Realizing Fab 2.0 as an endeavour with meaning and value

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Abstract

Fab Labs are communities guided by ideology, the desire to democratize production. However, actual activities in some Labs appear contradictory to ideological rhetoric, especially to critics. Issues that are important to Labs in theory, from supporting peer learning to localizing production to encouraging fabrication according to need, are easily overshadowed by structural conditions and current concerns. Impacts outside the Lab can remain invisible. Given these conditions, Fab Labs in the global North are often seen as mere hobbyist spaces for a homogenous elite. Positive work therefore needs to be better communicated, but Labs also need to build in time for reflection and visioning if they are to avoid becoming a 'printing service'. The paper is based on the author's doctoral research findings. The study articulated how ideology could be materially seen in Fab Labs, but also how it could eclipse the reality of socio-environmental impacts outside the Lab. At the same time, the existing society within which Fab Labs operate present dominant conditions that weaken the ability to enact ideology. This tension is best made explicit: when Fab Labs can acknowledge when they are compromising their ideals and when they are creating value for themselves and others.

1   Introduction

Fab Lab managers have long realized how easy it is to become 'just another printing service' while struggling to ensure revenue streams. This paper summarizes key aspects of my doctoral research, where I have studied European Fab Labs in various stages of development (Kohtala, 2016). It is especially based on a longitudinal (three years') ethnographic study of one Fab Lab in northern Europe (Kohtala, in review). In the Labs studied, managers struggle to establish strategy and vision at the same time as dealing with everyday tasks and institutional structures. Their successes at enacting visions and also their compromises are seen in the material configurations of their Labs, which affect how outsiders perceive the Fab Lab network and how participants are recruited into fabbing. Fab Labs who do not consciously consider their activities and impacts can easily slide into promoting a Fab 2.0 model that is – at best – a mere service without meaning for managers or users or – at worst – a model that promotes the status quo: the undemocratic, technocratic, black box mode of production the Fab Lab network is espoused to counteract.

2   What we *say* in Labs

Why do Fab Labs exist? From the outset of the National Science Foundation grant, Fab Labs were established for educational outreach and, "instead of bringing information technology (IT) to the masses, fab labs show that it's possible to bring the tools for IT development, in order to develop and produce local technological solutions to local problems" (Gershenfeld, 2005, 13). Fab Labs were therefore explicitly established to address the digital divide between "developed" and "developing" countries (or privileged and underprivileged regions) in terms of fabrication tools (Gershenfeld, 2005, 13, 249-251). Over the ensuing years the network has co-developed new practices and shared values aligned with

"empowerment", education and peer learning, as the route to "democratization" of production and technologies (Gershenfeld, 2005; 2012; Walter-Herrmann & Büching, 2013).

How does this, then, construe the role of Fab Labs in "developed", post-industrial economies? In the global South, there are areas of visible inequity: where access to resources (natural resources, technologies, tools, skills, education and the like) is limited for many citizens and regions are more vulnerable to the externalities of mass production such as natural resource exploitation, labour exploitation and pollution. In these geographies Fab Labs have a clear role. Democratizing the means of invention and production, enhancing people's ability to meet their own local needs, would appear to have clear socio-economic *and* environmental, ecological benefits in these contexts. In the global North, however, where people are generally highly educated, they have greater access to capital, and technologies are widespread even if not widely understood, what is the perceived need of a Fab Lab and fabrication tools?

Fabbing is clearly seen and promoted as something new and different: an alternative to mass production, to being reliant on large corporate technology providers, to consumerist values and acts without meaning, and to traditional ways of work that are hierarchical and unfulfilling. But what people say and what people do are different animals: Fab Lab organizers face time constraints and institutional and structural barriers that hinder their ability to rehearse, act out and do experiments with what their ideology means in practice. We all want to document and share our work, but we *do* it less often than we would wish. We want to build a new economic and social model, but we live in a world with others and their habits, infrastructures and systems that do not understand or consciously erode any new, disruptive models. We all either run out of time or money.

In my doctoral research, I was especially foregrounding the environmental issues of making and the socio-environmental potential of the new production paradigm being co-created in Labs. Fab Labs are spaces where new practices around open design and open innovation meet new uses of materials (and new materials) and energy-intensive production methods: where the espoused equipotentiality (Bauwens, 2005) of citizens globally for creative making and invention may or may not meet equitable global access to and use of energy and natural resources.

The aims of empowerment and democratized production in Fab Labs promise certain benefits: answering one's own needs as opposed to 'satisficing' through passive consumption (Gershenfeld, 2005); distributing production within local networks as opposed to long, large-volume supply chains (Walter-Herrmann & Büching, 2013); and the enhanced skills people acquire to build, disassemble and repair (e.g. Mellis and Buechley, 2014). These benefits have clear environmental implications, from lessened negative environmental impact resulting from production only according to need, to more eco-efficient use of materials and products combatting planned obsolescence, to reduced negative impacts from transport emissions. There is clear potential for Fab Lab users and organizers to bypass the negative ecological impacts of mass production and consumption in their collaborative endeavours, but it is not self-evident that actors even acknowledge or actively pursue this potential, at least in the global North. This is not a concern if making and fabbing remain marginal and specialist, but given the rapid proliferation of both Fab Labs and digital fabrication capability, the potential to do away with these negative impacts associated with mass production and distribution (and decouple them from socio-economic prosperity) is as great as the potential that new, unforeseen environmental consequences will arise and spread. Moreover, my studies revealed how environmental issues in Fab Labs are more than simple concerns with energy, waste and materials: they are intertwined with and embedded in other ideological concerns in complicated and contingent ways. In simple terms, this means that ignoring socio-environmental issues can call into question the very rationale of Fab Labs: what a Fab Lab is for.

3   What we *do* in Labs

How social groups decide what to do together needs work. Co-creating ideologies and visions can be an effective way to congeal around a task and attract new participants. In science and technology scholarship, the ideology and "imaginaries" from which a particular group draws shed light on a technology as a socially constructed entity and its potential trajectories (Hyysalo, 2010). For Hyysalo, a

"practice-bound imaginary" comprises "the relatively integrated sets of visions, concepts, objects, and relations that practitioners regarded as desirable, relevant, potentially realizable, and as having cognitive and motivational power for organizing their practice" (Hyysalo, 2010, 76). Imaginaries and ideologies are seen as galvanizing, mobilizing elements: "It is this ideology that is used to legitimize the new technique, to attract and integrate new users, to provide a framework for use of the innovation. It also affords a set of justifications that enable designers and users alike to explain their engagement in the digital world" (Flichy, 2007, 208, on the development of the internet). The role of Fab Lab actors in propagating digital fabrication technologies and practices is no different. The ideology of democratizing production and empowering users incites, inspires and mobilizes, but it also creates a complicated relationship with the status quo: a "complex" relationship to markets (Powell, 2012).

From this perspective, technologies in a Fab Lab may be perceived, construed and contested as toys for non-professional hobbyists, low-cost inclusive tools or open and adaptable entities for highly skilled technicians, depending on with which practices and imaginaries they become associated. Critics of Fab Labs and the maker movement see a clear conflict: are Fab Labs aiming to offer a platform for communities and free expression, or business and free markets? These critics hear what Fab Labs and makers *say*, promoting local socio-economic opportunities for inventors and micro-entrepreneurs, but what they see makers *do* is being seduced by success of another kind, measured in economic profit and ensuring this profit by proprietary, protectionist means (as large corporations tend to do) (Morozov, 2014; Draitser, 2015). For other critics, the movement's claim that making is a meaningful, self-empowering act and a better, freer alternative to a consumerist worldview is questioned. In practice, they argue, makers only appear to "play with tools and make personalized schlock" (Sadowski and Manson, 2014); "exclusive knick-knacks for the anomic plutocracy" (Poole, 2012); or "crapjects" (Smith, 2012). The fact that these critics' condemnations appear largely based on what is shared on social media should give Fab Labs pause: to reflect on what images they are projecting, what outputs they are encouraging from their users, and/or how or if they are communicating their best and most socially meaningful projects.

In my research observations, many decisions in Labs were not based on ideals or ideologies but rather by convenience. Procurement procedures, for example, were largely *not* led by strategies to foster local, neighbourhood collaboration (or even local economies), nor prioritize locally available feedstocks. Practical duties often dictated priorities, activities and decision-making to the extent they could eclipse other values, whether this was an espoused commitment to open hardware and software or the desire to attract a particular community or user group. Shortcuts to save time also cut short envisioned worthy projects. Such compromises made visible the often hidden dynamics in how a social group such as a Fab Lab carries out its work: a group with a peer-to-peer operating mode that is emergent, heterarchical and explicitly defined as "open" and enabling, working in concert or in tension with formal institutional structures such as hosts (universities or municipalities), sponsors, funders or simply the surrounding community, the group of existing and potential users.

Fab Labs were third spaces, offering a counter-space keeping at bay the conventional realities of home and work (Kohtala & Bosqué, 2014). In such protected spaces, ideology can be exalted and massaged, and new technologies and practices can be shaped and honed. But the implications of digital fabrication outside this space were not often seen or discussed, from supply chains to energy sources to unsafe working conditions in other regions producing the components being used – even if clear consequences of a digitalizing society. That said, Labs were often sharply aware of their socio-geographical context: where in the city or region they were located, the history of the building or area, the demographic and socio-economic make-up of the neighbourhood and so on. How they were able to act on this awareness to create a distinct Lab identity was less apparent, however, especially in the sense of creating, maintaining and enacting a future vision.

4   What we *see* in Labs

Ideology, as well as compromises to meet ideals, become visible in objects and spatial arrangements in Labs. Fab Lab Amersfoort, for example, is known in northern Europe for its commitment to ecological awareness and knowledge, open hardware and software, and citizen science. The Lab's experiments

with plant boxes and beehives, its wood pellet heating system and its open hardware projects convey messages to visitors about what the Lab prioritizes and invite them to participate (Figure 1).
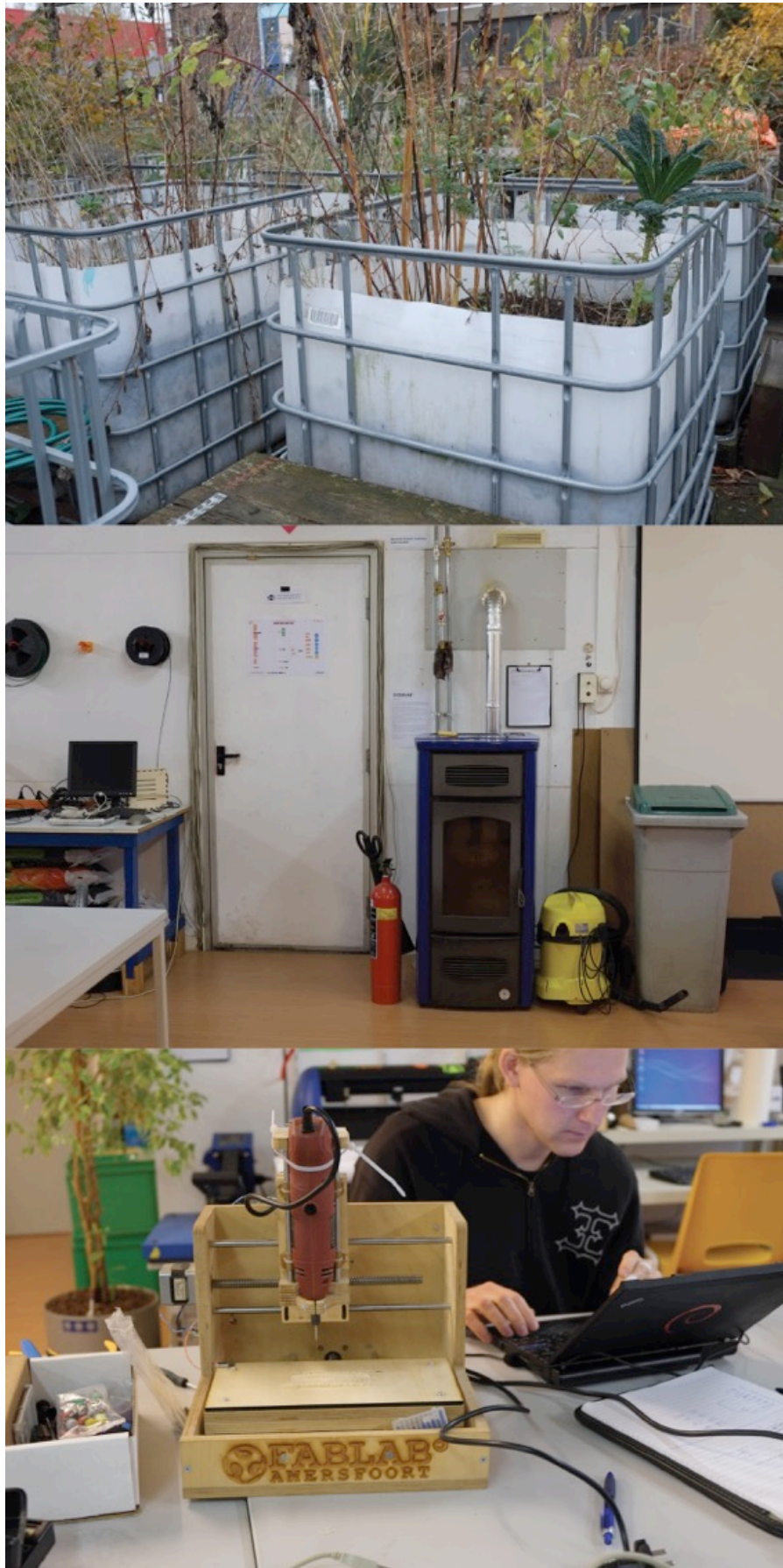

Figure 1: Fab Lab Amersfoort. Source: author.

Things also represent relationships and make them visible: the existence of the Fab Lab network, for instance, is represented in the video-conferencing system. In MIT-Fablab Norway, the polycom symbolized much more than a technological communication channel. The system often displayed webcam feeds from other Labs in the global network, rendering the network and relationships with other people and Labs visible and explicit. The system also stood for other relationships, as the Lab Director described: the ability to support distance education for local students in this remote region following university courses conducted further south. (Kohtala & Bosqué, 2014) In the main Lab studied, other Labs' webcams were also shown from time to time, and the system was used for the participants attending the Fab Academy. Three Lab employees had attended the Fab Academy as well as FABx meetings, and two had worked in other Fab Labs. However, once these employees left the Lab, the new employees used the screen to play music on a digital jukebox and for teaching, but they did not have access to the resources nor sociality of the network. The existence of the network via Lab webcams was thereby not visible, to the Lab organizers nor to users.

Lab culture and values are also communicated in other material artefacts in the space. These choices (or defaults) convey other implicit information regarding priorities and time constraints. Furniture, display shelves and storage systems may be bought (new or used), made from appropriated objects or fabbed in the Lab (Figure 2). There are clear environmental messages in these objects too: whether a second-hand piece of furniture is recruited into the Fab Lab space; how an object may be appropriated ('hacked') and turned into another object (Figure 2, centre right); or if new, mass-produced objects are purchased in lieu of custom objects being made onsite due to time constraints.
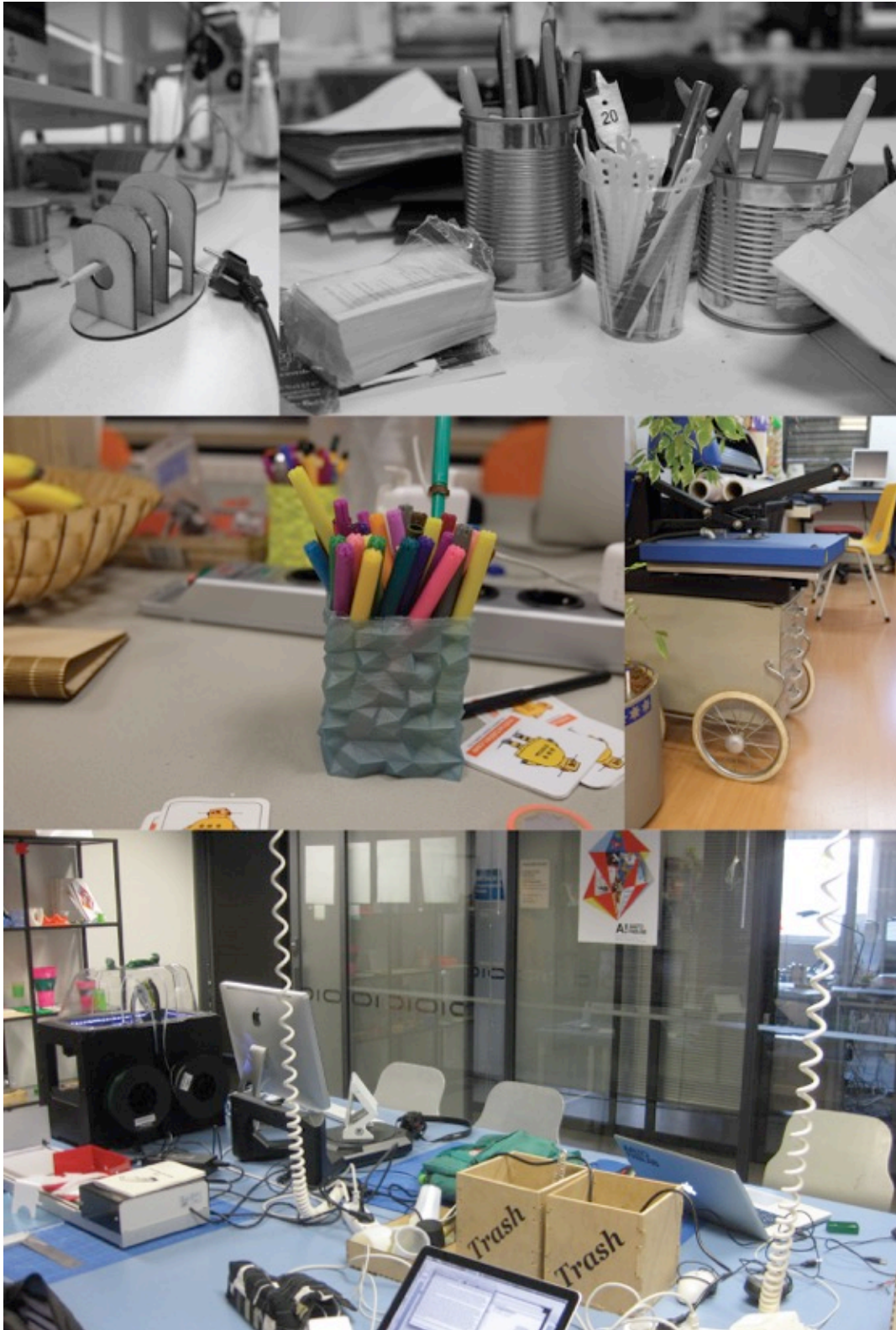
Figure 2: Material accessories in Fab Labs, in France, the Netherlands and Finland. Source: author.

Most importantly, environmental issues in digital fabrication are intertwined in other issues in Fab Labs, and these material realizations are visible in Labs even if the social meanings are not. Printer waste in Labs does not only represent wasted natural resources (and Lab finances): it becomes intractably entangled in issues that impinge directly on espoused Fab Lab ideology, extending beyond simple 'ecological concern'. It can symbolize user time and frustration (thus feelings of satisfaction and accomplishment versus lack of 'empowerment'); technology design decisions (thus feelings of estrangement from the very tools of 'liberation'); recycling (thus symbolizing dependent or independent

relationships with existing infrastructure and institutions); materiality (from the aesthetics of plastics to concern about Peak Oil); and so on.

The meaning of making and consequences of what a Fab Lab does is therefore best understood in both its tangible and intangible flows. Labs import objects from outside its walls – materials and equipment, but also ideas on what to make and for whom. Labs also release things into the community, the network and the wider society whose impacts are easy to ignore. Waste, emissions and artefacts (including 'crapjects') are the obvious targets of critics, but Fab Labs are a key delivery system for the meaning of digital fabrication and the relevance of democratizing production.
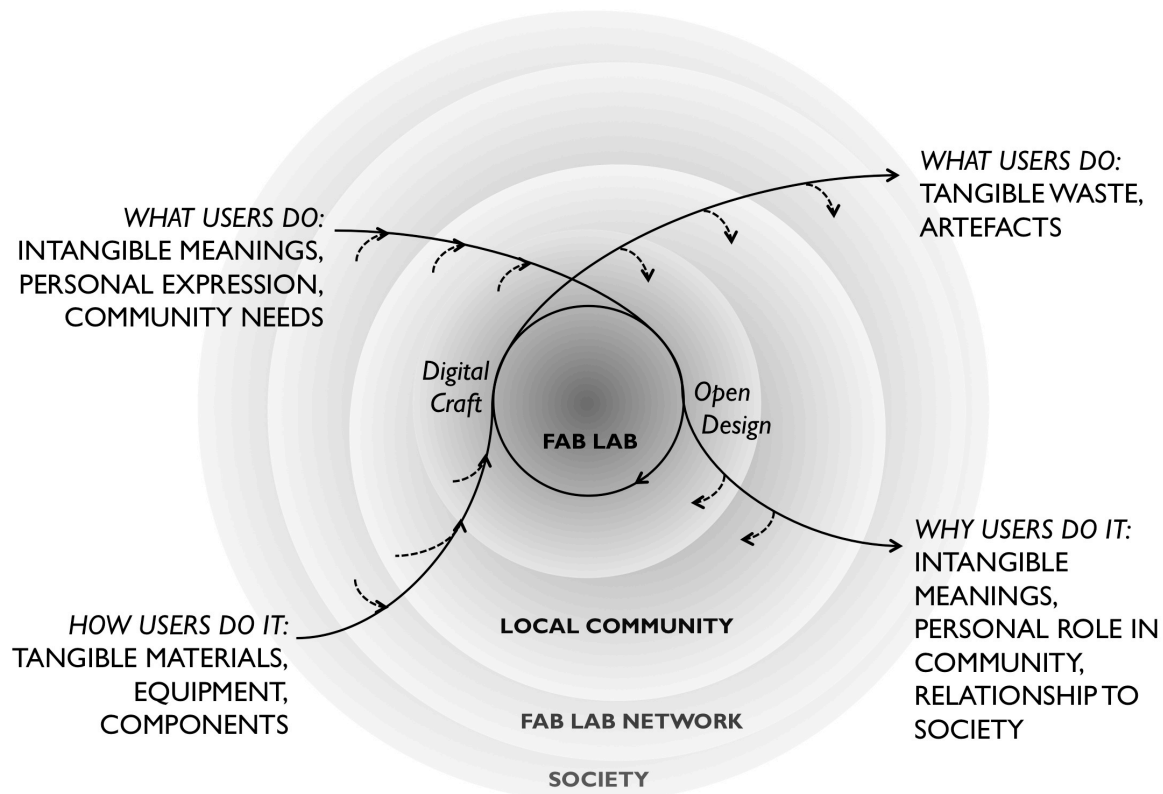
Figure 3: Fab Lab inputs and outputs: tangible and intangible impacts. Source: author.

5   Conclusions: What we can do

Given the strength of Fab Lab ideology, the Fab Academy and the network itself, Fab Labs are one of the best actors in the maker movement to communicate its impacts; generate new knowledge, practices and solutions; and ensure making has meaning. Achieving this requires reflection and critical discussion: do everyday actions reflect vision, values and ideology? Environmental sustainability is but one thread in the sociotechnical fabric of Fab Labs, but it is an integral thread. To counteract the negative criticism that Fab Labs in the global North are mere hobbyist spaces for a homogenous elite, there could be more stories and narratives on how Fab Labs are contributing to a sustainable distributed economy paradigm: engaging in research and with researchers, co-creating solutions with diverse stakeholders, and articulating how environmental concerns intertwine with the existing concerns of education and entrepreneurship.

The contingencies, the very situatedness of Fab Labs, mean that every Lab must be built anew. Even experienced Fab Lab founders, managers and gurus must take time to understand the local conditions when setting up a new Lab to stimulate and sustain engagement with the local user and stakeholder communities – to understand the local needs. There are therefore relatively few default modes of operation or established routines, no Lab-in-a-kit, that can be implemented quickly, allowing more time and focus on identifying strategy and target users nor the most appropriate action plans or partners. The mundane – setting up the Lab and its procedures, maintaining it, maintaining inventory, serving users

and organizing short-term activities – easily takes precedence; the *what* of what needs to be done can dominate the *how* things could or should be done, and especially *why*.

A Lab's situatedness is therefore its strength, the source of its identity and mission, which can help sustain it over time and nurture commitment. It is also its weakness, as this identity and mission must be co-constructed among a variety of actors, and usually repeatedly. If not, the *why* of the Fab Lab dissolves; Labs discover after a certain period of time that they have become just another printing service; and they need to firmly establish a new strategic direction and a clearer identity of what they are for. For Fab Labs this translates into a question of not mere empowerment, but *how* it should be effected (and, of course, *who* should be empowered, but that is an ongoing and salient question). Making things easier for new makers (via kits, for instance, or easier user interfaces for software) also tends to remove functions and control from the hands of the very users intended to be empowered. The same tension between convenience and control is also true of making a Lab itself, via manuals and guidelines. Such a manual can pre-empt and make invisible the very questions a Fab Lab founder should ask him- or herself: what is this Fab Lab for? Fab Labs and the network will develop and mature, consolidate and become infrastructure, but the direction of decentralizing and distributing control to regional bodies and keeping the remit of Fab Labs open to ensure diversity still appears preferable to an easily implementable, standardized Lab-in-a-kit. This would also ensure the new, young Lab understands its role and responsibility (and the sustainability implications entwined) in its situated local community.

Acknowledgement

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