Envisioning Physical Collaboration at a Distance: Design Fiction for Hybrid Prototyping

Nathalie S. Borgognon
RISIS, University of Geneva
Geneva, Switzerland
nathalie.borgognon@unige.ch

Laurent Moccozet
RISIS, University of Geneva
Geneva, Switzerland
laurent.moccozet@unige.ch

Gaelle Molinari
TECFA, University of Geneva
Geneva, Switzerland
gaelle.molinari@unige.ch

Sophie Varone
TECFA, University of Geneva
Geneva, Switzerland
sophie.varone@unige.ch

Abstract

This workshop invites participants to explore the futures of distributed collaboration in hybrid manufacturing environments through the lens of Design Fiction. Drawing on scenarios inspired by real-life observations in university FabLabs, participants will co-create narrative prototypes in the form of quick-start guides. The workshop interweaves human and technological, tangible and digital dimensions within a postdigital perspective, aligning with the paradigm of ubiquitous learning. It seeks to interrogate the conditions that enable phygital continuity between physical co-presence and remote participation. Aimed at an interdisciplinary community, the workshop invites critical engagement with emerging uses of ubiquitous computing and wearable technologies in collaborative practices.

CCS Concepts

• **Human-centered computing** → **Ubiquitous and mobile computing**; **Interaction devices**; **HCI design and evaluation methods**; • **Applied computing** → **Collaborative learning**.

Keywords

Ubiquitous learning, Design fiction, Participatory design, FabLabs, Hyper-hybridity, Distributed collaboration, Hybrid prototyping, Phygital, Postdigital design

1 Introduction

Today, collaborative practices in FabLabs face growing challenges related to geographical dispersion, the hybridization of tools, and the need to ensure continuity between physical presence and remote collaboration. In this context, the concept of the postdigital does not refer to a period following the digital era, but rather to a critical stance toward its dominant norms—emphasizing Do-It-Yourself (DIY) approaches, autonomy, and resistance to standardization [6]. This perspective enables us to conceive collaboration as a distributed co-presence, shaped by the interplay between humans and technologies, across both material and immaterial, synchronous and asynchronous modalities.

FabLabs, as hyper-hybrid pedagogical spaces, are fully aligned with this postdigital perspective. Far from being mere technical workshops, they operate as ecosystems where tangible objects, digital platforms, situated learning, and collective dynamics intersect [12]. This hyper-hybridity, as described by Nørgård and Hilli [13], gives rise to complex forms of interaction at the intersection of the social, spatial, material, and digital. In this context, the metaphor of the ecotone—borrowed from ecology—offers a particularly insightful framework for understanding these transitional zones. It sheds light on their potential for confrontation, adaptation, and mutual transformation, highlighting that it is often within these in-between spaces that the most significant developments occur [17].

From this perspective, distributed collaboration — whether synchronous or asynchronous—emerges as a central field of exploration. It takes shape in configurations where participants, whether physically co-present or remote, must coordinate, share resources, and maintain continuity of action. To support this continuity, a spectrum of ubiquitous technologies — such as tangible interfaces, mixed reality, wearable sensors, and the Internet of Things — can be combined with low-tech tools like paper or smartphones, following a logic of postdigital complementarity [1].

In line with this, the concept of ubiquitous learning (u-learning) refers to an educational paradigm designed to support hybrid, contextualized, and distributed learning experiences that are accessible anytime, anywhere, and in any way [6]. This perspective, which integrates ambient digital technologies with situated learning dynamics, finds a practical application in the work of Zhang [21], who explores how the interplay between physical and digital environments fosters distributed, context-sensitive forms of learning—an

approach particularly relevant for understanding FabLabs as phygital ecosystems.

This workshop aligns with this trajectory by employing Design Fiction as a speculative and critical methodology. This approach enables the imagining of preferable futures rooted in situated practices, using fictional scenarios derived from real-world observations. The fabrication of tangible fictions and the co-construction of shared narratives have the potential to foster a more inclusive and integrated appropriation of both design practices and their uses by participants from diverse disciplinary backgrounds [3, 7]. Through the creation of diegetic prototypes in the form of quick-start guides, participants will be invited to materialize these hybrid futures. This process of fictionalization aims to stimulate reflection on possible forms of distributed co-presence within postdigital collaborative fabrication environments, while simultaneously rethinking current practices [2, 4].

2 Workshop Goals & Outcomes

The primary goal of the workshop is to foster critical reflection on technological solutions for distributed collaboration, particularly within the context of ubiquitous computing and wearable technologies—understood here as collaboration focused on the co-creation of shared and materially embodied artifacts [16]. By employing Design Fiction as a research-through-design approach, participants will co-create conceptual tools—based on speculative scenarios—in the form of quick-start guides for future devices they collaboratively envision. These artifacts aim to materialize visions of postdigital collaborative environments that integrate human and technical dimensions in a complementary way—bringing together tangible technologies, mixed reality, wearable sensors, and low-tech solutions—to support phygital continuity in distributed manufacturing practices.

The main objectives of the workshop are to:

- **Collectively exploring the post-digital futures of collaborative making**, examining how the co-creation of materially embodied artefacts and the practices that develop in relation to them can be supported through a sustained continuity between physical presence and remote participation within hybrid environments.
- **Co-design conceptual tools that embody situated forms of distributed co-presence**, drawing on Design Fiction imaginaries and scenarios inspired by real co-presence experiences, fictionally reframed to include remote participants.
- **Integrate human and technological dimensions through ubiquitous and portable devices**, in order to critically examine their roles in shaping preferable futures for phygital collaboration.

The primary output of the workshop will be a diegetic prototype in the form of a quick-start guide, developed using the Design Fiction approach as outlined by Dunne and Raby [7] and Bleecker [3]. This guide is intended to materialize a phygital future in which physical and digital spaces converge, and to serve as a boundary object that fosters critical reflection on hybrid futures.

More than just a narrative and functional artifact, this prototype is meant to be actively co-created by participants as a means of enacting future scenarios presented in the form of comic strips.

These scenarios will be prepared in advance of the workshop, based on video excerpts collected through field observations of activities involving the simultaneous use of physical and digital tools. The goal is to transpose these real-world observations into speculative, remote hybrid collaborative contexts.

Inspired by the concept of cultural probes, as introduced by Gaver et al. [8] and further developed by Sanders and Stappers [18] and Nova et al. [14], this quick-start guide also serves as a tool for both research and creative inquiry. It invites participants to explore and critically engage with practices and usages within hyper-hybrid environments, while reflecting on the social, cultural, and ethical implications of a phygital future.

2.1 Pre-workshop

Participants will be invited to complete a short form to share their expectations, prior experiences with hybrid collaboration, and motivations. An optional brief online meeting will introduce the workshop organizers, provide space for questions, and present an immersive pre-session activity. Participants will watch a video illustrating a scenario of remote engagement in a co-present workshop setting, followed by the completion of a probe card inspired by the Cultural Probes method to express emotions, perceived obstacles, and ideas for improvement. This activity is designed to foster a shared awareness of the challenges associated with distributed co-presence, which will inform the discussions during the workshop.

2.2 Workshop Schedule

Time	Activities
8:30 – 9:00 AM	Welcome, setup, and guided tour of the academic FabLab (overview of available spaces and tools)
9:00 – 9:30 AM	Introduction and context (workshop objectives, Design Fiction approach, and sources of inspiration)
9:30 – 10:15 AM	Presentation of pre-developed scenarios
10:15 – 10:30 AM	Break
10:30 – 11:30 AM	Group brainstorming – Extrapolation of weak signals
11:30 – 12:30 PM	Prototyping planning (definition of visual and narrative codes)
12:30 – 1:30 PM	Lunch break
1:30 – 3:00 PM	Co-creation workshops – Narrative prototype design (collaborative creation of the quick-start guide)
3:00 – 3:15 PM	Break
3:15 – 4:15 PM	Iterations and feedback (intermediate prototype testing and refinements)
4:15 – 5:00 PM	Final presentations and discussion (exhibition of prototypes and collective reflection on phygital collaborative futures)
5:00 – 5:15 PM	Wrap-up and future perspectives (summary of learnings and discussion of next steps)

Table 1: Preliminary workshop schedule

2.3 Post-workshop

Following the conference, we aim to continue the collaborative effort by drafting a concise article that synthesizes the outcomes and insights generated during the workshop. The goal is to share these contributions with the international community by exploring various publication avenues. We plan to submit the article to academic journals specializing in human-computer interaction, ubiquitous technologies, and design fiction, as well as to thematic collections linked to conferences such as UbiComp and ISWC. A first publication could be envisioned as early as February 2026, providing a platform to showcase and disseminate the collaborative innovation emerging from the workshop. All outputs from the workshop—including prototypes, documentation, and collective summaries—will be made available under a Creative Commons CC BY-NC-SA 4.0 license, allowing for sharing, adaptation, and reuse with proper attribution, non-commercial intent, and under the same license terms.

2.4 Participation Policy

The workshop will adopt an open format designed to foster broad participation from the community. Instead of requiring the submission of formal papers, this inclusive approach invites contributions from individuals of diverse backgrounds through the creation of physical prototypes that illustrate the use of a speculative phygital device situated within the realms of ubiquitous and wearable computing. This process will be supported by a lightweight evaluation based on an application form, in which prospective participants will be asked to describe their background, the role they intend to take on, and the personal contribution they envision for the day-long Design Fiction workshop.

2.5 Estimated Attendance

Participants will be divided into 3 to 5 groups of 5 to 6 people. Within each group, every participant will take on at least one of the following roles to ensure a truly multidisciplinary and collaborative approach:

- **Expert in ubiquitous and wearable technologies** – Ensures that the prototypes align with current and emerging technological trends.
- **Design and prototyping specialist** – Brings practical expertise in industrial or physical design to help materialize concepts using tangible tools.
- **Interdisciplinary innovator** – Coming from fields such as human-computer interaction or user experience, contributes diverse perspectives to enrich the evaluation process.
- **Community engagement advocate** – Assesses the social impact of the prototypes in remote collaboration contexts and supports the reinforcement of collaborative networks.
- **Communicator** – Responsible for real-time documentation and dissemination of the creative process.

This structure is designed to enable every participant to actively contribute by leveraging their expertise and generating new solution pathways throughout the Design Fiction workshop.

2.6 Venue

We propose to hold the workshop at the Aalto University FabLab, subject to availability, as it is a dedicated prototyping space located on the Aalto University campus. This venue provides access to a wide range of essential equipment and resources—including 3D printers, laser cutters, and soldering stations—supporting diverse fabrication and prototyping activities. Hosting the workshop in this environment will allow participants to concretely experiment with hybrid collaboration scenarios directly aligned with the themes addressed through Design Fiction. The layout of this academic FabLab, which closely resembles the one used in our video-based field observations, facilitates both the manipulation of tangible artifacts and their digital documentation. We will ensure that all logistical needs are met (including access, equipment, power outlets, etc.) and will provide a detailed itinerary, as the FabLab is located approximately 10 minutes on foot from the main conference venue.

2.7 Promotion

To attract a diverse range of participants, the call for participation will be disseminated through academic mailing lists, UbiComp/ISWC communication channels, and the professional networks of the organizers and partner institutions. Additional visibility will be ensured by leveraging our extended professional contacts. A dedicated website—or a section integrated into the main conference website—will serve as a central hub for key information and registration. This outreach strategy aims to gather a diverse and engaged group of participants, fostering meaningful exchanges and the development of relevant, impactful prototypes.

3 Organisers

Nathalie S. Borgognon is a Doctoral Assistant at the Centre Universitaire d'Informatique of the University of Geneva. With a dual background in software engineering and educational engineering, her current doctoral research focuses on phygital continuity and collaborative human-computer interactions for learning design and prototyping in hybrid or comodal environments. Her recent work investigates distributed co-presence in FabLabs and physical-digital interaction dynamics in collaborative creative activities [5].

Laurent Moccozet is a Senior Lecturer and Researcher at the Centre Universitaire d'Informatique at the University of Geneva. Part of his research focuses on the application of digital technologies to support teaching and learning activities, including personal learning environments [9] and the assessment of knowledge and skills [10, 15, 20]. He is also interested in FabLabs as places for innovation and experimentation in university learning. He is one of the founders of the FacLab [12], the academic FabLab, at the University of Geneva.

Gaëlle Molinari is an Associate Professor in Educational Technologies at the University of Geneva, where she leads the TEPEE group (Technologies for Positive lEarning Experiences) within the TECFA Lab. Her research is situated in the field of Computer-Supported Collaborative Learning (CSCL). She investigates how individuals collaborate to learn in remote or digitally mediated settings, with a particular emphasis on the role of emotions in these contexts [11].

Her work aims to enhance group dynamics and learning outcomes through the development and integration of emotion awareness tools.

Sophie Varone is a Doctoral Assistant in Educational Technologies at the University of Geneva, within the TECFA laboratory. With a background in philosophy and educational engineering, her research explores the value of combining narrative approaches and ethics in the design and development of digital technologies. Anchored in the field of environmental humanities, her recent work investigates how alternative paradigms of sustainability can inform reflection on the design and development of digital engineering [19]. She is particularly interested in futures thinking and systems thinking, and in their respective impacts on shaping more desirable futures.

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