Notes for future research on the impact of the Fab Lab network

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Bio

Massimo Menichinelli is a designer and researcher who works on open, collaborative, and co-design projects and the systems that enable them since 2005. Massimo has published several books and scientific articles about Fab Labs, the Maker movement, Open Design and collaborative design processes; furthermore, he has given lectures and workshops in various countries including Italy, Spain, Finland, Germany, United Kingdom, Mexico, Colombia, South Korea and Singapore. He worked on the development of several Fab Labs including the Aalto Fab Lab (Helsinki), the MUSE Fab Lab (Trento) and Opendot (Milan), and has facilitated more while working as a Director at Make In Italy Italian Fablab & Makers CDB Foundation where he researched and facilitated Fab Labs and Makers in Italy. He lectured on Digital Fabrication and Open Design at Aalto University, SUPSI (Lugano) and at the Fab Academy edition at WeMake and Opendot (Milan). He currently works as a project manager for research projects at IAAC | Fab City Research Lab (a design and make think tank launched by Fab Lab Barcelona), especially in the MAKE-IT Horizon 2020 European project and as project manager of Fablabs.io, the official and open source platform for the global Fab Lab Network.

Abstract

Throughout the years, research initiatives related to the global Fab Lab network emerged by addressing several issues with scientific articles and popular books, among the many publications. However, there are still many issues in the Fab Lab network that should be addressed by future research, specially regarding the impact of Fab Labs on society. This short contribution aims at proposing a set of research questions and methods for the Fab Lab network, that should be considered more as notes shared among members of the community than as a structured research proposal. The notes presented in this article reflect upon this topic and emerged from working in a Horizon 2020 research and innovation project of the European Union, MAKE-IT, that is specifically oriented at understanding and improving the social impact of Makers and therefore also of Fab Labs. Understanding the impact of the Fab Lab network on society is one of the most strategic directions for improving the network and its role in society. This short contribution proposes a framework, a list of research questions for moving forward in this direction, in order to start a discussion, research initiatives and potential collaborations in them.

1.   Introduction

In the past few years , research initiatives related to the global Fab Lab network emerged by addressing more issues, from digital fabrication technologies (Hawkes et al., 2010; Knight & Stiny, 2015; Liu, Boyles, Genzer, & Dickey, 2012) to the everyday practice in labs (Wolf, Troxler, Kocher, Harboe, & Gaudenz, 2014); from exploring specific labs or contexts (Ronald N. Beyers, Blignaut, & Mophuti, 2012; Fonda & Canessa, 2015; Kohtala & Bosqué, 2014) to exploring the global social ecosystem (Menichinelli, 2016b); from exploring business models of labs (Troxler, 2013; Troxler & Wolf, 2010) to exploring the work dimension at a national scale (Menichinelli, Bianchini, Carosi, & Maffei, 2017); from exploring educational activities in workshops (Ronald Noel Beyers, 2010) to exploring them at a national scale (Menichinelli, Bianchini, Carosi, & Maffei, 2015); and finally towards addressing sustainability (Kohtala, 2013, 2016b, 2016a). Furthermore, the Fab Lab network has been explored in several books as well, starting from the first book that contributed to launching the movement (Gershenfeld, 2005) to a more recent wave of publications (Bosqué, Noor, & Ricard, 2014; Eychenne, 2012; Menichinelli, 2015, 2016a, 2017; Walter-Herrmann, 2013). However, there are still many issues in the Fab Lab network that are largely unexplored and therefore should be addressed by future research, expanding existing investigations , opening new frontiers and testing and adopting new research methods. This short contribution aims at proposing a first set of research questions for the Fab Lab network, that should be considered more as notes shared among members of the community than as a structured research proposal.

"*Fabricating Society*" is the central topic of the 2017 edition of the International Fab Lab Meeting, the 13th edition, focused on how to address the "*many gaps in strategic dimensions that make the process of constructing a developed society challenging*"[1] by presenting and discussing successful projects that create high social impact. The notes presented in this article reflect upon this topic and emerged from working in a Horizon 2020 research and innovation project of the European Union, MAKE-IT[2], that is specifically oriented at understanding and improving the social impact of Makers and therefore also of Fab Labs.

2.   The MAKE-IT research and framework

The growing interest on online platforms is arguably one of the consequences of the success of companies like Amazon, Apple, Facebook, and Google, that have based their business models less on competition and more on collaboration with providers and users by building ecosystems, partnerships and communities (Simon, 2011). Their ability to leverage the long-tail of markets and communities and scale is one of their most admired features (Anderson, 2008), together with the ability to offer a place for multiple individuals or groups to get together in order to exchange goods and services (multisided platforms) (Evans & Schmalensee, 2016). The general interest that is emerging from such platforms is mainly due to their economic performances, but there are several other platforms that are also interesting for different reasons: not for conquering markets and creating profits, but for supporting democratic practices that are environmentally aware, participatory and based on sharing and collaboration. These platforms are called by Fabrizio Sestini Collective Awareness Platforms: (CAPS) (Sestini, 2012): and beside MAKE-IT several other Horizon 2020 projects[3] are working in this context along these directions: Open Democracy, Open Policy Making, Collaborative Economy, Collaborative Making, Collaborative Consumption, Environmental action, New Collaborative approaches[4]. CAPS are therefore not limited to only one sector, but more generally "*are defined as ICT systems leveraging the network effect (or the "collective intelligence") for gathering and making use of open data, by combining social media, distributed knowledge creation, and IoT. They are expected to support environmentally aware, grassroots processes and practices to share knowledge; to achieve*

1http://fab13.fabevent.org/
2http://make-it.io/
3https://capssi.eu/
4https://ec.europa.eu/digital-single-market/en/collective-awareness

changes in lifestyle [...], production and consumption patterns; and to set up more participatory democratic processes. The ultimate goal is to foster a more sustainable future based on a low-carbon, beyond GDP economy, and a resilient, cooperative democratic community." (Sestini, 2012, p. 58). Rather than just focusing on technology, the goal of such platforms is "*to move beyond purely technology-driven solutions to enable new organizational, social, and governance models. These are needed to face the current societal challenges and achieve sustainability and well-being*" (Sestini, 2012, p. 54).

MAKE-IT is a Horizon 2020 European research project focused on how the role of CAPS enables the growth and governance of the Maker movement, particularly in relation to Information Technology, using and creating social innovations and achieving sustainability. The results of this research will help to understand the uses and impacts of CAPS in different contexts, as well as of the Maker movement itself. The mainresearch questions of the project are:

- How can Maker communities achieve sustainability and organize themselves?

- What do Maker participants do, and how do they behave?

- What value do they create, and how does this benefit society?

- How can we help their governance, their impact and sustainability?

MAKE-IT started in January 2016 and it is now finalizing research activities and outputs that we are already sharing on thewebsite make-it.io and that we hope can be useful for the Maker movement and for all its stakeholders in research, policy making and business activities. One of the most important elements of MAKE-IT, specially for future research, is its main analytical framework (Millard et al., 2016)that can be adopted for understanding the impact and social dimension of Maker initiatives and not just on platforms. The role of the framework is to foresee and monitor the development of the Maker movement in the context of the CAPs approach, as a flexible conceptual and analytical tool for MAKE-IT during the project and as a final output for all the researchers interested in it. The focus of MAKE-IT and its analytical pillars (Figure 1) is on the role of CAPs in:

1. how Maker communities are organised and governed;

2. what Maker participants do and how they behave;

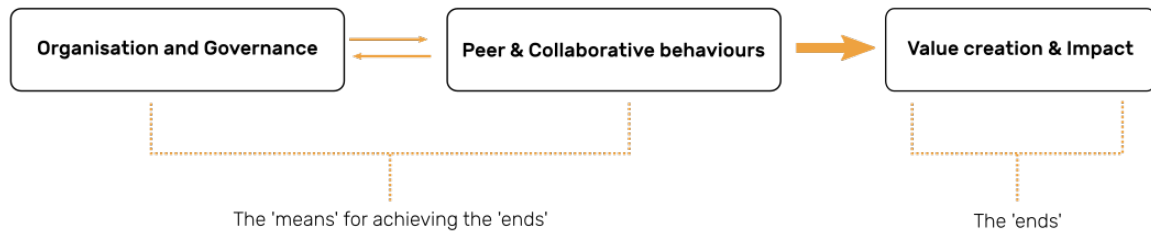3. the various ways this impacts on and adds value to society.

Figure 1: The analytical pillars of the MAKE-IT framework (Millard et al., 2016)

This simple framework could be very useful for informing several researches for the Fab Lab network, especially the ones dedicated to understanding the impact of the network and of its labs and participants on society. The role of digital platforms is important, and often crucial in connecting people, labs and researchers, but the framework can be used also outside digital platforms, more generally for understanding the social impact of Maker initiatives. The importance of this framework is of exposing the social interactions and processes that enable the impact of Maker initiatives, giving therefore more depth to understanding what could improve them. I suggest to consider the investigation of the impact of the Fab Lab network as a very strategic move, it is a sign of maturity for the network and for its researchers, at least for these reasons:

1. if we understand our impact, we can reorient our activities in order to strengthen it wherever and whenever necessary;

2. if we understand our impact, we can further communicate it and improve it (and this, hopefully, would bring to a larger impact by getting more stakeholders involved);

3. if we manage to measure our impact and find interesting results, then we are becoming a more self-aware community and more experienced researchers, and ultimately we can provide evidence of our role in shaping society.

The history of Maker movement and of the Fab Lab network is the history of like-minded people finding each other all over the world, in spite of differences and distances. If we manage to understand the impact of the Fab Lab network we can also then apply the knowledge and expertise acquired in order to understand the impact of other ecosystems made of distributed and autonomous agents.

3.   Notes for future research questions

Research in/with/for the Fab Lab network should aim at both understanding the present conditions and also at proposing potential future developments. Here is a first list of potential research questions that might be helpful to understandthe impact of the Fab Lab network and that would be strategic to address in the future:

1. Social dimension and its sustainability

1.1. What are the sizes of the local communities of each Fab Lab and what is the size of the global network? Given the distributed nature of the network, how can we measure them?

1.2. And beside just the number of people participating in the community, what are their demographic characteristics? Are there any gender gap or other gaps, and how could we reduce them?

1.3. How can we understand the social structure of the local communities and of the global network? What are the interactions and processes taking place among members of the communities? How can we improve collaboration and social structure in the communities?

1.4. Is there only one culture in the network, or do we have several cultures? What are the cultures of the local communities of each Fab Lab and, as a whole, of the size of the global network? How can we research and understand this dimension?

2. Economic dimension and its sustainability

2.1. What are the existing business models of labs, what are the most recurring patterns? Could these business models be improved, changed or developed? How could we measure the impact of existing and new business models on the activities of users and labs and of the network as a whole?

2.2. What are the existing business models of projects developed in labs, what are the most occurring patterns? Could these business models be improved, changed or new ones adopted? And how could we measure the impact of existing and new business models on the activities of users and labs and of the network as a whole? How could we improve the design, acceleration or incubation, sharing, commercialization and distribution/deployment of such projects?

2.3. What are the existing work conditions of users accessing the labs or people working in the labs? How could we understand them and improve them?

2.4. How are the business and work dimensions of labs, projects and people interconnected? How can we balance them and understand how this activity influences them?

3. Environmental dimension and its sustainability

3.1. Have Fab Labs measured their supply chains and the life cycle of materials, components and projects? How could we help Fab Labs and the network in this task, and improve their sustainability?

3.2. Have Fab Labs measured their usage of energy and carbon footprint in labs and in the network as a whole? How could we help Fab Labs and the network in this task, and improve their sustainability?

4. Impact

4.1. Do Fab Labs have an impact on society, economy and the environment? How can measure it for single labs and for the network as a whole?

4.2. What is the influence of labs and their projects on local systems, even beside manufacturing? For example: does a Fab Lab influence the local production of food or educational activities or unemployment? And how could this be measured (and best practices scaled) at network level?

4.3. More specifically, what is the impact of labs and their projects on city, regional and national resilience?

4.4. How can we take into account the differences among Fab Labs and their local contexts in order to have a balanced understanding of their impact between local impact and global impact and knowledge transfer with other labs?

5. Role of platforms

5.1. What could be the business models for the Maker and Fab Lab platforms?

5.2. How could we design the Maker and Fab Lab platforms taking into considerations the needs of a worldwide community of users and labs and by balancing all these different needs with the complexity of a platform?

5.3. How could we improve the participation of users and labs in the design/development and managing of such platforms?

5.4. How can we measure and understand the impact of a platform over the activities and sustainability of users, labs and of the network as a whole?

All of these research questions are important on their own, but they would become strategically relevant when integrated in a coherent model that can be used for estimating the impact of Fab Labs on society, the environment and the economy, if any. A model, although it is a simplified map of a very complex reality, could be also used to communicate quickly the impact of a Fab Lab, a sort of Fab Lab Impact Index, for example like OECD measures and visualizes well-being at national[5] and regional level[6]. The MAKE-IT framework can be applied to this in order to understand the role of organisation, governance, processes and interactions on the creation of value: in order to understand the immaterial elements of social interactions and processes that most of the time go unnoticed.

Research in/with/for the Fab Lab network is not an activity that takes place without the participation of makers and of the Fab Lab community, and it should learn from the continuous creative activities done. For this reason, I suggest to adopt also a design approach, following the definition of design elaborated by Nelson and Stolterman which establishes design as a method of inquiry separated from the scientific and the artistic ones, which is not a mix or intermediate approach between the two but a culture of its own: *"Design is a tertium quid— a third way — distinct from the arts and sciences. In support of this argument we make a case for the reconstitution of sophia— the integration of thought and action through design. We make a case for design as its own tradition, one that reintegrates sophia rather than following the historical Western split between science and craft or, more recently, between science and the humanities."* (Nelson & Stolterman, 2012, p. 11).

The important point of the design approach is that it points to future development rather than to an analysis of existing conditions. In this direction, I suggest to especially experiment with a *research through design* approach where the design practice generates insights with its own original methods, tools and skills. The artifact is not the goal of research through design; knowledge and understanding is and

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5http://www.oecdbetterlifeindex.org/
6https://www.oecdregionalwellbeing.org/

artifacts are a side effect: "*researchers make prototypes, products, and models to codify their own understanding of a particular situation and to provide a concrete framing of the problem and a description of a proposed, preferred state [...] By practicing research through design, design researchers can explore new materials and actively participate in intentionally constructing the future, in the form of disciplined imagination, instead of limiting their research to an analysis of the present and the past*". (Zimmerman & Forlizzi, 2008, p. 42).

4. Conclusions

Several researches have been done in order to better understand the Fab Lab network, and understanding its impact on society is one of the most strategic directions for improving the network and its role in society. This short contribution proposes a framework and a list of research questions for moving forward in this direction, in order to propose potential collaborations in new research initiatives.

5. Acknowledgements

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