to break new ground, with the support of a growing community of HCI and adjacent domain experts, to design interactive interventions that take the body as a starting point to facilitate human performance aspirations.

To upload your contribution, go to: wellthlab.ac.uk/inbodied4

Thank you, from: m.c., Josh, Abby, Scott, Kai, Liz, Mike, Steeven, Aaron.

Organizers – a cast of thousands

m.c. schraefel - m.c. is a professor of computer science and human performance, and leads the WellthLab at the University of Southampton. The lab focuses on human-systems interaction with the mission to "#makeNormalBetter @scale 4all"[15]. m.c. is also an NSCA certified strength and conditioning coach, nutritionist and functional neurology coach.

Josh Andres has co-led various Inbodied Interaction workshops and the Summer School. Josh's work at IBM Research Australia investigates intelligent like systems as human partners to support human potential[3, 4] .

Aaron Tabor is a PhD student in the HCI Lab at the University of New Brunswick and works to apply the Inbodied Interaction approach to our breath, exploring how it can be used as a tool to

support health, wellness, and performance goals. He has been a co-organizer of Inbodied Interaction workshops and Summer Schools to date, and plays an active role in exploring how physiology can inform HCI design and research practices.

Kai Kunze. Kai works as a Professor at the Graduate School of Media Design, Keio University, Yokohama, Japan. He is a pioneer researcher in the emerging Eyewear Computing field [2]. His current research includes augmenting humans, quantifying cognitive states and amplifying human senses [22] He is a founding member of the Superhuman Sports Academy Society, Japan [12]

Abby Wanyu Liu is a CNRS (The French National Centre for Scientific Research) research scientist at IRCAM Paris. Her main interests include computational, music and movement sonification interactive systems.

Michael Jones is an Associate Professor of Computer Science at Brigham Young University in Provo, Utah. He and his students investigate HCI in the outdoors and sensor-based systems for training in sports.

Steeven Villa Salazar is a PhD researcher at the Human-Centered Ubiquitous Media lab of LMU Munich. His current research involves Self-Awareness and Sensory/Motor augmentation. He has been working in a closed-loop control approach to support individuals to achieve long-term goals using the Inbodied framework.

Elizabeth Murnane is an Assistant Professor of Engineering at Dartmouth College. She specializes in the human-centered design of interactive technologies for biopsychosocial assessment, informatics, and intervention, with a focus on exploring creative new strategies to study and shape well-being.

Scott Bateman is an Associate Professor in Computer Science and directs the Human-Computer Interaction Lab, at the University of New Brunswick, in Fredericton, Canada. Scott's research focuses on enabling people to work and play together in new ways, so that we can learn from each other and lead healthier, happier lives. His group's work has included research into mixed reality, game design, computer supported cooperative work, novel interactions, visualization, and serious games for learning and health.

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