

Towards Sustainable Tools for Technology-Mediated Collaboration in Artistic Practice and Research

Host institution STMS IRCAM-CNRS-Sorbonne Université (the ISMM Team, Sound Music Movement Interaction)

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Context, related work and positioning regarding the priority themes of PC5

Digital technologies contribute to the global environmental footprint through manufacturing and mineral extraction and through use and maintenance of digital infrastructures. The more our modern, digital society develops, the more we lose capacity to manage and absorb what is produced in excess, and as a result, the global north systematically relegates electronic waste to the global south [27]. At the same time, new digital technologies have been argued to function as levers to lower environmental impact, for example, by reducing greenhouse gas emissions as remote collaboration tools replace air and car travel, or by facilitating a sharing economy. However, these developments come with a rebound effect, where increased efficiency leads to increasing demand and, in turn, increasing environmental impact, a development that cannot be sustained in the long term [19, 26].

Today, digital technologies play an integral role in music and movement practice by facilitating and supporting artistic creation, expression and distribution [11, 28, 30]. Moreover, digital technologies play key roles in the collaborative aspects of learning, playing and listening. Musical expression is so tightly linked with the development of music technology that we see music genres shaped by interface presets and constraints in music software and hardware [25]. As a result of this dynamic, communities of practice are evolving around technologies as they find ways of hacking the systems to go beyond the imposed constraints [20]. Computing and music technologies are for many artists inevitable tools in their practice, and open up new avenues for collaborative artistic creation [4, 16]. Digital technologies impact users in their ways of reasoning [14, 24], moving and being in the world [12, 13]. The profound entanglements between digital technologies, humans and their surroundings, often in dialectical processes in which artists' practice is shaped by the technologies they use and the technologies are shaped by practice, has prompted the interest of researchers who are investigating the challenges of designing technologies that effectively foreground, transmit and safeguard embodied, artistic knowledge [20, 30]. Hence, the rapid development and adoption of digital technologies in movement-music practice raises important questions not only about the impact of technology-mediated artistic collaboration but also about the environmental implications of the tools and platforms that enable these collaborations.

Research at the intersection of computing and sustainability explores alternative ways of designing and developing computing and interactive systems that take environmental impact into account. In Human-Computer Interaction (HCI), the annual workshops LIMITS, initially a workshop at the ACM Conference on Human Factors in Computing Systems (CHI), focus on computing *within* planetary limits [21]. At the intersection of HCI and music technology, the International Conference on New Interfaces for Musical Expression (NIME), also initially a CHI workshop, address topics of researchers' responsibility towards climate action through an environmental committee with various outreach activities, and the conference is seeing an increasing number of publications on the topic of sustainable NIMES [17].

Approach/challenges/originality

Although the systems and infrastructures behind the digital technologies used in artistic practice contribute to environmental degradation and are ultimately unsustainable, they also enrich artistic expression, foster collaboration, and enhance our ways of living. We are deeply attached to our technologies, both as individuals and as societies, and immediate abandonment, in search of a more sustainable future, is likely to be brutal, undemocratic, and serve a series of repercussions across the long and complex value chains involved in the infrastructures behind digital technologies [6, 19]. But in the same way that not all humans are equally responsible for climate change, not all technologies are equally resource intensive. However, measuring the environmental impact of a specific technology is very complex, if not impossible [26]. Hence, despite not being able to measure the exact impact of our technologies, we are collectively attached to the infrastructures behind these and a *redirection* needs to take place if the earth is to remain liveable [19].

In contexts of artistic research and practice, some choose to abandon existing infrastructures and, for example, no longer use air travel and turn to solar-powered digital technology. Desertion in these cases is primarily enabled by already influential socio-cultural positions, such as being a renowned artist or established researcher, and therefore not an option for most people. This raises the question of who has access to what options for sustainable practices. Furthermore, desertion is not feasible on a large scale due to our aforementioned societal attachments to larger technical infrastructures and the consequences of mass abandonment, that we are currently unprepared to deal with.

This research proposal in Human–Computer Interaction (HCI) draws on existing work on practice-based artistic research [3] and sustainable HCI [10]. To address these challenges, I propose an approach building upon *ecological redirection* [6, 9, 19], and aim to articulate an actionable approach letting both researchers and artists *redirect* their practice. I aim to provide tools and methods for how to collectively think and practice sustainability in artistic research. I propose to do so through a situated approach of inheritance of already existing technologies [18] and renouncement through unmaking practices [5, 8, 22], and through reconfiguring our attachments to technologies in technology-mediated collaborations in music-movement practice.

The originality of this proposal lies in its integration of critical design practices and embodied knowledge with sustainability, specifically *ecological redirection* in collaborative artistic contexts. Artists are uniquely positioned to explore the limits that digital technologies place on their practice, and are often seen pushing the boundaries of what is possible or intended. They are often part of communities receptive to alternative practice. Working with a practice-based artistic approach with communities of artists and artist-researchers that shape their own systems and set their own limits and boundaries for collaboration, places us in a unique position of shaping the digital collaborative technologies of the future.

With the proposed approach, this research also addresses ethical and political complexities of technology-mediated collaboration on a larger, societal scale by considering the future of entire research institutions built upon digital technologies for the arts. The proposed project will take place at Ircam, an institution with a history of addressing these issues [25], and the host team’s research agenda for the coming years align with the subject of this proposal.

Scientific and technical objectives

The research is organised around three main objectives:

I. Understanding our attachments to technologies. I will investigate researchers’ and artists’ socio-material attachments to digital technologies through practice-led artistic research [3] on co-located, collective music-movement practice. This inscribes in previous research on artistic collaborations with artefact ecosystems made up of networked computers, sensors, digital musical instruments and acoustic instruments in interaction with dancers and musicians [1, 4].

The purpose of this activity is to gain an understanding of the importance of digital technologies in terms of artistic value, preservation of embodied knowledge, and environmental impact. Hence, I will collect data on practitioners’ experience of their creative collaborations and strategic workarounds to appropriate technologies to their needs. To do so, I will conduct interviews with practitioners using the ‘explicitation’ technique [29], more commonly known as microphenomenology in HCI [15, 23].

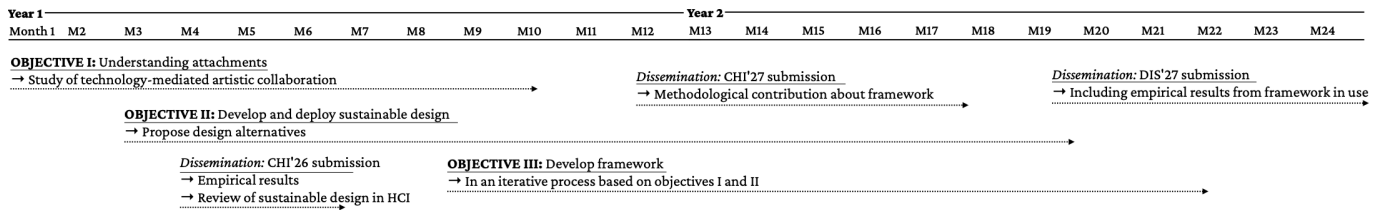
II. Sustainable design for collaborative artistic practice. I will develop and deploy sustainable design alternatives to existing digital technologies through research through design [31] in triangulation with theory and study of on-going artistic practice. I aim for design alternatives whose deployment and maintenance allows for artistic practice to continue indefinitely with low resource consumption [2], all the while preserving the artists’ embodied knowledge and continued facilitation of novel artistic expression through technology-mediated collaboration.

III. Articulating strategies for sustainable technology-mediated collaboration. Based on the previous two steps, I will articulate an actionable framework with strategies for technology-mediated, sustainable, artistic collaboration through *unmaking* attachments to technologies that cannot be sustained in the long-term in a post-carbon society, and *redirecting* to alternative attachments.

The proposed project will produce the following outcomes: (1) A critical review of approaches to sustainable computing in HCI and their critical stance in the Anthropocene. (2) A contribution to our understanding of the environmental costs associated with digitalisation through the lens of artistic practice, extending to HCI by large by addressing skill rebound [7] and embodied knowledge in technology-mediated collaboration, i.e., the environmental impact of digitisation as a result of deskilling. (3) Finally, with concrete concepts from *ecological redirection* and actionable strategies for designing sustainable, low-impact digital tools for collaborative artistic practice, I aim to contribute to a critical discourse on theories and methods related to sustainability and unmaking practices in the design subcommunity of HCI, to which I belong.

Together, these outcomes will be synthesised into publications at premier HCI research venues ACM CHI and DIS, and my work will be more broadly disseminated through workshops, artistic performances and design exemplars.

Project organisation, duration, milestones



Partnership: presentation and role of co-advisors

Andrew McPherson Professor of Design Engineering and Music at Imperial College London

The proposed project has shared interests with McPherson's ongoing ERC Consolidator Grant (funded by UKRI), 'RUDIMENTS: Reflective Understanding of Digital Instruments as Musical Entanglements'. McPherson will act as a collaborator for the design work associated with objective II.

Nathan Ben Kemoun Research Fellow in Management Science at Clermont School of Business

Alexandre Monnin Scientific Director of Origenes Media Lab

Ben Kemoun and Monnin teach and do research on ecological redirection and surrounding concepts and will take roles of advisors on these topics.

Makis Solomos Professor of Musicology at Université Paris 8

Solomos leads the research team C.et.i / Musidanse, which for several years has carried out research at the intersection of music, sound and ecology. This project inscribes in a lineage of collaborations between C.et.i and the host institution, the ISMM team specifically. Solomos will act as a contributor in the continuation of these efforts.

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