Special Issue on Critical Making

June 2023

The Critical Making Consortium

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 101006285

Executive summary 1/2

Critical Making is a research project that adds scientific insights into the potential of the maker movement. By focusing on critical and socially responsible making, it shows how global maker communities can offer new opportunities for young makers of all genders to contribute to an open society via open source innovation.

The research project received funding from the European Union's Horizon 2020, and the consortium consists of five partners: The Centre for Social Innovation (ZSI), Global Innovation Gathering (GIG), VTT Technical Research Centre of Finland, Technische Universität Berlin (TUB), and Wikifactory (WIF).

This special issue summarises the project's outcomes on the various aspects of Critical Making in a collection of scientific publications, which approach Critical Making from different angles. The research focus of the Critical Making project has been on the exploration of responsible innovation processes in the global maker community. More specifically aspects of gender and inclusiveness, openness, and the engagement of young people have been at the centre of our participatory research approach. This led to a series of academic findings, presented at conferences and published in academic outlets. Participatory research also led to very practical output formats and alternative publishing formats, next to the scientific publications. The Critical Making zine is such an example.

Executive summary 2/2

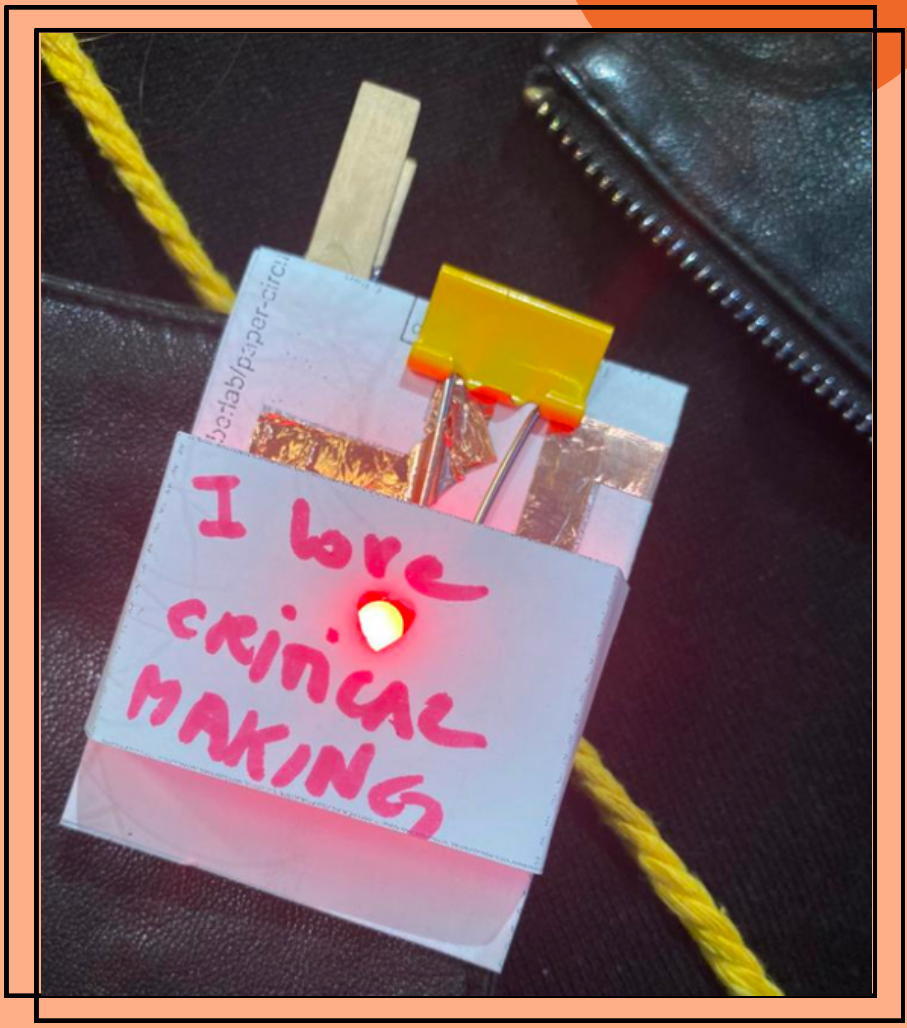
Next to the findings directly derived from the Critical Making project and our intense collaboration with the global maker community, this summary also includes references to relevant work we encountered during our Critical Making journey. We would like to highlight some of the influential experts - academics and practitioners - who have been and keep exploring critical making practices from different perspectives. This ranges from more artistic approaches of Garnet Hertz to feminist and intersectional views of Stefanie Wuschitz.

In the end, we hope that this collection of Critical Making publications inspires scholars to further explore and highlight the potential of responsible grassroots innovations in makerspaces.

Introduction 1/2

The Critical Making project puts a spotlight on critical and socially responsible making practices. The Gender case action is co-creating measures to counteract the existing gender imbalances in makerspaces and in online spaces. In the Young Talents case action, the project engages young people in makerspaces and explores educational tools that build skills for responsible research and innovation. Finally, the Openness case action strengthens the social responsibility of the open hardware movement through a mentoring programme for open hardware business innovations.

The theoretical underpinning for our Critical Making research is inspired by the work of scholars such as Ratto (2011) and Hertz (2012) from a conceptual point of view and combines the dimension of GIM - Grassroots Innovation Movements (Smith 2017) and RRI - Responsible Research and Innovation (e.g. Stilgoe, Owen & Macnaghten 2013) from an analytical point of view. This work resulted in the CMRF - Critical Making Responsibility Framework. It helped us to critically reflect on the insights gained during the participatory research processes.



References

- Hertz, G.: Critical Making (300. Aufl.). Garnet Hertz. 2012. http://conceptlab.com/criticalmaking
- Ratto, M.:(2011) Critical Making: Conceptual and Material Studies in Technology and Social Life, The Information Society, 27:4, 252-260, DOI: 10.1080/01972243.2011.583819
- Smith, A.: Social Innovation, Democracy and Makerspaces. SSRN Electronic Journal. 2017.https://doi.org/10.2139/ssrn.2986245
- Stilgoe, J., Owen, R., & Macnaghten, P.: Developing a framework for responsible innovation. In: Research Policy, 42(9), 1568-1580. 2013.

Introduction 2/2

What is our understanding of Critical Making?

We define Critical Making along 6 core values:

Open
Critical Making promotes open collaboration, including the sharing of skills and knowledge. It boosts creativity in the ecosystem of makers by making processes and results accessible.

Local & connected
Critical Making is happening locally, working on the ground and adapted to a particular socio-cultural context. Thereby, critical making implies an engagement with local communities as well as global networks – thinking globally and making locally.

Social & Diverse
Critical Making reflects on the social dimensions of making, the living realities of those persons involved and concerned, as well as the ethical implications of their work. Critical Making thereby addresses societal challenges and needs. That's why it is so important to strive for diversity and inclusiveness.

Reflexive
Critical Making re-thinks and re-constructs the dominant mainstream maker culture from a critical stance, reflecting on underlying power structures and their implications.

Impactful
Critical Making aspires to really make a difference. It seeks to improve life and build a sustainable future.

Joyful & meaningful
Critical Making is still about the joy of and in making, but adds meaning to it. What is made critically is made with a specific purpose of individual or social kind.

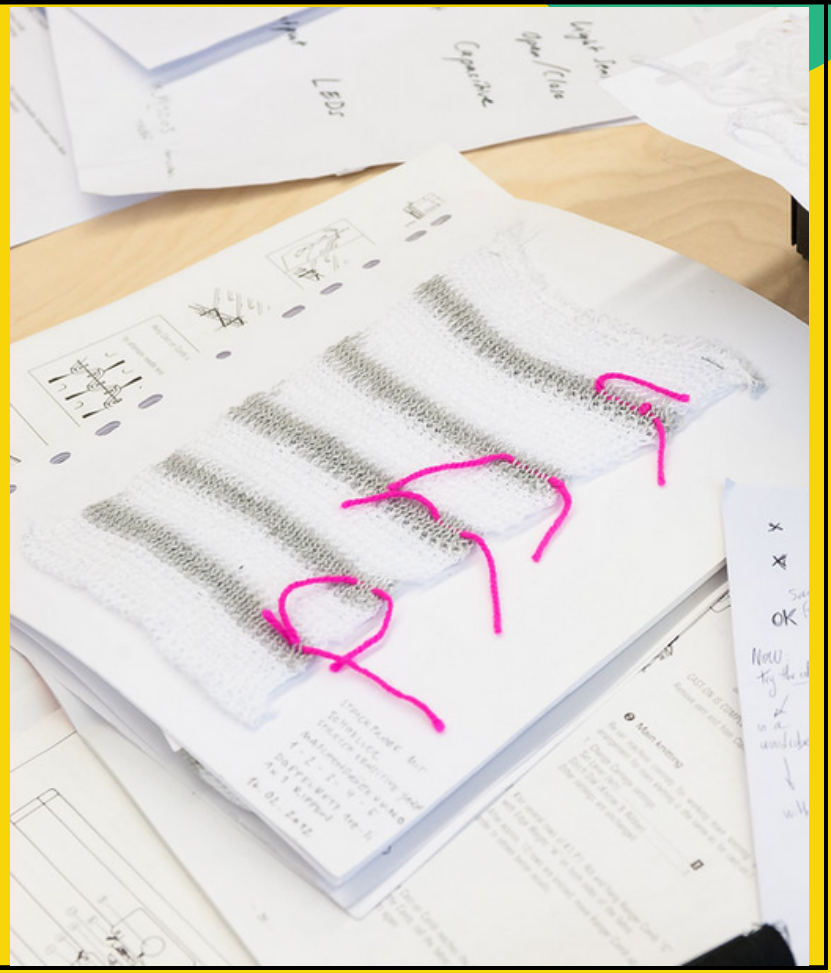
Contents

This special issue includes:

- A Foreword by Garnet Hertz
- The Critical Making zine, an alternative form of publishing
- Critical Making original publications
- Recommendations for further reading on the topic of Critical Making

In order not to violate any publishers rights we decided to add a short abstract for each of the publications, a screenshot, and a link to where the publication can be found.

We would like to thank all our colleagues and co-researchers from the wide global maker community and related stakeholder groups, who worked with us during the whole project and who helped to build our project results on truly participatory processes.



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Foreword by Garnet Hertz

ZINES AS AN INTERDISCIPLINARY PLATFORM:

Critical Making, Technology and Ethics

GARNET HERTZ

To me, critical making is about extending beyond the act of building artifacts and embracing a multidimensional approach that engages with technology's broader social, cultural, and ethical implications. Critical making highlights the social and reflective aspects of building designed objects in the real world, urging creators to contemplate the larger context within which their creations exist.

In this way, critical making transcends the realm of technical expertise and embraces a range of practices, from digital fabrication and hacker culture to traditional craft, environmental and social activism, co-operatives and open-source collaborations. This inclusive approach highlights the potential for democratizing, making and empowering individuals to actively participate in shaping their technological environment.

Central to critical making is the idea that innovation should not exist without ethics. As an approach, critical making

encourages designers, developers and makers to question the underlying assumptions and power structures embedded in technological systems. By critically examining the ethical dimensions of their work, practitioners can actively contribute to shaping a more just and inclusive society.

Innovation and Ethics: How Zines Function as an Interdisciplinary Platform

As a part of helping move this interdisciplinary work forward, I personally think that small, informal publications are useful in encouraging useful dialogue between engineers, designers, ethicists, assorted stakeholders and the public. Zines, in other words, are a strong platform for cross-disciplinary work. I have found them useful to bring together diverse groups from different disciplines, cultures, and perspectives – and they have the added bonus of having a tactile outcome.

As an interdisciplinary platform, I have found zines useful and fun as an "un-disciplined" starting point for meaningful dialogue around the topics of technology and ethics. Zine-making is good for collaborative projects with diverse communities, and are useful in bringing together marginalized groups, local stakeholders, professional experts, plus grassroots organizations and activists.

Critical making is more than producing zines related to ethics and technology, however. Zines are one mode of production, but there are several other ways to use making as a form of social, cultural, and political critique. The creation of prototypes to create dialogue – which might be called "dialogical prototypes" –

is also incredibly useful in highlighting alternate modes of technology production. This includes the entire field of what Julian Bleecker terms 'design fiction' where design is used in a science-fiction way to explore possible and near future worlds that emerge from technological change. Critical making is more of an attitude than anything else – it is about creatively challenging dominant narratives, power structures, and the assumptions embedded in designed technological artifacts.

In summary, the concept of critical making represents a fusion of critical theory, hands-on fabrication, and the exploration of materiality. It encourages individuals to actively engage with the world through making and reflection, using their skills and creativity to interrogate and reimagine the socio-technical systems that shape our lives. I see hands-on experimentation, play, and tinkering can be used to uncover new insights and to challenge established norms. Zines are one example of a 'critical making' mode of interdisciplinary publishing – and many more modes of critically engaged making exist. In this way, making itself can function as a means of inquiry and critique, blurring the boundaries between theory and practice – and incorporating unconventional materials and processes to embrace a spirit of experimentation and exploration.

[May 2023]

Critical Making zine

“a zine (/zi:n/ ZEEN; short for magazine or fanzine) is a small-circulation self-published work of original or appropriated texts and images, usually reproduced via a copy machine. Zines are the product of either a single person or of a very small group, and are popularly photocopied into physical prints for circulation. A fanzine (blend of fan and magazine) is a non-professional and non-official publication produced by enthusiasts of a particular cultural phenomenon (such as a literary or musical genre) for the pleasure of others who share their interest...

... Written in a variety of formats from desktop-published text to comics, collages and stories, zines cover broad topics including fanfiction, politics, poetry, art & design, ephemera, personal journals, social theory, intersectional feminism, single-topic obsession, or sexual content far outside the mainstream enough to be prohibitive of inclusion in more traditional media.” (Wikipedia, 2023)

Through the 2,5 years of our Critical Making journey and working across the globe with engaged co-researchers from the maker communities we felt the urge to reflect the creativity found in makerspaces to be partly reflected also in our project outcomes. Thus, next to the more traditional forms of publishing in academic journals and conferences, we also wanted to summarise and reflect our experiences in a less standardised way. The Critical Making zine is our attempt to complement our many research outcomes with an alternative publishing artefact that speakers to a diverse audience.

Critical Making zine

Critical Making Consortium. (2023). Critical Making Zine. Zenodo. https://doi.org/10.5281/zenodo.7966847

Critical Making

Academic publications

01 Sipos, Regina; Åkerman, Maria; Saari, Hanna & Kieslinger, Barbara. (2022). Critical Making Responsibility Framework. Extending an Academic Proposal to Support Reflexivity in Maker Communities. Proceedings of the Fab 17 Research Papers Stream, 57–71. https://doi.org/10.5281/zenodo.7432068

02 LSaari, H.; Åkerman, M.; Kieslinger, B.; Myllyoja, J.; Sipos, R. How Open Is the Maker Movement? Integrative Literature Review of the Openness Practices in the Global Maker Movement. Sustainability 2021, 13, 13559. https://doi.org/10.3390/su132413559

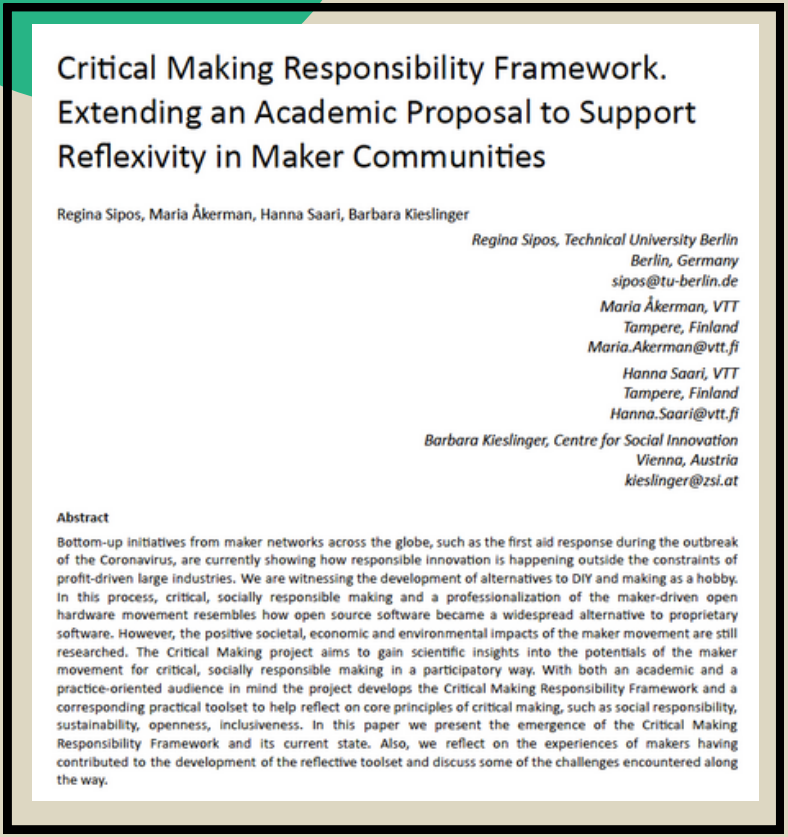
03 Sipos, Regina & Åkerman, Maria. (2023). Introducing the Critical Making Responsibility framework for analyzing responsible innovation processes in grassroots practices, Innovation: The European Journal of Social Science Research, https://doi.org/10.1080/13511610.2023.2195583

04 Sipos, Regina; Klose Janina; Kutschera Alexander (2023): Sparking Meta-Discussions for Critical Thinking in Vocational Education: Critical Making Workshops. Under review in: Special issue on "Competence based education: from school to responsible citizenship, wellbeing and democracy" - IxD&A Journal

05 Schaefer, Teresa; Seebacher, Lisa M. , Pietschmann, Cin; Chinoy, Saad (forthcoming): How to turn makerspaces more gender-inclusive: internationally co-created recommendations for gender-inclusive making.

06 Saari, Hanna; Åkerman, Maria; Sipos, Regina (forthcoming): Openness of making as a social innovation: globally connected, locally acting maker communities for social change in the Global South.

01



Critical Making Responsibility Framework. Extending an Academic Proposal to Support Reflexivity in Maker Communities

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Abstract

Bottom-up initiatives from maker networks across the globe, such as the first aid response during the outbreak of the Coronavirus, are currently showing how responsible innovation is happening outside the constraints of profit-driven large industries. We are witnessing the development of alternatives to DIY and making as a hobby. In this process, critical, socially responsible making and a professionalization of the maker-driven open hardware movement resembles how open source software became a widespread alternative to proprietary software. However, the positive societal, economic and environmental impacts of the maker movement are still researched. The Critical Making project aims to gain scientific insights into the potentials of the maker movement for critical, socially responsible making in a participatory way. With both an academic and a practice-oriented audience in mind the project develops the Critical Making Responsibility Framework and a corresponding practical toolset to help reflect on core principles of critical making, such as social responsibility, sustainability, openness, inclusiveness. In this paper we present the emergence of the Critical Making Responsibility Framework and its current state. Also, we reflect on the experiences of makers having contributed to the development of the reflective toolset and discuss some of the challenges encountered along the way.

https://zenodo.org/record/7432068

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02

sustainability

MDPI

Review

How Open Is the Maker Movement? Integrative Literature Review of the Openness Practices in the Global Maker Movement

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Abstract: This article explores the multiple meanings of the concept of openness in the global maker movement. Openness is viewed as one of the key principles of the maker movement. As the global maker movement is a bricolage of diverse and situated practices and traditions, there are also many different interpretations and ways of practicing openness. We have explored this diversity with an integrative literature review, relying on the Web of Science™ database. We identified three interrelated but also, in part, mutually contested approaches to openness. Firstly, openness often refers to applying open hardware. Secondly, it is in many cases related to the inclusion and empowerment of various groups in making. Thirdly, openness appears to be seen as a means to pursue economic growth through increasing innovation activity and entrepreneurship. Our results also highlight the substantial barriers encountered by makers while aiming to open up their practices. These barriers include: value conflicts in which openness is overridden by other important values; exclusion of lower income groups from making due to a lack of resources; and difficulties in maintaining long-term activities. The different meanings of openness together with the barriers create tensions within the maker movement while implementing openness. We propose that engaging in a reflexive futures dialogue on the consequences of these tensions can enhance the maker movement to become more open, inclusive and resilient.

Keywords: maker movement; openness; critical making; open hardware; inclusion; tensions

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Citation: Saari, H.; Åkerman, M.; Kieslinger, B.; Myllyoja, J.; Sipos, R. How Open Is the Maker Movement? Integrative Literature Review of the Openness Practices in the Global Maker Movement. *Sustainability* **2021**, *13*, 13559. https://doi.org/10.3390/su132413559

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1. Introduction

Today, we are witnessing a growing professionalisation of the maker-driven open hardware movement that is comparable to open-source software, which has already become mainstream. An often-claimed characteristic of the maker movement is its strong commitment towards openness. Makers are keen to realise openness as much as possible and openness and sharing seem to be key principles that makers abide by according to Millard et al. [1]. Openness is practiced by the sharing of ideas and designs locally in makerspaces, and by learning online in the wider community using multiple platforms for uploading designs and projects for other makers to use and adapt. Openness is one of the major ways in which the maker movement challenges currently prevalent production systems that rely on closed systems and intellectual property rights. Without open practices the maker movement would not be able to spread in the way we see it spreading currently.

Even though openness is such a central value to the maker movement and has such a profound role in shaping the movement's future, a comprehensive review of the topic has been lacking so far. When openness of the maker movement has been studied, the perspective has usually focused on one of the aspects of openness, such as inclusiveness

https://doi.org/10.3390/su132413559

03

Innovation: The European Journal of Social Science Research, 2023
https://doi.org/10.1080/13511610.2023.2195583

Routledge
Taylor & Francis Group

Check for updates

Introducing the Critical Making Responsibility framework for analyzing responsible innovation processes in grassroots practices

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(Received 21 December 2021; final version received 19 February 2023)

This paper introduces the Critical Making Responsibility Framework. The framework has been developed by the Critical Making consortium in order to analyze responsible innovation processes in grassroots innovation, specifically in the practice of making. The paper builds on a literature review to highlight the shortcomings of current Responsible Research and Innovation (RRI) frameworks' relevance towards grassroots innovation practices, and conversely, the lack of scientific understanding on ethics and responsibility in making. To fill the gap, this paper proposes a combination of the dimensions of the Grassroots Innovation Movements (GIM) analytical framework and the RRI capacity dimensions. Finally, the outlook reflects upon how the framework will be utilized in hands-on ways to support the work of academic and non-academic co-researchers of reflexive maker practices.

Keywords: literature review; critical making; grassroots innovation; Responsible Research and Innovation; participatory action research

Introduction

Academic interest in makerspaces has been growing, as these nurture an approach different from traditional methods of innovation: participatory grassroots innovation. Makerspaces are known for supporting the practice of making, which is a term for the subculture that constitutes a technology-based extension of DIY culture (Doyle 2013). This support consists of access to infrastructure and tools, but also to community members, their shared knowledge and skills.

Grand narratives around the possibilities the so-called maker movement represents have been formulated, and expectations towards these innovation spaces have been high, including bringing about a new industrial revolution (Anderson 2012) or democratizing innovation (Tanenbaum et al. 2013) through the prosumer's empowerment (Paltrinieri and Esposti 2013). Maker communities have also been celebrated for their potential impacts, including social (Unterfrauner et al. 2020; Bosse et al. 2019), political (Maxigas 2012) and environmental (Lange 2017; Kohtala 2016) impacts. A recent example of the capacity of the maker movement to address societal needs in a responsive manner was witnessed during the COVID-19 pandemic when grassroots communities were rapidly prototyping, testing, documenting and reproducing necessary products (Kieslinger et al. 2021) as global supply chains broke down.

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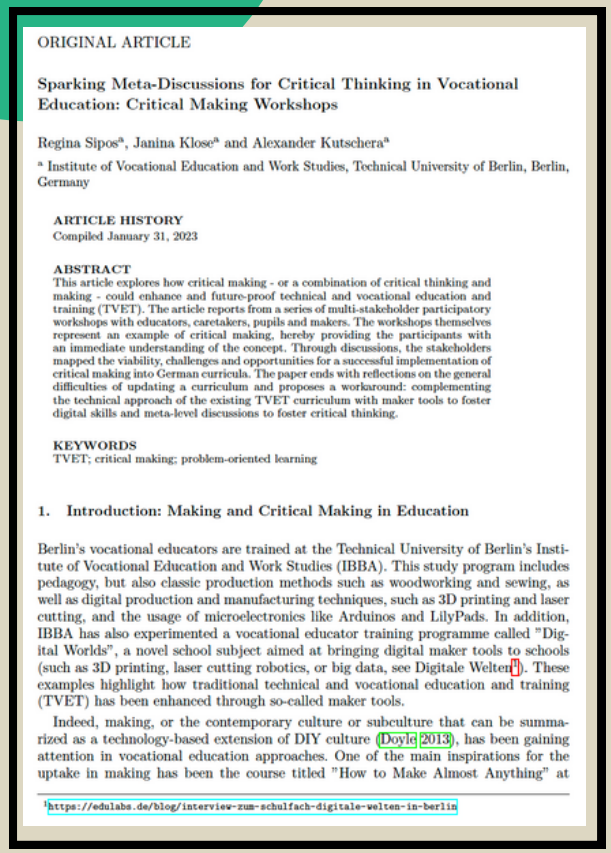

ORIGINAL ARTICLE

Sparking Meta-Discussions for Critical Thinking in Vocational Education: Critical Making Workshops

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ARTICLE HISTORY
Compiled January 31, 2023

ABSTRACT
This article explores how critical making - or a combination of critical thinking and making - could enhance and future-proof technical and vocational education and training (TVET). The article reports from a series of multi-stakeholder participatory workshops with educators, caretakers, pupils and makers. The workshops themselves represent an example of critical making, hereby providing the participants with an immediate understanding of the concept. Through discussions, the stakeholders mapped the viability, challenges and opportunities for a successful implementation of critical making into German curricula. The paper ends with reflections on the general difficulties of updating a curriculum and proposes a workaround: complementing the technical approach of the existing TVET curriculum with maker tools to foster digital skills and meta-level discussions to foster critical thinking.

KEYWORDS
TVET; critical making; problem-oriented learning

1. Introduction: Making and Critical Making in Education

Berlin's vocational educators are trained at the Technical University of Berlin's Institute of Vocational Education and Work Studies (IBBA). This study program includes pedagogy, but also classic production methods such as woodworking and sewing, as well as digital production and manufacturing techniques, such as 3D printing and laser cutting, and the usage of microelectronics like Arduinos and LilyPads. In addition, IBBA has also experimented a vocational educator training programme called "Digital Worlds", a novel school subject aimed at bringing digital maker tools to schools (such as 3D printing, laser cutting robotics, or big data, see Digitale Welten[1]). These examples highlight how traditional technical and vocational education and training (TVET) has been enhanced through so-called maker tools.

Indeed, making, or the contemporary culture or subculture that can be summarized as a technology-based extension of DIY culture (Doyle 2013), has been gaining attention in vocational education approaches. One of the main inspirations for the uptake in making has been the course titled "How to Make Almost Anything" at

[1] https://edulabs.de/blog/interview-zum-schulfach-digitale-welten-in-berlin

This article explores how critical making - or a combination of critical thinking and making - could enhance and future-proof technical and vocational education and training (TVET). The article reports from a series of multi-stakeholder participatory workshops with educators, caretakers, pupils and makers. The workshops themselves represent an example of critical making, hereby providing the participants with an immediate understanding of the concept. Through discussions, the stakeholders mapped the viability, challenges and opportunities for a successful implementation of critical making into German curricula. The paper ends with reflections on the general difficulties of updating a curriculum and proposes a workaround: complementing the technical approach of the existing TVET curriculum with maker tools to foster digital skills and meta-level discussions to foster critical thinking.

(under review)

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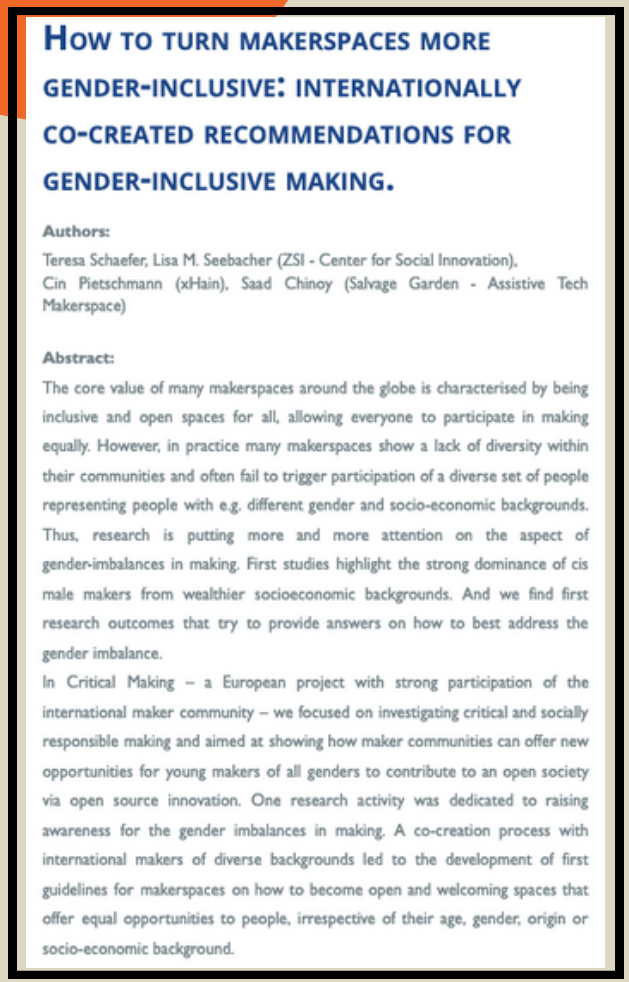


How to turn makerspaces more gender-inclusive: Internationally co-created recommendations for gender-inclusive making.

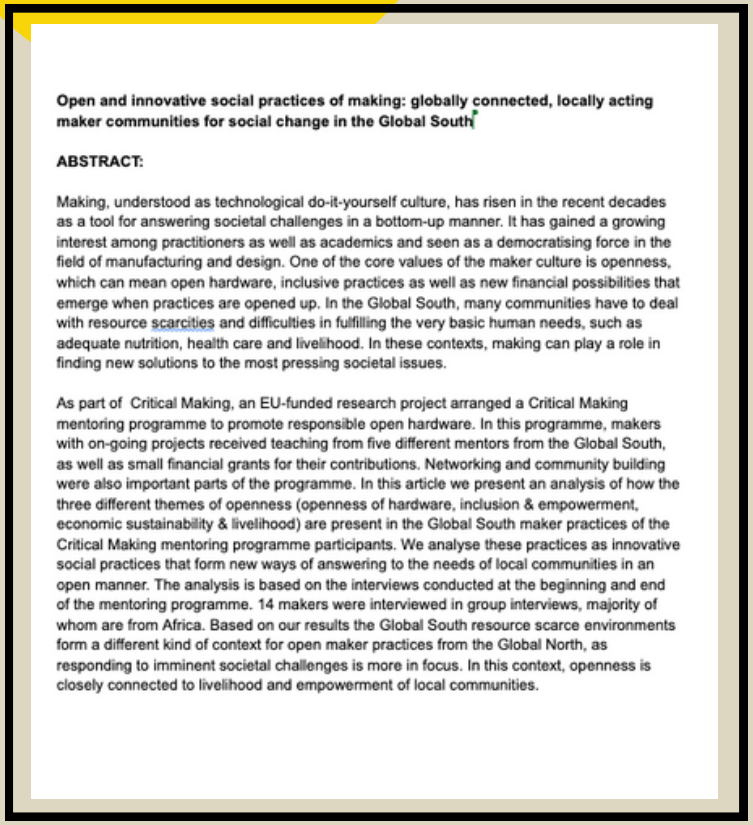
Authors:
Teresa Schaefer, Lisa M. Seebacher (ZSI - Center for Social Innovation), Cin Pietschmann (xHain), Saad Chinoy (Salvage Garden - Assistive Tech Makerspace)

Abstract:
The core value of many makerspaces around the globe is characterised by being inclusive and open spaces for all, allowing everyone to participate in making equally. However, in practice many makerspaces show a lack of diversity within their communities and often fail to trigger participation of a diverse set of people representing people with e.g. different gender and socio-economic backgrounds. Thus, research is putting more and more attention on the aspect of gender-imbalances in making. First studies highlight the strong dominance of cis male makers from wealthier socioeconomic backgrounds. And we find first research outcomes that try to provide answers on how to best address the gender imbalance.
In Critical Making – a European project with strong participation of the international maker community – we focused on investigating critical and socially responsible making and aimed at showing how maker communities can offer new opportunities for young makers of all genders to contribute to an open society via open source innovation. One research activity was dedicated to raising awareness for the gender imbalances in making. A co-creation process with international makers of diverse backgrounds led to the development of first guidelines for makerspaces on how to become open and welcoming spaces that offer equal opportunities to people, irrespective of their age, gender, origin or socio-economic background.

(forthcoming)

This article introduces the recommendations for gender-inclusive making which were co-created and evaluated by the Critical Making project together with representatives of the global maker community. The core value of many makerspaces around the globe is characterised by being inclusive and open spaces for all, allowing everyone to participate in making equally. However, in practice many makerspaces show a lack of diversity within their communities and often fail to trigger participation of a diverse set of people representing people. Thus, research is putting more and more attention on the aspect of gender-imbalances in making and the Critical Making project started to co-create recommendations for gender-inclusive makerspaces. As gender-imbalances in making are strongly influenced by the local context this first set of recommendations was put to evaluation and further improvement by six makerspaces and by members of a network of makerspace coming from Central European, African and South-East-Asian countries. This evaluation process not only led to a new and improved version of the recommendations. It also showed the huge impact that only the reflection of such recommendations can have on makerspaces around the globe to become more inclusive places. With this paper we want to disseminate the guidelines and stimulate reflection and discussion around gender-equality in making, supporting the make community to become accessible for all.

06



Open and innovative social practices of making: globally connected, locally acting maker communities for social change in the Global South

ABSTRACT:

Making, understood as technological do-it-yourself culture, has risen in the recent decades as a tool for answering societal challenges in a bottom-up manner. It has gained a growing interest among practitioners as well as academics and seen as a democratising force in the field of manufacturing and design. One of the core values of the maker culture is openness, which can mean open hardware, inclusive practices as well as new financial possibilities that emerge when practices are opened up. In the Global South, many communities have to deal with resource scarcities and difficulties in fulfilling the very basic human needs, such as adequate nutrition, health care and livelihood. In these contexts, making can play a role in finding new solutions to the most pressing societal issues.

As part of Critical Making, an EU-funded research project arranged a Critical Making mentoring programme to promote responsible open hardware. In this programme, makers with on-going projects received teaching from five different mentors from the Global South, as well as small financial grants for their contributions. Networking and community building were also important parts of the programme. In this article we present an analysis of how the three different themes of openness (openness of hardware, inclusion & empowerment, economic sustainability & livelihood) are present in the Global South maker practices of the Critical Making mentoring programme participants. We analyse these practices as innovative social practices that form new ways of answering to the needs of local communities in an open manner. The analysis is based on the interviews conducted at the beginning and end of the mentoring programme. 14 makers were interviewed in group interviews, majority of whom are from Africa. Based on our results the Global South resource scarce environments form a different kind of context for open maker practices from the Global North, as responding to imminent societal challenges is more in focus. In this context, openness is closely connected to livelihood and empowerment of local communities.

(forthcoming)

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Critical Making

Selected Conference contributions

01 Sipos, R., Kieslinger, B., Stilz, M. (2021): Critical Making Consortium: Studying Responsible Research and Innovation Principles in the Maker Community. Proceedings of the Objectif Sciences International 12th Geneva Forum at United Nations Conference, 2020

02 Åkerman Maria, Saari Hanna, Sipos Regina (2022). Reshaping RRI keys to embrace grassroots innovations: focus on community empowerment. Eu-SPRI 2022. https://euspri2022.nl/wp-content/uploads/sites/556/2022/05/Eu-SPRI-2022-extended-abstracts.pdf

03 Saari Hanna, Åkerman Maria (2022). Shaping sustainability from the grass-roots: A perspective from Global South innovation communities. STN Scientific conference 2022, Helsinki, Finland.

04 Saari Hanna, Åkerman Maria, Kieslinger Barbara (2023). The growing role of globally connected, locally acting maker communities for social and societal change: insights from grassroots movements in the Global South. Eu-SPRI 2023

05 The Critical Making Consortium (2023): Six Arguments why Critical Making is open, local and connected, social and diverse, reflexive, impactful, joyful and meaningful. HASTAC 2023 Conference on Critical Making and Social Justice (June, New York, USA)

06 Teresa Schaefer, Lisa Mo Seebacher, Asmaa Guedira, Yine Yenki Nyika, Irene Agrivina (2023): How to increase gender-inclusiveness in critical making: innovative formats and measures co-created with makers worldwide. HASTAC 2023 Conference on Critical Making and Social Justice (June, New York, USA)

01

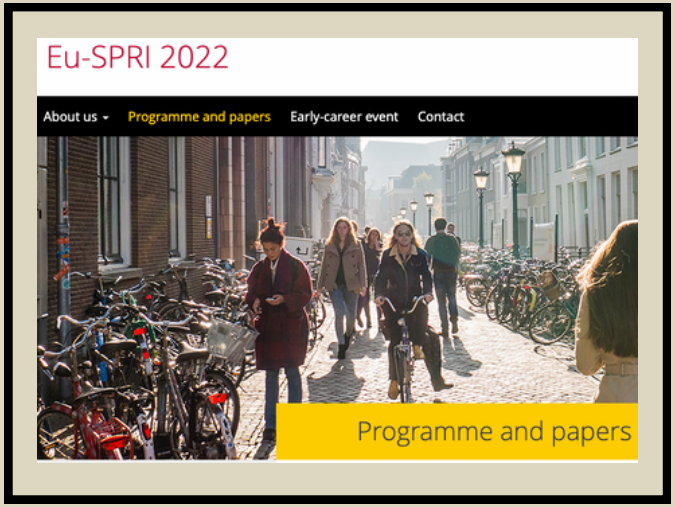
Shaping sustainability from the grass-roots: A perspective from Global South innovation communities

This paper introduces the Critical Making Consortium, a Europe-based consortium that aims to study responsible research and innovation principles in offline and online maker communities. It introduces the concept of Grassroots Innovation Movements (GIM), which include hacker and maker communities, and outlines their potential for societal impact, which can be analyzed through the lens of Responsible Research and Innovation (RRI). The paper then offers a brief outline of the term critical making and how it relates to and can be grounded in grassroots innovation practices. Against this background, the paper portrays the project itself. First, the project's overarching research questions and goals are described. Second, a framework for analysis combining GIM, RRI and responsible making principles is proposed. Third, participatory case actions on gender, youth and openness are outlined and finally, the consortium members are presented.

https://osi-genevaforum.org/

02

Reshaping RRI keys to embrace grassroots innovations: focus on community empowerment



Recent research has shown the potential of grassroots innovations and maker communities to shape socially relevant, problem-driven innovations. To ensure that these citizen-driven innovation processes ultimately lead to more sustainable and inclusive outcomes, there is a need to increase and support the reflexivity and responsibility of key grassroots innovation actors, including communities active in makerspaces and fablabs. Currently the concept of Responsible Research and Innovation (RRI), which is originally developed for the purposes of institutionalised research and innovation funding and performing organisations fails to address the particularities of these kinds of citizen-driven processes taking place outside research organizations. As the sites of frugal and grassroots innovations are diverse ranging from social collectives to informal enterprises, also the understanding of dynamics of innovations and their social embeddedness needs to be revised and enriched with context specific knowledge to make the concept of RRI meaningful for these communities. To address the need to support responsible citizen- and community-driven innovations , the EU funded Critical Making project has co-created a Critical Making Responsibility Framework to better understand how social responsibility can be understood, practiced, and evaluated at the level of grassroots innovations. The Critical Making Responsibility Framework draws from the existing conceptualisations of RRI capacities, including anticipation, reflexivity, inclusion and responsiveness (Tassone et al. 2018) and reinterprets them with an indepth substance understanding of social embeddedness of maker-driven grassroots innovations provided by grassroots innovation movement (GIM) studies (Smith et al. 201). The GIM framework guides researchers to focus on the context, framings, pathways and spaces and strategies shaping the development of grassroots innovation communities. The core of the Critical Making Responsibility framework is to put the analytical, retrospective four-dimensional GIM framework into dialogue with the forward looking and reflexive RRI capacities approach. This presentation introduces the Critical Making Responsibility framework and presents the experiences related to its participatory development and application while evaluating different types of responsibility interventions in maker spaces. Based on these learnings, we will also introduce and justify a suggestion to include community empowerment as a novel RRI key when evaluating grassroots innovations. Our preliminary results indicate, in line with the existing research on grass roots innovations, that a functioning community with committed members is one of the most important corner stones of grassroots innovation movements, and therefore projects working with these communities should also take community empowerment seriously. Empowered grass-roots communities have a feeling of capability when it comes to creating changes in the society and they hold the keys to maintaining their functionality in the long term. These kinds of community empowerment aspects are not covered by the existing RRI monitoring and indicator frameworks.

References: Smith, A., Fressoli, M., Abrol, D., Arond, E., & Ely, A. (2017). Grassroots innovation movements. Taylor & Francis. Tassone, Valentina C.; O'Mahony, Catherine; McKenna, Emma; Eppink, Hansje J.; Wals, Arjen E. J. (2018) (Re)designing higher education curricula in times of systemic dysfunction: a responsible research and innovation perspective. Higher Education, 10.1007/s10734- 017-0211-4

https://euspri2022.nl/wp-content/uploads/sites/556/2022/05/Eu-SPRI-2022-extended-abstracts.pdf

03

Shaping sustainability from the grass-roots: A perspective from Global South innovation communities


strateginen tutkimus

Strategic Research - Scientific Conference: A fair, just and sustainable society

12.-13.10.2022, Helsinki

Summary of abstracts

(in alphabetical order according to presenter)

Sustainability transition in the Global South differs from Global North in many aspects. One of them is the key role that grass-roots communities play in shaping societal and technological transformations. Grass-roots innovation communities, often discussed under the umbrella term makers, are crucial in solving local problems and making new solutions available in communities that are affected by resource scarcity and unreliable electricity supply. In EU Horizon 2020 funded project Critical Making, we explore how the global maker movement can contribute to sustainability transformations with a particular interest in the ways maker communities work. Our study is based on group interviews with 14 makers from Africa, South America and Europe. Our initial results indicate that grass-roots innovators in local communities of the Global South hold significant agency in bringing about a fair and sustainable technological transition, especially when they are connected to global maker networks online. These people with Internet access, IT-skills and knowledge of English can act as links between the global maker movement and local communities, thus holding important positions in building the capacities of these communities. Based on our interview data, grass-roots innovators of Global South also deeply care about the environmental aspects of their products and are ambitious in working towards social justice. In our presentation, we will discuss about the potentials and barriers for the maker practices to empower the resource scarce communities in the Global South and about the lessons that the welfare societies of the Global North can learn from these global networks.

https://www.aka.fi/globalassets/3-stn/1-strateginen-tutkimus/tiedon-kayttajalle/tapahtumat/2022/ohjelma_otsikoineen_final_5.10.22.pdf

04

The growing role of globally connected, locally acting maker communities for social and societal change: insights from grassroots movements in the Global South

https://www.euspri2023.com/

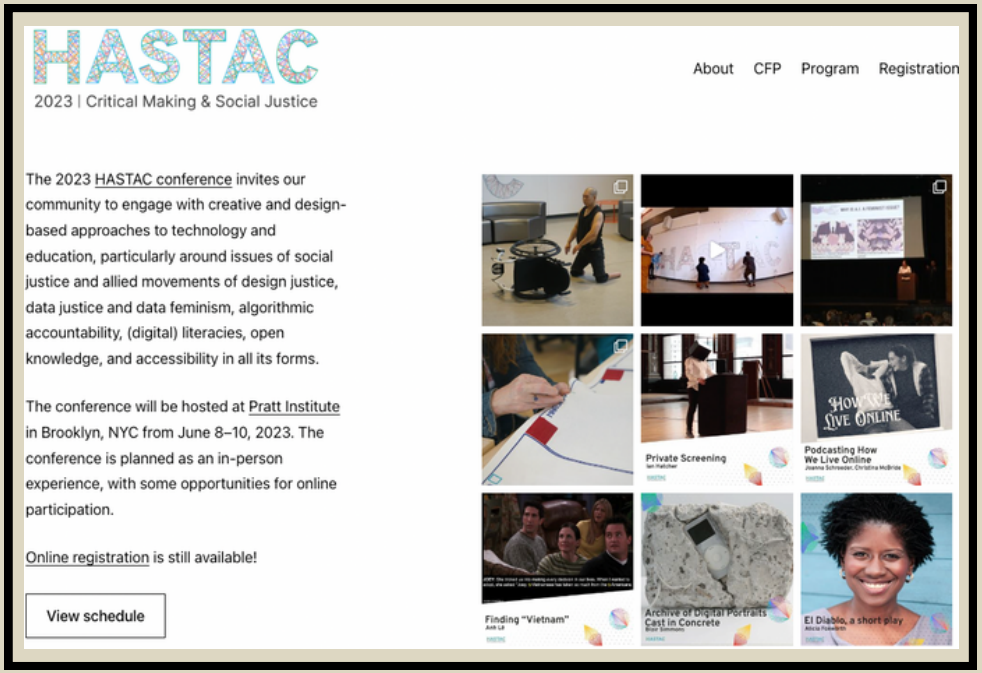
TIn many communities globally, especially in the Global South, environmental degradation and climate change threaten the very conditions of life. The residents in the frontlines of the ecological changes react in many ways. Grassroots innovations and innovation communities that aim at combating local environmental changes and contributing to global solutions hold significant potential for change. We argue that a critical aspect in realizing this potential is community empowerment. In EU-funded Critical Making project, we explore the potential of the global maker movement to address the societal needs of communities and to challenge the existing economic structures in a responsible and inclusive way.

This article is primarily based on interviews that we have conducted with participants of the Critical Making Mentoring programme launched by the Critical Making project. The participants had an on-going maker project aiming at creating social impacts. The mentoring programme aimed at helping them enhance the sustainability of their practices as well as build for economic continuity. Building an online community and receiving peer support were important parts of the mentoring programme. A small financial support was also offered as part of the programme. The interviews are conducted twice with the same participants, first right before the start of the mentoring programme (“entry interviews”, 14 participants interviewed) and second time after the last workshop (“exit interviews”, 11 participants interviewed). All interviews were group interviews held online.

Here we are presenting the very initial first results of the interviews, cross-fertilized with earlier community empowerment literature. We were able to identify five aspects that are especially important for empowering maker communities of the global south, namely creative resource mobilization under scarcity, increasing situational awareness, learning to manage relations with wider society, new skills and knowledge, and sharing and openness. The analysis we will present is initial, and the work of conceptualizing community empowerment of maker communities and the potential impacts it has will continue. Based on our research, the consideration of community aspects is crucial in creating impactful maker communities with potential of bringing about positive societal changes.

05/1

Six Arguments why Critical Making is open, local and connected, social and diverse, reflexive, impactful, joyful and meaningful



In 2021 five mostly European-based organizations launched the participatory research project "Critical Making" to explore the criticality and responsibility of current maker practices (https://criticalmaking.eu/). Recent studies have shown the diversity of practices found in the global maker movement. Highly generalized, while making in the Global North involves a lot of tinkering and playing with the latest digital fabrication technologies, makerspaces in the Global South have a much more entrepreneurial function and are serving small local businesses as incubation spaces. Next to the innovation potential found in maker communities experts have assigned them great education potential. Critical Making builds on these findings and defines three areas of research interest, namely gender, education and open innovation. In a series of co-creation activities members from the global maker movement were invited to reflect on current practices and suggest concrete projects that contribute to elaborate core principles of Critical Making. Through these explorations and practical implementations the following aspects have been defined as describing core principles or values of Critical Making, each exemplified each by a concrete project:

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05/2

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Open: Critical Making promotes open collaboration, including the sharing of skills and knowledge. It boosts creativity in the ecosystem of makers by making processes and results accessible.
The Water Filter kit https://wikifactory.com/+criticalmaking/stem-water-filter-kit developed in Kenya to teach about water filtration and recycling is an engaging, portable, recyclable, modular, scalable and replicable STEM kit.

Local & connected: Critical Making is happening locally, working on the ground and adapted to a particular socio-cultural context. Thereby, critical making implies an engagement with local communities as well as global networks - thinking globally and making locally.
In the "Gosanitize" project https://gogirlsict.org/gosanitize/ in South Sudan teachers are producing hand sanitizers from locally available material with local female brewers. They took on this approach from MboaLab in Ghana, who gave them remote training on the process.

Social & Diverse: Critical Making reflects on the social dimensions of making, the living realities of those persons involved and concerned, as well as the ethical implications of their work. Critical Making thereby addresses societal challenges and needs. That's why it is so important to strive for diversity and inclusiveness.
The Xixi project, https://wikifactory.com/+criticalmaking/stories/xixi-inspiration provides a tool for women, non-binary and trans persons for intimate safety when they need to use the streets to relieve themselves.

- **Reflexive:** Critical Making re-thinks and re-constructs the dominant mainstream maker culture from a critical stance, reflecting on underlying power structures and their implications.
  - The manual on how to create inclusive makerspaces https://criticalmaking.eu/creating-an-inclusive-and-welcoming-maker-space/ offers guidance, resources and tips on how a makerspace and its community can become more inclusive, diverse and welcoming to those, who might feel under-represented.

- **Impactful**: Critical Making aspires to really make a difference. It seeks to improve life and build a sustainable future.
  - The Responsive Open Source modular Housing Prototype project https://wikifactory.com/+criticalmaking/stories/roshop is a housing prototype for complex post-conflict and politically unstable environments. It was created at the Pagirinya South Sudanese Refugee Settlement in Uganda, as a response to urgent community-use housing needs.

- **Joyful & meaningful**: Critical Making is still about the joy of and in making, but adds meaning to it. What is made critically is made with a specific purpose of individual or social kind.
  - The open source educational wood game Virando Jogo https://wikifactory.com/+criticalmaking/stories/virando-jogo-open-source-educational-games emerged during the pandemic to offer joyful remote education for young children and stimulates their sense of cultural belonging.

The project is offering tools for makers to self-assess and reflect on these principles in their practice. In this contribution we present the status of our work, and spark discussion around these principles and how they relate to social justice.

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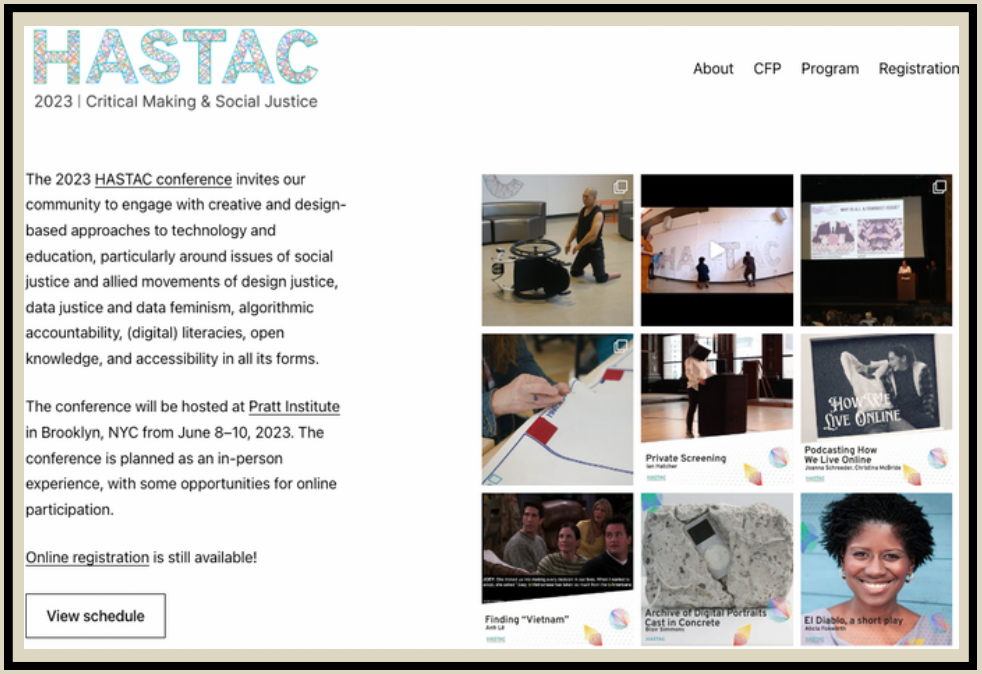
06/1

How to increase gender-inclusiveness in critical making: innovative formats and measures co-created with makers worldwide



In the collaborative research project Critical Making, which is conducted by five European-based partner institutions and financed under the European Research Framework Horizon 2020, we study grassroots innovations in the global maker movement. In this research on maker practices we put a special focus on gender relations. We started our work with a collection and review of existing initiatives and programmes, on- and offline, that are aimed to engage and accept cis and trans female, inter*, and non-binary persons in the community of responsible innovators and makers. Gender aspects have been investigated in the maker movement for some years now and studies confirm a cis male gender bias in maker settings across the globe (Maric, 2018; Wittemyer et al., 2014).

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06/2

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In a participatory research manner we wanted to collectively explore what measures can contribute to a more balanced gender representation in making. In our approach towards gender, we define gender as a relational, fluent category of social structuring and relevance, which is inherently tied to power differentials and inequalities. We do not consider gender as binary, but as a category offering space to cis and trans men and women, inter* and nonbinary persons and those not only attributing themselves to one of these categories. In relation to the concept of intersectionality (Crenshaw, 1989), gender cannot be deduced as a single category of interest, as at the level of individuals gender intersects with other categories of discrimination such as race, class, disability or sexual orientation. In three online workshop sessions with 12 representatives of the maker community, which were happening in October and November 2021 a series of gender-specific measures were co-designed to achieve a more gender diverse participation in makerspaces. The proposed measures include new formats for caretaker inclusive making, supporting women in local communities to engage in making, and specific communication and dissemination activities to highlight gender diversity in making, such as the documentation of inspirational stories.

https://criticalmaking.eu/gender-equality/

The feedback from those implementing these measures has been very positive so far. For example, the two maker organisations HONF and XXLab in Yogyakarta, Indonesia, ran an inclusive space camp, where they invited mothers, nonbinary persons and children to produce innovative projects out of everyday and domestic objects. They engaged 20 mothers & children, 4 nonbinary persons and 65 participants from the general public in total in their activities. Participating mothers all valued the experience of making as very rewarding. However, those mothers who were in their teenage years had varying interests and would have liked to work more with coding and programming rather than hands-on activities. Another example is the GoSanitize project implemented by the GoGirls ICT initiative in South Sudan. Based on the shared experiences from the MboaLab in Cameroon young female brewers were trained to produce highly concentrated alcohol (ethanol) for use in the hand sanitizers. In order to counteract slander of women being involved in the production of alcohol, religious leaders were invited for their approval and important safety standards for local brewers were discussed, which all contributed to strengthening the female brewers businesses. In our contribution for HASTAC 2023 we will elaborate further on the co-created measures for gender-inclusiveness in making and discuss the experiences and feedback collected from their implementation in maker communities worldwide.

The authors of this proposal intensively collaborated in the presented activities. Representing diverse geographical and cultural contexts, they combine a history of researching social innovations in technology and making, with in-depth experiences of implementing hands-on innovation processes in local maker communities. We write this proposal as 3 women and 1 nonbinary person, as 2 white persons from the Global North and two BPOC from the Global South, as nondisabled social scientists and makers. Our different perspectives have enriched our mutual collaboration and the presented activities.

https://hastac2023.sched.com/event/1LeRR/how-to-increase-gender-inclusiveness-in-critical-making-innovative-formats-and-measures-co-created-with-makers-worldwide?iframe=no

Further reading 1/3

Do you want to explore Critical Making further? Here is our curated - but non-exhaustive - selection of recent (including the last 5 years) publications from international scholars:

Critical Making (Concepts, Theories and Practice)

- Hertz, Garnet (2023). Art + DIY electronics. The MIT Press, Cambridge, Massachusetts. https://doi.org/10.7551/mitpress/9324.001.0001

- Ratto, M. (2019). Not Just Guns but Bullets, Too: "Deconstructive" and "Constructive" Making within the Digital Humanities. In M. K. Gold & L. F. Klein (Eds.), *Debates in the Digital Humanities 2019*(pp. 307–318). University of Minnesota Press. https://doi.org/10.5749/j.ctvg251hk.29

- Loes Bogers & Letizia Chiappini (eds); (2019) The Critical Makers Reader: (Un)learning Technology, Institute of Network Cultures, Amsterdam https://ualresearchonline.arts.ac.uk/14218/3/CriticalMakersReader.pdf#page=19

Openness and Critical Making

- Arancio, Julieta, and Shannon Dosemagen. "Bringing Open Source to the Global Lab Bench." Issues in Science and Technology 38, no. 2 (2022): 18–20. https://issues.org/open-source-science-hardware-gosh-arancio-dosemagen/

- Arancio, J. C. (2021). Opening up the tools for doing science: The case of the global openscience hardware movement. International Journal of Engineering, Social Justice and Peace, 8(2), pages 1-27

Further reading 2/3

Do you want to explore Critical Making further? Here is our curated - but non-exhaustive - selection of recent (including the last 5 years) publications from international scholars:

Gender and Critical Making

- Chaar López, Iván. 2022. 'Latina/o/e Technoscience: Labor, Race, and Gender in Cybernetics and Computing'. Social Studies of Science 52 (6): 829–52. https://doi.org/10.1177/03063127221108515.

- Cipolla, Cyd. 2019. 'Build It Better: Tinkering in Feminist Maker Pedagogy'. Women's Studies 48 (3): 261–82. https://doi.org/10.1080/00497878.2019.1593842.

- Eckhardt, Jennifer, Christoph Kaletka, Bastian Pelka, Elisabeth Unterfrauner, Christian Voigt, and Marthe Zirngiebl. 2021. 'Gender in the Making: An Empirical Approach to Understand Gender Relations in the Maker Movement'. International Journal of Human-Computer Studies 145 (January): 102548. https://doi.org/10.1016/j.ijhcs.2020.102548.

- Hedditch Sonali & Vyas Dhaval (2023) Crossing the Threshold: Pathways into Makerspaces for Women at the Intersectional Margins. in Proceedings of the ACM on Human-Computer Interaction 7(CSCW1):1-40 DOI: 10.1145/3579599

- Loose, Elisabeth. 2020. 'A Morphological Exploration into Gender Inclusiveness and Environmental Attitudes Concerning Maker Practices in Makerspaces in the United Kingdom, Germany and Austria'. Glasgow: University of Glasgow.

- Wuschitz, Stefanie. 2022. 'A Feminist Hacklab's Resilience towards Anti-Democratic Forces'. Feminist Theory 23 (2): 150–70. https://doi.org/10.1177/14647001221082298

Further reading 3/3

Do you want to explore Critical Making further? Here is our curated - but non-exhaustive - selection of recent (including the last 5 years) publications from international scholars:

Education and Critical Making

- Ratto, Matt, and Garnet Hertz. 2019. "Critical Making and Interdisciplinary Learning: Making as a Bridge between Art, Science, Engineering and Social Interventions." In The critical makers reader: (un)learning technology, edited by Loes Bogers and Letizia Chiappini, INC reader 12. Amsterdam: Institute of Network Cultures.

- Unterfrauner, E., Voigt, C. & Hofer, M. (2021). The effect of maker and entrepreneurial education on self-efficacy and creativity. Entrep Educ . https://doi.org/10.1007/s41959-021-00060-w

- Vuorikari, Riina, Anusca Ferrari, and Yves Punie. (2019). Makerspaces for education and training: exploring future implications for Europe. Luxembourg: Publications Office of the European Union. OCLC: 1127885227

useful links

Critical Making library on Zotero:
https://www.zotero.org/groups/3695948/critical_making_literature

Critical Making publications on Zenodo:
https://zenodo.org/search?page=1&size=20&q=critical%20making

Critical Making community:
https://wikifactory.com/+criticalmaking

Critical Making resources:
https://criticalmaking.eu/resources

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