From Papers to the Real World: Making Fabrication Research Matter

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Abstract

Digital fabrication research within HCI has generated powerful new techniques, tools, and systems, enabling lay users to create novel application devices. Yet many of these contributions remain confined to academic publications or lab prototypes. This workshop asks how fabrication research can make an impact beyond the paper. We will examine motivations for dissemination, strategies employed, and lessons learned from both successes and failures. Through two invited keynotes and interactive ideation activities, we will chart pathways by which fabrication research reaches the real world. The outcome will be a set of shared notes and insights, documenting practices that help researchers extend the reach of their work.

CCS Concepts

• **Human-centered computing → Human computer interaction (HCI)**; HCI theory, concepts and models.

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Digital Fabrication, Personal Fabrication, Research Dissemination, Maker Community

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1 Motivation

Digital fabrication has become a central thread of HCI research. Over the last two decades, researchers have developed novel design tools [16, 26], fabrication techniques [5, 11, 19, 24], materials [14], and machines [2, 10], that expand who can make and what can be made. This body of work has enriched academic discourse, inspired new systems, and created vibrant communities at venues like CHI and UIST. More recently, fabrication research has diversified into areas such as objects which compute without electronics [17, 32], composite materials [4], and sustainable materials [27, 28], reflecting the field's maturity and breadth.

Despite these advances, much of the impact of fabrication research remains within the academic sphere. Research prototypes often live only in papers or lab demonstrations, without a clear path to broader dissemination. At the same time, there are notable exceptions. Fab Labs, initiated by Gershenfeld's group at MIT, have scaled

from a handful of academic labs into a global network, embedding fabrication research into education and community practice [6, 7]. Kyub began as a research prototype for cardboard instruments [3] and has since grown into a commercial product[1]. Parametric and computational design tools and interactive fabrication workflows [18], have influenced education and maker communities[2]. Such examples demonstrate the potential of fabrication research to shape not only scholarship but also education, industry, and society.

Nevertheless, such transitions remain the exception rather than the rule. For most projects, dissemination typically stops when the research paper is published, and the field lacks a shared understanding of why. This raises important questions: what kind of impact do researchers aim to make outside of their research? What are the challenges and strategies in the pathways? Are there common practices that can be easily adapted and employed? Are there particular areas that fabrication researchers should try to connect to as a community?

Now, 20 years after Gershenfeld's book *Fab* suggested that personal fabrication might become widespread [7], technologies such as 3D printers and laser cutters have become widely accessible; at the same time, there is increasing pressure—both from within fabrication and without—to consider topics such as social impact and sustainability alongside novel techniques. CHI is the ideal venue to host a conversation about the impacts fabrication research can make, as it convenes the community of researchers who both advance fabrication technologies and care deeply about their societal impact.

This workshop will provide a space to map the diverse practices of dissemination in fabrication research. Rather than aiming for a single framework, it will collect experiences and insights from participants and invited speakers, documenting them as shared notes from ideation activities. These notes will serve as a resource for researchers who aspire to move their work from papers to the real world.

1.1 Significance and Goals

Fabrication researchers have long explored pathways to disseminate their work beyond academic papers. These include open-sourcing software and hardware projects [15, 20, 25], sharing toolkits online [33, 35], conducting workshops with designers and curators [21, 22], integrating research into teaching [9, 31, 34], engaging with local students or the general public [23, 30], involving makers in research [8, 12, 13], pursuing commercialization [3], and in some cases, driving societal initiatives such as the Fab Lab movement [7]. While such efforts clearly demonstrate impact beyond publications, there has been little collective reflection on their successes, challenges, and transferable lessons. This workshop seeks to fill that gap by bringing together researchers and practitioners to exchange practices, map dissemination strategies, and discuss how fabrication research can achieve meaningful impact.

At the same time, the wider research environment increasingly emphasizes impact beyond academia. For example, the UK's national research funding agency (UKRI) highlights projects that make societal and economic contributions, and requires applicants to identify beneficiaries and engagement plans [29]. Similarly, UK's Research Excellence Framework (REF) assesses UK university research based on its influence on economy, society, culture, and public policy [1]. Comparable expectations exist internationally, such as the National Science Foundation's Broader Impacts criterion in the US and the European Commission's Horizon Europe Impact Pathways. These developments place new emphasis on dissemination practices that are not only meaningful to researchers, but also legible and credible to funding bodies and stakeholders.

Against this backdrop, our workshop aims to create a collective map of dissemination strategies based on six pathways we identified in current practice. We invite participants to reflect on their own experiences within these pathways, or to propose additional ones. Position papers will serve as starting points for discussion, and activities will center on surfacing lessons, open questions, and strategies that can be shared across the community.

Pathway 1. Open-Sourcing and Replication. Many fabrication researchers have released their projects as open-source, sharing source code, design files, or instructions on personal websites and community platforms. These efforts aim to maximize replication and use by hobbyist makers. Yet questions remain: How often are such projects actually replicated? What kinds of information is important to include, and what is commonly missing? Are certain project types more approachable or appealing to makers? And what formats or platforms best support effective sharing?

Pathway 2. Using Fabrication Research in Teaching. Integrating fabrication research into teaching allows students to explore and extend research platforms while learning digital fabrication, electronics, or design skills. However, teaching raises practical challenges: students require access to facilities and materials, and research platforms need to be stable enough for classroom use. At the same time, teaching can provide valuable feedback to research, as students often identify new applications or stress-test systems at scale. Open questions include how to balance teaching goals with research insights, and how to evaluate student engagement meaningfully.

Pathway 3. Commercialization. Commercialization can be a powerful way to disseminate fabrication research, providing sustainable motivation and resources for broader adoption. Yet it is unclear when a research project is mature enough for commercialization, or how researchers can access the resources and networks needed to start a company. To address this, we will invite perspectives from Anna Roumen, CEO of Kyub—a fabrication toolkit that successfully transitioned into a commercial product—as well as other researchers who have navigated industry partnerships.

Pathway 4. Public Engagement. Public engagement offers accessible opportunities for dissemination, from participating in local maker fairs to contributing to exhibitions. These activities can increase the visibility of fabrication research and spark dialogue with non-academic audiences. However, they raise questions: How should research content be adapted for different audiences? What strategies can maximize relevance and accessibility? And how can these engagements provide value back to researchers?

Pathway 5. Involving Makers in Research. Some projects directly involve hobbyist makers or practitioner communities in

[1] https://kyub.com
[2] For example, a WirePrint-inspired feature was available in the Ultimaker Cura slicer up to version 5.2.

the research process. Such involvement can provide valuable insights into real-world practices, help validate research tools, and create reciprocal learning opportunities. Yet involving makers also introduces challenges in recruitment, collaboration, and balancing academic and community priorities. This pathway will explore both opportunities and tensions in co-producing research with makers.

Pathway 6. Societal Impact. Finally, fabrication research can have broad societal implications, whether through movements like Fab Labs, initiatives for sustainability, or projects that address local or global challenges. While relatively rare compared to other pathways, these examples highlight the potential for fabrication research to shape cultural practices, policy conversations, and access to technology. We will reflect on how societal impact might be envisioned, supported, or evaluated in the context of HCI and fabrication.

Because time is limited, we expect to prioritize a subset of pathways for in-depth discussion, guided by the interests expressed in position papers. Small-group activities will surface key practices and questions, followed by plenary discussion to identify overarching strategies across pathways. Our ultimate goal is to map how fabrication research can matter beyond papers, to articulate common challenges and opportunities, and to seed future collaborations on dissemination and impact within the CHI community and beyond.

2 Organizers

Hyunyoung Kim is an Assistant Professor in the School of Computer Science at the University of Birmingham. Her research explores novel fabrication toolkits and techniques that empower lay users to design and build solutions to their own problems. She actively open-sources her work to broaden access and maximize its real-world impact.

Daniel Ashbrook is an Associate Professor in the Department of Computer Science at the University of Copenhagen. His research focuses on how novel fabrication techniques can enable the creation of objects which can sense, compute, and actuate.

Andrea Bianchi is an Associate Professor in the Department of Industrial Design and an Adjunct Professor in the School of Computing at KAIST. He researches in the field of Human-Computer Interaction, focusing on building tools for creativity support that blend physical and digital elements, such as toolkits, physical computing, fabrication, as well as hardware systems for body augmentation.

Jack Forman is a PhD student in the Center for Bits and Atoms (CBA) and Tangible Media Group at MIT. His research centers on creating 3D and 4D textile artifacts that embed responsive behaviors in a seamless way.

DPV Joseph Jayakody is a Ph.D. candidate at the Topological Design CDT of the University of Birmingham. His research lies at the intersection of geometric modelling and computer-aided manufacturing, with a particular focus on vector field-based design and shape optimisation frameworks for additive manufacturing techniques.

Sara Nabil is an Assistant Professor in the School of Computing at Queen's University (Canada) and Director of the iStudio Research Lab. Her research explores interactive computing and smart materials, including soft sensing, e-textiles, and shape-changing mediums, blending interior, fashion, and product design to create seamless, expressive interactions. She is particularly interested in embedding interactivity into everyday spaces and objects, engaging marginalized and diverse user groups.

Hyunjoo Oh is an Assistant Professor with joint appointments in the School of Industrial Design and the School of Interactive Computing at Georgia Tech. She directs the CoDe Craft Group, where her research bridges design and computing to explore how people think, make, and learn. Her work integrates everyday materials with computing technologies to foster creative discovery through exploratory construction.

Thomas Pietrzak is a full professor at the Université de Lille. His research is about Human-Computer Interaction (HCI), Virtual and Augmented Reality (VR/AR) and haptics. He is particularly interested in interaction techniques and interactive devices that leverage the human cognitive and sensorimotor skills.

Thijs Roumen is an Assistant Professor at Cornell Tech, where he directs the Matter of Tech lab. His research focuses on making digital fabrication relevant to everyone, as opposed to industrialists and hobbyists currently using fabrication machines.

Valkyrie Savage is an Assistant Professor in the Department of Computer Science at the University of Copenhagen. Her research focuses on input devices and techniques mediated through sensing and digital fabrication. She is particularly interested in creating deeply custom interfaces that are adapted to users' bodies, contexts, and needs.

Lining Yao is an Assistant Professor at UC Berkeley, where she directs the Morphing Matter Lab. She investigates mechanisms of morphing materials, computational design algorithms, and fabrication pipelines.

Clement Zheng is a researcher, educator, and technologist working at the intersection of physical computing, tangible interaction, and making cultures. He leads the Interactive Materials Lab at the National University of Singapore and holds a joint appointment with the NUS CUTE Center. His research explores alternative material approaches for designing interactive systems, often resulting in new tools, techniques, and prototype artifacts.

3 Workshop Proceedings Publication Plan

With author consent, accepted position papers will be made available on the workshop website and , , in the CEUR-WS workshop-proceedings repository[3]. This ensures that the outcomes of the workshop are accessible to the broader HCI and fabrication research

[3] https://ceur-ws.org

communities. The website will serve as the central hub, hosting the call for participation, accepted papers, and the workshop program.

4 Offline Materials

To support continued engagement, participants who cannot attend the workshop will have access to the compiled summary notes, while photos from the workshop will be shared exclusively with participants. The compiled notes will be publicly accessible and maintained as a living resource for the community beyond CHI. This approach allows both participants and the wider community to benefit from the insights, discussions, and ideas generated during the workshop.

5 Accessibility

We aim to make the workshop as inclusive and accessible as possible for all participants. Position papers will be expected to follow the ACM accessibility guidelines to help ensure they are usable by everyone. Depending on participants' accessibility requirements, we will encourage speakers to use high-contrast slides, large fonts, and verbal descriptions of visuals. If this is not feasible in every case, we will invite speakers to share slides in advance so participants can adapt them on their own devices. We will also prioritize accessibility when preparing the workshop output notes.

6 Workshop Length and Structure

The workshop will take place over **two 90-minute sessions** and will combine invited talks, participant contributions, and group activities. We expect 10-20 participants.

Session 1: Setting the Stage and Mapping Pathways

- Welcome and Introductions (10 min): Organizers introduce the goals of the workshop, the six identified dissemination pathways, and the plan for the day.
- Invited Talk 1 – Neil Gershenfeld (30 min): Neil will share reflections on the societal and community-level impact of fabrication research, drawing on his leadership of the Fab Lab movement.
- Invited Talk 2 – Anna Roumen (30 min): Anna will discuss her experience commercializing fabrication research, providing a perspective on opportunities and challenges in translating research into products.
- Lightning Talks from Participants (20 min): Each participant will give a 1–2 minute overview of their position paper, focusing on their dissemination strategies, key challenges, or open questions. To streamline transitions, participants will be asked to share their presentation materials in advance, which the organizers will compile into a single deck.

Break

During the break between sessions, participants will be encouraged to mingle with others and post questions or ideas on the group discussion boards, especially for the pathways they will not be joining. This will help spark broader reflection and ensure that ideas extend beyond the groups they directly participate in.

Session 2: Deep Dives and Synthesis

- Breakout Group Discussions (35 min): Participants will form groups around selected pathways (e.g., open-sourcing, teaching, commercialization, public engagement, involving makers, societal impact). Each group will be provided with a board and post-its to capture practices, challenges, and opportunities related to their chosen pathway. The pathways will be selected in advance of the conference, based on the submitted position papers, to encourage more in-depth discussions. Groups will also be encouraged to address questions posted during the break.
- Group Presentations (25 min): Each group presents their insights back to the full workshop, enabling cross-pollination of strategies and identification of recurring themes.
- Synthesis and Future Directions (20 min): As a whole group, we distill key lessons into a set of collective insights, identifying overarching strategies across pathways. This session also sets directions for post-workshop publications and collaborations.
- Closing (10 min): Organizers summarize outcomes, thank participants, and invite continued engagement in follow-up activities (e.g., joint papers, online community space).

Throughout both sessions, we will use interactive, lightweight methods (sticky notes, collaborative online boards, collective mapping) to capture ideas. Notes will be compiled and made available after the workshop to ensure accessibility and support ongoing collaboration.

7 Post-Workshop Plan

We will share a summary of the discussions and results of the ideation sessions with all participants. With participants' consent, these materials will also be made publicly available to the broader community. To sustain momentum, we will facilitate continued conversations and collaborations through the existing Fab Research Slack, creating dedicated channels for sharing resources, announcing follow-up events, and initiating new collaborations. By embedding the workshop community into an active, international network of fabrication researchers, we extend the reach of the discussions beyond CHI and foster longer-term impact. We anticipate that these exchanges may lead to future initiatives such as a Dagstuhl seminar, additional CHI workshops or Meet-Ups, or research projects focused on the impact of fabrication research. The workshop website will serve as a living hub, hosting workshop outcomes and providing updates on subsequent events and opportunities for engagement.

8 Call for Participation

Fabrication research in HCI produces tools, machines, and methods that support creative practice, yet many innovations remain primarily academic prototypes. This two-session, 90-minute workshop invites researchers and practitioners to reflect on methods for disseminating fabrication research, exploring pathways including open-source release, education, community engagement, and commercialization.

We plan to invite keynote speakers: Neil Gershenfeld (MIT, Center for Bits and Atoms), on fabrication's societal impact; and Anna Roumen (CEO of Kyub) and Patrick Baudisch (Founder of Kyub), on turning research projects into commercial products. Participants

will join interactive group discussions, and engage in activities to surface the diverse ways research travels into the world.

We invite submissions of a 2-4 page position paper in the single-column ACM Template describing one or more dissemination pathways they have explored or questions for discussion. Both success stories and lessons from failures are welcome. Papers may include motivation for dissemination, strategies employed, and reflections on outcomes. We welcome visual materials, unique experiences in fabrication research dissemination, or ideas to spark in-depth discussion.

Submissions should be made to the workshop website. Accepted papers will be published via CEUR-WS and on this workshop website. At least one author from each accepted paper must register for the conference and the workshop.

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