EXPLORING NEW CO-PRODUCTIVE PATHS IN DESIGN-DRIVEN INNOVATION

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STS italia

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Co-production and creative economies

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In urban contexts, what has been called 'maker culture' has recently given birth to a collaborative ecosystem of innovation made up of institutions, enterprises, universities, creative professionals, citizens and associations. This trend has engendered an urban community of innovators who are active in many fields and an array of collaborative spaces which are hybrid in nature, such as co-working spaces, fab labs, incubators, and creative centers. This is a distributed system of hyperlocal 'incubators of experiences' that generate what can be considered a new creative class. This paper compares the two cases of maker culture in the cultural industry addressed by the other essays in this book, namely collective architecture and fab labs operating in the field of fashion. Through comparison, some key issues of the new trend become manifest.

Keywords*: citizen-centric innovation, maker culture of production, new creative class, city, creative industries, architecture, fashion.*

Introduction

Something is changing in industry. The traditional landscape of factories, processes and actors is being progressively transformed, creating an opportunity for new socioeconomic, organizational and technological models of innovation to arise, namely, what has been termed the maker culture of production.

The city has once again taken center stage. As during the first industrial revolution, metropolitan areas have become agents of social change and development by bringing together demand and supply: demand for product-services, technologies and infrastructure, economic, political and organizational resources, environmental knowledge, physical spaces, and supply of individual and collective competences and skills, research facilities (private and public entrepreneurship, universities, labs and research

institutions) and the infrastructure of production and distribution that enables everyday city life.

The city itself is also a vast market for innovation made up of both public and private actors deeply rooted within its physical and social structure. Such a market may benefit from an innovative, distributed system of production, embedded within city systems, supplementing the existing one. It may be possible to nurture a new idea of manufacturing as a public-private 'alliance' and cross-disciplinary development model that emerges from a consideration of certain critical societal challenges such as local or regional development models, new forms of work and employment, the circular economy and sustainability, future urban growth, and production-consumption models.

Thanks to its own positive energy – including creative ignorance and naivety (Formica 2015; Dougherty and Conrad 2016) – and social engagement, the maker culture has spawned an ecosystem of institutions, enterprises, universities, creative professionals, citizens and associations, setting the stage for a more collaborative context. This trend generates a vibrant urban community of innovators who are active in a variety of fields: social, economic, technological, creative and cultural. In short, a community of converging communities. It includes a community of design innovators: designers and other creative industry professionals and their agencies, schools and universities, artisans and companies evolving from the 'traditional' fields of fashion, design and communication. It includes a community of social innovators (Barbera and Parisi 2019): policymakers, sociologists, economists, associations, bodies and institutions that develop services or social enterprises on an urban scale. Finally, it includes a community of technological innovators: engineers, researchers, scientists, start-ups, makers, fab labs, hi-tech and med-tech companies developing ICT technologies, advanced manufacturing technologies, nanotech and biotech.

Beside these agents are citizens with the capacity to organize themselves as independent innovators. They actively participate in the co-design and co-production of goods and services, adopting a clear sharing economy perspective and displaying a growing sensitivity to issues of social and environmental sustainability and therefore the circular economy. This urban community aggregates in an array of hybrid (multidisciplinary, social, experimental) collaborative spaces, such as co-working spaces, fab labs and maker spaces, incubators and business accelerators, cultural and creative centers.

Such experiments have reinforced and empowered the established system of public and private institutions, enterprises, universities and research centers. A series of urban policies have also supported the birth of new communities of innovators while reinforcing the social, economic, technological, and cultural milieu through the creation of spaces for digital fabrication (maker spaces, fab labs, co-working spaces) and the rise of awareness and networking.

The city might be considered an open city-laboratory that fit into a Fab City perspective[1]: a connected ecosystem capable of conceiving, developing, and materializing new product-services in high-value production chains (agro-food, fashion, digital transformation and communication, healthcare and med-tech). Some municipalities (e.g. Amsterdam, Barcelona, Milan and Paris) have developed policies to provide incentives for the development of a distributed digital manufacturing infrastructure – made up of fab labs, maker spaces, co-working spaces and startup incubators – to support experimental research projects on innovation models and pilot projects on an urban scale, and for developing young people's individual digital skills.

The role of technology has branched out accordingly, becoming: a) an enabler of collaboration processes and structural changes in the organizations devoted to production or service delivery; b) a tool for restructuring roles and practices in the process of materialization from the idea to the artefact; c) a component (thanks to the overwhelming digital data) of imagination and decision processes; d) the object of design processes that increasingly consider interaction a significant aspect of the product's imagined performance.

This change is happening as part of a sociotechnical mix in which the principles of the collaborative economy and co-design are profoundly influencing traditional design processes, especially in sectors such as healthcare, food, transportation, and fashion. New kinds of innovation spaces – such as maker spaces (Herrmann and Büching 2013), living labs (Keyson et al. 2017) and experience labs (Raman et al. 2017) – are proliferating, promising a future in which co-design and co-production practices are increasingly part of the innovation framework in advanced socioeconomic contexts (Reznick 2016).

This general framework contains favorable conditions for the rise of a distributed system of hyperlocal 'incubators of experiences' which generate

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[1] See the *Fab City Manifesto*, Mairie de Paris, https://fab.city/uploads/Manifesto.pdf. Accessed 6 April 2019.

what can be defined a new 'creative class' (Florida 2002) operating in and for new urban creative scenes that include the suburbs (Florida 2017)[2]. At the beginning of this century, this emerging digitally and socially augmented creative class is destined to create and spread a new culture of innovation that can collect and integrate the most significant aspects of the socio-technical and environmental transitions. Indeed, the ideas that characterize this new creative class – such as collaboration, openness, connection and democratization of access to technology – form a civil utopia that distances itself from the techno-deterministic paradigms of Industry 4.0 or smart cities (Brynjolfsson and McAfee 2014; Schwab 2017; Bria and Morozov 2018). In the new creative scene, it seems possible to revive the ability to challenge inherited models of development, the idea of human power and design agency and the purposes and meanings of productive acts (Anderson 2012; Rifkin 2014; Mason 2016; Srnicek and Williams 2015).

Two cases for a discussion

The present volume brings together two contributions to the discussion that explore the transformations that co-production processes have brought about in important areas of design such as architecture and fashion. The first ('Collective architecture?'), by Alvise Mattozzi and Fabio Maximilian Franz, examines in detail the role of the architect in the context of co-production of a building. The second ('User and design innovation in fashion practices within urban collaborative spaces'), by Chiara Di Lodovico, analyzes the role of fab labs as places of co-production and digital fabrication in the context of the fashion system. Both texts elaborate on talks given by the authors at the seventh STS Italia conference ('Technoscience from Below'), held in Padua, Italy, from 14-16 June 2018. Thus, they are further developments of a discussion that flourished on the basis of these and other papers presented at the conference track 'From grassroots to citizen-centric innovation: the collective design of emerging innovation ecosystems' that we convened.

The two studies that we have collected in this book are different in several ways. First, and most obviously, they deal with two different and largely non-communicating areas of design, such as architecture and

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[2] Richard Florida has recently self-criticized his previous work on the 'creative class', highlighting that in many cities the rise of the creative class created economic growth only for wealthy people, displacing the working class in the suburbs.

fashion. Despite the existence of fashion designers who are also architects, or of design approaches that exploit the two metaphorical spaces constituted by the architecture of garments and the cladding of buildings, they are actually two quite distinct worlds. They diverge with respect to the characteristics of the designed artefacts, the underlying economic and productive processes, prevailing professional practices, and because they are distinct social networks that intersect only in the design of flagship stores and art foundations.

Secondly, the two studies address two opposite aspects of the design field. The next paper deals with the issue of citizen-centric innovation applied to the manipulation of public spaces, managed by the public body and experienced by the community as a whole. The 'civic' character of co-production does not concern only the production process open to the collaboration of anyone armed with good will (including the passer-by, in principle). It also affects the final product, which is an artefact that modifies a public space and therefore influences community life – a community which nevertheless only partially coincides with the community that co-produced it. In the last paper, on the other hand, the same topic is applied to fashion, that is, to a design field based on private, individualistic consumption, albeit one which is subject – as is known – to the norms of social homologation and distinction. While in the first case one of the key issues is the relationship between the various 'publics' that interact and conflict around the artefact, in the second case it is the relationship between collective activity and individual motivation, which indeed constitutes an element of fragility in the diffusion of forms of citizen-centric innovation in the field of production as well as in the field of consumption – which in fashion are just two sides of the same coin, as observed by Entwistle and Slater (2012).

Finally, the two papers also differ in terms of technologies. The first presents a case of co-production entirely based on analog technologies and on the manual, largely unskilled activities of participants. The second, on the other hand, digs into the world of fab labs, which are among the most common and established expressions of the new digital manufacturing movement. Not only is the use of new technologies an element that was originally constitutive of digital fabrication, but the combination of high-level (creative, managerial and IT) specialisms is in fact an essential key to the functioning and success of maker spaces. This means that the dynamics exhibited by the two cases, evidently permeated by in-situ technology, are very different in character and apply to different social frameworks.

These differences make the two cases in a certain sense mutually complementary and allow a wider understanding that only a stereoscopic vision can offer. Forms of co-production do not arise in a social void, but expand on existing economic models, institutional frameworks, practices, situations and professional cultures. It is from these relationships that they take on their shape and direction of development. Thus, for example, interaction with public administrators with regard to transformation of a public space takes place through a steady negotiation of the limits of legality and the concept of community. On the contrary, fashion co-production in a fab lab is usually conceived as an instrument that can renew the creation and production of clothing without calling into question the legitimacy of industrial production and the market. Accordingly, the two cases are representative of two opposite poles of potential development for the collaborative economy (Greenfield 2017).

Mattozzi and Franz also make it clear how, in the case which they examined, a set of people's acquired skills, technical constraints, goals, and traces of organizational forms produced the structuring of hierarchies and access barriers, even in a co-production site that is strongly shaped by ideological considerations. (Reading their description, one has the impression that the realization of the artefact is functional to the experience of collaborative architecture at least as much as co-production is functional to the realization of that particular building.) This raises two interesting issues for research into co-production. On the one hand, it needs to understand how hierarchies are formed, what makes them stronger or weaker, how they bypass the very spirit of co-production and contradict the original logic of the activity in question. On the other hand, it must seek to understand how these dynamics can be taken into account in pursuing co-design and co-production objectives in order to avoid the risk that the contribution of each be subjected to and limited by access barriers imposed by others.

Another crucial issue on which Mattozzi and Franz's study focuses, albeit in a different direction, is that of the architect's authorship. The observation of a case of non-traditional architecture reveals how the architect's authorship goes far beyond the design phase and recognized design tools (such as concepts, designs, blueprints, etc.). To begin with, the architect's authorship is substantially exercised in the management of social relations. Specifically, it is exercised both in negotiations with stakeholders (mainly public commissioning bodies) and the management of the construction site and coordination of all those who, de facto, contribute in various ways to

the construction of the building. Moreover, authorship is accomplished not only in the production of an artefact of which the architect is the only one who can be considered fully responsible, but also in the creation or validation of a new collective architectural process which is capable of educating people to re-appropriate public spaces by exploiting their own resources. Considered in these terms, the architect's authorship is not only the fruit of the specialist's technical expertise but is also a form of 'cultural' authorship that is typical of cultural intermediaries (Bourdieu 1979), that is, of those who mediate tastes, collective norms and values through their own work, thus actively contributing to the continuous transformation of the cultural landscape of society.

Considering the economy of co-production from the perspective of fashion allows Di Lodovico to reveal an undeveloped potential that needs to be kept under observation for years to come. Notoriously, fashion is a strongly hierarchical industry and social sphere, based on the distinction of a production and consumption elite that anticipates the choices of the consumer masses (prone to homologation). It is therefore not surprising that the fashion system has long been kept away from concepts such as co-design, co-production, and participatory economy. However, the phenomenon of participatory design-driven production is beginning to pervade the textile and clothing sector too, for now in embryonic and experimental forms, whose future is yet to be discovered and investigated. The premise of Di Lodovico's is that more extensive use of fab labs and digital fabrication in the textile and clothing sector would lead to a gradual transformation of a number of essential aspects of fashion, and to its effective democratization. The author does not hide – from herself or us – the barriers encountered by the sharing economy in the attempt to gain access to the fashion system, which is strongly based on brand identity, individual creative performances and protection of specific know-how on the part of SMEs and has not yet worked out what to do with the culture and practices of the maker movement. Yet to for the players in this field interviewed by Di Lodovico it is very clear that the force of change represented by fab labs lies not so much in digital manufacturing technologies as in the human factor that they bring to the field. Particularly, it resides in its two main (and complementary) aspects: the strength of the community as a multiplication of individual resources which are not trapped within rigid organizational forms, and the cross-fertilization that it enables between specialized professionals who in traditional companies rarely have the chance to work together.

Conclusions

The experience of collective architecture described by Mattozzi and Franz and the relevance of fab labs to the textile and clothing sector and fashion in particular as investigated by Di Lodovico, are useful for testing the scope and limits of the maker culture, as they show it 'in action', i.e. applied to actual professional practices within the cultural industry, highlighting the context of constraints and potentialities within which the maker culture can and must establish itself. They also show the heterogeneous community of agents that supports, and is required by, the actualization of a maker culture.

The growth of this extraordinary milieu, based on new ideas, values and experiences and not only on traditional production modes based on a market economy, engenders a new creative class. It is precisely this new creative class that can channel a new maker culture of production capable of extending the landscape of urban transformation in a broader, more collaborative way and proactively challenge those systems of commodity and value production that replicate the traditional culture of industrial capitalism.

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Collective architecture?
Reflections on collective designing and collective construction based on ethnographic observations of an Arquitecturas Colectivas' construction site

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Thanks to some vignettes coming from ethnographic observations of a collective architecture construction site, the present paper proposes few tentative reflections on the role of design and designers within new collective-based forms of production.

Keywords: *construction site, collective architecture, design, ethnography, translation.*

Introduction

We intend to present a specific case study of collective architecture, which we have observed by a short participation in it.

By describing our specific case, we will address two issues that we consider key for discussing co-design and co-production: the role, in these processes, of
- designers

- (architectural) designs, taking usually place through blueprints, but that can also take place through sketches, renderings, and other kinds of visualizations, which in our case were missing (at least from the construction site).

The ethnographic observations that gave way to our ethnographic vignettes on which our reflection is based were gathered while carrying out a research on eco-social design practices[1].

One of the practices we have researched upon is a Spanish architectural studio, which, as a member and as a propeller of the Arquitecturas Colectivas network, engages in 'guerrilla architecture', in order to allow citizens to reclaim and live the public space, especially by rearticulating it, through construction practices. The Arquitecturas Colectivas network works through two Internet sites: the site of the network (https://arquitecturascolectivas.net), and the site of GRRR - Gestión para la reutilización y redistribución de recursos (https://www.grrr.tools), where exchange of recovered construction materials among the network's construction sites takes place.

As we have done with the other seven practices considered in our research, we not only ran a long narrative interview with one of the architect of the studio, but we also managed to spend some time with him and his associate and collaborators, observing their everyday life.

It is so that, quite unexpectedly, we found ourselves on a Saturday of April 2017 on the construction site of an autonomous community center in a town in the hinterland of a major Spanish metropolis. The community center being built was supposed to replace another autonomous community center located in a century old cultural multipurpose center (with a theater, a dancehall, a terrace for open-air events). The multipurpose center had been abandoned and then squatted and now was going to be demolished in order to make room for a city council project.

The new autonomous public center was going to be built just besides the old cultural multipurpose center, recovering some of the side buildings. It comprised a new two-story building – the one on which we worked – designed to be, besides the seat of the collective running the community

center and a place for meetings, also a watch tower on the renovation works.

Out of a negotiation with the squatters and within a framework of participatory architecture, which has lately characterized urban policies of the Spanish area, where the project was taking place, the city council approved to fund a participatory path that lead to the construction we took part in building. The architectural studio we were researching on entered into the project only at a second stage. As any other architectural studio, the studio we observed asks for a fee proportionate to the costs of the construction, when dealing with public administration. Construction costs are lower than usual, not only because of the use of recycled materials, but also because construction does not employ payed employees, given that construction works, except for some technical features, which can require expert interventions, will be carried out by those living and using the building. Indeed, the only professional on the site was the architect of the studio we were doing research about. All other participants had jobs not related to construction works[2].

Because the project had been funded and approved by the city council, it was legal – and indeed while there, neither police nor other institutions payed us a visit, though everything was happening in a very visible and central place. However, from what the architect told us, the mayor expected a much smaller construction, developed only on the ground floor. In the language of the architect the project was then moving from being legal to be alegal, i.e. not completely illegal, however pushing the boundaries of what agreed with the public administration. The aim of the two-day work during the weekend was indeed finishing the two-story structure before the city council could question it.

In what follows, through some ethnographic vignettes, we will outline the work on that construction site on the day we were there and from them we will develop few reflections about collective design and co-production.

For those who know guerrilla architecture, the network of Arquitecturas Colectivas or Spanish art and design practices working in between aesthetics and activism, it will not be difficult to recognize the studio and the architect and even the project we observed. As for now, we have preferred to leave

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[2] The studio uses the Spanish regulations drafted for participatory architecture in order to carry out these kinds of projects. The architect has indeed a deep understanding of such legislation. He considers such knowledge key to run a studio like his own. The first time we met, one of the first things he asked, in order to prove our inaptitude as academics, was if we knew the Italian legislation on the matter.

everything anonymous, not so much for the sake of anonymity of those, whom we observed, but because we do not intend to ascribe our observations and reflections to the architectural studio, to the project or the construction site we observed. Indeed, our observations and the following reflections are very circumscribed to only one day of participant observation and can be hardly extended to other situations. Thus, we do not want the readers to identify the architectural studio, the project or the construction site, which are defined by many other processes, events, and circumstances, with what we observed. Nevertheless, we deem our observations do provide inputs for reflections on collective design and on co-productive paths.

Ethnographic vignettes

Our arrival

We arrive at the construction site. It is a sunny April Saturday, 10 am. Few people are already gathered around the architect. They are assessing the state of a small building that is meant to become a bar.

The ceiling, which displays a very peculiar structure, has some rotten beams. A wall on the back needs to be teared down, too. The architect and some of the local people decide what to do for the day, in order to start renovating the small building.

The architect is now back outside and other people are now gathering, here on the main playground, where the most important work – the two-story structure – has to be completed by tomorrow night, before the new week starts. Monday, the mayor, whose office has a view on the construction site, will get back to work and will find the structure completed – a sort of surprise.

As the architect told us in a long interview about his practice the day before, acting rapidly in order to catch institutions on the wrong foot is one of the studio's tactics.

While we, together with other local and non-local voluntary construction workers, gather around a trunk full of safety gears lent by a local craftsman, waiting for instructions, other people are already working on the upper floor of the two-story building that needs to be completed. They already know what to do and how to do it. They are preparing the structure in order to secure the stairs that will connect the upper floor with the ground.

While above work runs fervently, below people wait and basically hang around.

Hanging around 'courtesans'

While waiting for directions about what to do, we find the time to visit, guided by some local squatters, the old cultural multipurpose center: a huge complex, more than one century old, now almost completely rundown. In the last twenty years or so, it has been used by squatters as a venue for concerts, events and meetings.

We soon understand that, not only we are not the only newcomers, but also that we are not the only ones not directly affected by the construction, nor directly interested in it – like the local squatters or the members of the Architecturas Colectivas' network are. Besides us, there are other people more interested in the architect, than in the works: architecture students, other researchers, former collaborators of the architect living in the area coming to pay a visit, a publisher that has worked with the architect.

Given the informal atmosphere and the fact that many people do not know yet what to do, it is not easy to understand, at first, who is there to actually build together, who is there for the architect, but willing to provide a hand – like us –, and who is there just for watching, taking pictures and greeting the architect.

Little by little, as soon as people are given tasks or find something to do themselves, the distinction between working people and bystanders starts to be a bit clearer, even though the passage from one role to the other remains quite fluid all along the day. Some persons however, maintain their role of bystanders all the time, playing, to our Italian eyes, the role of sort of alternative *umarell*[3].

Beside the different roles and the different engagement in the construction works, nobody feels really as an outsider. This is so also because the architect pays attention to everyone, being able to pass from working with a tool, to a consultation regarding the planning of the works, to a joke with visitors, in an imperceptible flow that makes him the glue of all the people present on the construction site.

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[3] '*Umarell* is a term popular in Bologna [increasingly used in other parts of Italy] referring specifically to men of retirement age who pass the time watching construction sites, especially roadworks – stereotypically with hands clasped behind their back and offering unwanted advice' (see, https://en.wikipedia.org/wiki/Umarell).

Working and safety

Finally a common task. It is time to take out the metal stair to be handed out to the guys above who have set the system to fasten it. It has been kept in the rundown dance-hall and a group of six men, including the two of us, is charged with brining it out.

We distribute ourselves around the stairs. The architect is one of us and helps and provides directions.

It is much heavier than we thought and without gloves, it would be impossible to grab and move it.

Everything goes fine, until we are outside. The maneuver to lay it down results much more difficult. Changing the position of the hands in coordination with the others is not easy.

One of us will write in his notes: 'I really feared I was going to mess everything up. Besides damaging the stairs and injuring someone, including myself, what I feared was showing my inaptitude to this kind of work, somehow corroborating the architect's distrust of academic people. In the end, everything works, but I felt how easily an accident can happen'.

Few minutes later, we are again confronted with a dangerous situation. We try to help to cut wooden boards with a circular saw, which is not well fastened on a shaky table and whose safety gear had been removed.

Luckily, one of us is a quite skilled craftsman and knows how to handle the tool. However, we do not keep working with it for long.

The architect tells us that on his construction's sites no accident has ever occurred.

From what we have experienced, a complete lack of accident sounds strange and, then, somehow also plausible, given the backlash an accident would have caused to the Architecturas Colectivas network.

It is evident that the architect takes and manages a lot of risk, but somehow he seems able to take care of all that, probably also by creating a convivial atmosphere. One of the bystanders, a former kindergarten teacher who had worked with the architect before in a project involving children, confirms that to us: 'Nobody could carry out a project like [the one I had in my former kindergarten], but the architect'.

Nevertheless, we do carry out some formalities that could guarantee us under many respects, providing very likely some sort of insurance. At a certain point a name register of the people working on site for the day appears and we have to fill it. The architect underlines the relevance of filling it.

Such a procedure seems a bit in contradiction with the general informality characterizing the construction site. However, it is not. The architect and his studio do work on the edges among – as he calls them – legal, alegal and illegal practices, engaging in all of them in order to accomplish their plans[4].

Leading from within

Once the stair has been fastened also on the ground, the architect is the first one to try it out, with few abrupt movements. He is now standing on the stair, which somehow provides him a stage. Everybody looks at him.

It seems rather obvious that the architect with his nonchalance loves to be at the center of everyone's attention, but not in a negative sense: he seems to be getting a lot of fuel from this and his collaborators play the game along and everyone seems to like and respect him. For sure he is *the* expert on site – the person who you need to ask if you have a doubt of how something needs to be done, or what needs to be done; the person whose approval is looked for by those contributing to the works. But at the same time he is extremely skilled in crafting collective situations with a high degree of conviviality, in which he 'floats around', from task to task, from group to group, making jokes, giving advice, offering beer, loosely directing the construction and generally coming across as a hanging-loose yet encouraging and (morally) supporting subject. Supporting, encouraging, driving and inspiring collaborators and co-builders not just technically or design-wise, but also, most importantly morally, seems to be one of his key-skills. He is an energetic, positive leader who enjoys switching between different roles and power-positions (director, tech-guy, co-builder, entertainer, drinking buddy, etc.). People trust him, his expertise, ideals and methods. This is why in this case he seems extremely well integrated in the group – not only socially but also from the looks.

Controversies

Afternoon, the architect takes the initiative and starts making a tilting wall for the lower part of the structure, in order to close it, however not

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[4] We have no idea of the legal liability of the architect in case of accident. Somehow, we oversaw this aspect while with him and during the interview. This is clearly a lack of our research, which is due to the fact that we were not there to research about the construction site.

permanently. Some of the local squatters are surprised by this addition. They would have preferred the lower part to stay open.

Despite such disagreement, the construction went on following a design that was evidently not public, but very clear for the architect. The small controversy that ensued is very soon closed by the architect, simply starting to build the tilting wall.

Others follow the architect in building the tilting door.

Contributing

The day is almost gone, and we have actually contributed very little to the construction. We are a bit frustrated of the whole situation. Out of will to be seen as proactive and skilled by others, once the group building the tilting wall takes a break in order to chat and have a beer, we grab the circular saw, OSB boards and drilldriver they were using and imitate what they had been doing before, in order to build a second element of the tilting wall. One of us, competent in woodworking, knows quite well how to reproduce the steps carried out by the other group. The other of us can only follow his instructions.

We manage to put up a second element of the tilting wall.

Some tentative reflections

The co-production practice we have presented differs, on many respects, from those that today are usually considered and highlighted, such as those related to fab labs or makerspaces. For the latter, indeed, digital technologies are key, as tools through which work is carried out individually and as tools through which work is shared collectively.

Of course, as we already mentioned, what described relies on networks that are enacted through the Internet, which allows the situation we described to be more open and more collaborative. However, Internet is not necessary in order to start and carry out a collective architecture project, and indeed the architect started to work in this way already in the '90s, when internet was starting to be diffused – not to mention the ever existing vernacular architecture projects, which usually presuppose a collective co-producing dimension.

Nevertheless, we deem that the practice we have described is relevant and interesting in order to reflect on the new collective-based forms of (knowledge) production, even when they are more grounded in digital technologies like, for instance, 3D printing.

We provide here two streams of tentative reflections: one about the tensions between designing and making and another one, strictly related to the first, about the mediations present on the construction site that allow the collective production to be articulated.

Designing and making

One of the features of the practice we observed that has stricken us is the absence of a blueprint or of drawings or of renderings or of sketches on the site. In short, the absence of any form of architectural design – here intended as 'a set of signs aimed at providing instructions for a determined future transformation of a place' (Armando and Durbiano 2017: 93), almost as if there was no design. Nevertheless, we know that there was a designing phase, which in its general aspects was co-designed by the architect together with the local squatters[5]. The latter, however, were missing the details, given the controversy that emerged about the tilting walls. We also know that there are CAD drawings in the computers of the studio, which were also probably used to present the project, or part of it, to the mayor.

However, on the construction site no trace of the designing process was present. What was present was, instead, the designer, or one of the designers, the architect. Besides the architect, present were also many materials and elements – a cargo container, metal beams, OSB boards – which, as components of the architect's 'kit', must have been selected and recovered on the base of a design project. These components of the architect's kit are usually reused from project to project, given the ephemerality of many of them.

Thus, on the construction site all the focus was on making.

Such focus has its consequences, as we have seen and as we are going to better highlight.

Before getting into this issue, we want to avow that our surprise about the absence of architectural designs on the construction site was due to our ignorance of architectural construction processes. Indeed, by reading literature about construction sites, we discovered that also commercial construction sites are usually characterized by a focus on making in a similar way to the one we have observed, at least for what concerns workers and low management (see for a striking example Löwstedt 2015). These are

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[5] We do not know the details of the process. We have gathered few information through talks with the architect and with the squatters and through the Internet, where there is a scanty documentation of co-designing sessions.

indeed the figures on which ethnographies of construction sites usually tend to focus (Löwstedt 2015; Pink et al. 2010; Pink, Tutt and Dainty 2012). These studies are indeed mainly interested in investigating issues related to safety (among others, Doria 2014), working knowledge (among others, Gherardi and Nicolini 2000) – the latter, in the end, also related to safety issues – and on masculinity (among others, Iacuone 2005). These studies do not tend to focus on the issue of the translation of the design project into the actual construction, as recently noted also in Sharif (2018)[6]. For instance, Pink at al. (2010) complain that, whereas there are ethnographies of design studio, there are few ethnographies of constructions sites. However, Pink et al. (2010) do not problematize the passage from one place to the other, somehow missing the issue that not only connects two situations, but that also provides, or should provide, their meaning.

We deem that the issue of the translation of architectural designs from the studio to the construction site and then into the actual building is key for both architectural studies interested in the 'power of the project' (Armando and Durbiano 2017), as well for STS, interested in the translations between inscriptions and things (Latour 1999)[7].

As for the construction site we observed, the focus on making gave way to a loosely directed do-ocracy, i.e. 'an organizational structure in which individuals choose roles and tasks for themselves and execute them' and in which responsibilities 'attach to people who do the work, rather than elected or selected officials'[8]. This is basically the way we started acting when we intended to actually contribute to the construction and decided to continue the work on the tilting wall, while those who had worked before took a break. Do-ocracy is one of the forms of management considered and

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[6] However, things are changing in relation to the diffusion of Building Information Management (BIM) systems on construction sites; see, for instance, Davies and Harty (2013), Mäki and Kerosuo (2015), Sackey (2014).

[7] Sharif (2018) apparently focuses on the transfer of the design project in the actual construction sites – 'the travel from conception to realization' (Sharif 2018: 158). However, he takes into account not so much the process of construction as a translation, but the discrepancies between the design projects and the way it has been constructed and the way it starts to be used. If Sharif (2018) approach is original for architecture, it is not for other fields of design, where STS have always looked at the discrepancies between what has been designed, its implementations and its uses (among others, Akrich 1992; Akrich 1993). As for an account of a product design project's translation into a prototype, see Parolin and Mattozzi (2013; 2014). Interesting considerations can be found also in Henderson (1999), in relation to mechanical engineering and the construction of prototype machines.

[8] https://communitywiki.org/wiki/DoOcracy.

advertised by some relevant examples of emerging innovation ecosystems like fab labs, makerspaces or hackerspaces. For instance, Noisebridge, a famous hackerspace in San Francisco introduces itself on its Internet site by saying that it is a 'hackerspace for technical-creative projects, doocratically run by everyone'[9].

Despite being considered 'a decentralized, anarchist way of deciding and managing how things get changed', as Noisebridge defines it[10], what we experienced, in a project whose scale requires a certain level of coordination, is, first of all, the emergence of hierarchies and, secondly, of barriers to participation and to actually co-producing. As for hierarchies, as they emerged from the construction site we observed, they are the following: top, those who know what to do and can provide examples; middle, those who are competent enough to follow the example – one of us; bottom, those who are not competent enough and can only follow directions and instructions – the other of us. Somehow, what we discovered is the quite banal evidence that a 'do-ocracy', focused on performance, is grounded on a 'competence-ocracy' – if we do not share the same competences, of course the 'do-ocracy' that will result will be quite hierarchical. All that does not mean that 'do-ocracy' or 'competence-ocracy' do not work or are deceptive, but simply that they do produce hierarchies – situated, immanent hierarchies, if you want, rather than a priori, transcendent hierarchies of traditional organizations, but still hierarchies.

Also, what is produced are, as we said, barriers to participation. For us indeed, was very difficult to join in the flow of work and to contribute to it substantially.

The issue is then not only related to manual-technical competences – one of us is an expert, for that matter –, but also to organizational competences:

-   on the one hand, knowing 'what to do next', in order to be able to anticipate it or to follow it up,
-   on the other, knowing how to actually sneak in in a workflow without interrupting it, which is related also to interactional competences – of course not speaking the local language, though understanding most of it, made things even more difficult.

These organizational competences are in part situated and immanent – knowing how to act here –, but in part are related to having an overview of

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[9] https://www.noisebridge.net/wiki/Noisebridge
[10] https://www.noisebridge.net/wiki/Do-ocracy

the project and of the workflow. The latter can be provided by elements that transcend the specific situation, like designing and planning outputs like blueprints, sketches, plans, schedules, etc., and by the occupation of a certain position or of a certain role within the entire designing-making process. Therefore, as suggested by one of the reviewers, hierarchy precedes knowledge-competence. Still, it could be said that a form of 'do-ocracy' is still in place, if we consider that a certain hierarchical position derives from what one has done in the designing-planning phase. Thus, what becomes relevant is the different point of view presupposed by the designing and making phases – global and from a distance in the first case, local and engaged in the second – and how it is possible to shift from one to the other and how it is possible to share them. We think that in relation to these shiftings, designing outputs, like blueprints, become key.

These hierarchies and barriers should be acknowledged and addressed in a framework of co-production, in order to allow everyone to take part to the production – according to their competences – and to increase their competences.

Mediations

Competence and performance, making do and doing, the passage from one to the other and the sharing of these processes lead us to address mediation. Which mediations take part and dispose the unfolding of agency we described?

As it has emerged, the construction process we have described does not entail the presence of the architectural designs. However, present in our case, was the architect. He carried out the main mediation, knowing also more or less by heart the design and thus mediating between the design and the construction[11].

The architect mediation does not concern only the knowledge about the project, but also the various relations among those present on the construction site, in order for the agency to unfold smoothly, following different rhythms that had to do more with constructing a convivial atmosphere than actually constructing the building. We suppose that it is

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[11] Yaneva (2008) is the only study we have found where an architect is observed on the actual construction site, while the construction is taking place. However, Yaneva (2008) is focused more on the way the building, already built and under renovation, acts on the architect than vice versa. Indeed, through Yaneva's account, we see very little of the renovation design and how it is carried out and eventually changed by the architect. For an architect on the construction site before the construction and the design project, see Houdart (2016).

also because of the specific emerging convivial atmosphere that accidents are basically absent from the architect's construction sites.

Nevertheless, the architect's one is not the only mediation on the construction site. Artifacts too carry out their mediation. For instance, the presence of the two-story building disposed upper and lower positions and consequently a hierarchy of competences. Only when another artifact, namely the stair, became part of such configuration, it carried out a further mediation, disposing a change of the configuration and allowing a passage between up and down and initial blurring of people with different competences.

Artifacts mediate the construction also in another way, given that the architect often chooses to combine recovered semi-finished constructions materials such as OBS boards, window frameworks acquired as gifts, orange steel beams, containers, etc., which also provide a relatively recognizable style to his studio. These recovered objects already influence the design.

On the one hand the designing process is redistributed among various human and non-human actors (the recovered semi-finished elements, the various persons of the studio, the squatters as the group participating in the project), thus, actually accomplishing a redistribution of the architectural practice as framed by ethnographers (Yaneva 2009) and as intended by some architectural theoreticians (Armando and Durbiano 2017). On the other, the architect recovers an authorial position within the construction process, where he works as the main mediator.

In this way, then, not only more relevance is provided to making rather than designing, but also the architect assumes an original role, within and through the making process. He does not find his authoriality before the design project, in his intentions, ideas and sensibility, then conveyed by the design project, as those idealtypical architects outlined in Armando and Durbiano's typology (Armando and Durbiano 2017: 48-80) – 'architect of the prince' or 'guarantor architect'. He finds, instead, his authoriality after the project, first in the negotiations clash with authorities – not observed by us[12] – and then in the management of the construction site, as we have seen.

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[12] Within the negotiation with the mayor and his office, the project or, better, the projects played a role, which goes beyond the one of providing an overview of what will be done. As the architect told us, when he, another person from the architect's studio, as well as two representatives of the squatters, went to negotiate with the mayor, they brought with them many different projects and asked the municipal administration to decide which one to authorize. This move allowed the architect and the squatters to gain time against the municipal administration, which was stuck in a decision process. It is very likely that the project we were

By assuming the architect's words we can define his role 'guerrillero leader', who has the tactical know-how to carry out an antagonist project (Fuad-Luke 2015), going against the official authorities, by leading a small group and taking official authorities on the wrong foot:

> [My studio] was born, looking for all the laws and regulations to give the tools [to] different people in order to say 'it is possible'. But you, as a citizen, you have to check the regulations and then it will be possible. [...] So I started to study [...]. We have [many] projects, more than those the politicians [can fight]. Never in my life we can collaborate. [...] In my experience is always a fight, but I don't want to fight. I want to use our law and collaborate but when the politician is a hijo de puta I can attack [...]. For us it is very difficult to find money for our work. The others have the time and money. So, for me the first thing is using the law in our favor and the second thing is bringing [in the negotiations] people to add so much information and experience.

As it is common in co-productive paths characterizing new forms of co-production like fab labs or makerspaces, also in the case of Arquitecturas Colectivas that we have observed, the designer has to cover various different roles such as that of the facilitator, activist, strategist and cultural promoter (Manzini 2016). These are all roles that can more or less downplay authoriality. However, the architect covered them all and in doing that, he has been able to reshape architecture authoriality, letting it emerge within the making phase of the design process, rather than within the designing process. From what we saw and heard, in the end the architect's studio works as a cultural promoter, intended here as an educator that, besides the construction of buildings, educates people to reclaim public space.

Conclusions

Based on some ethnographic observations of a collective architecture's construction site, our chapter has tried to propose some reflections on the role of design and designers within new forms of collectively shared design processes.

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building had not been yet approved, but was one of the variations presented and waiting for approval. This is an aspect we need to delve into. Therefore, as for what we gathered, the project, though not present on the construction site, did play a direct role in the 'guerrilla architecture' processes initiated and lead by the architect.

The construction site, which we observed and to which we took part, is of course not so technology loaded, nor innovative as makerspaces, for instance, can be. And yet, characterized by collaborative, open and challenged-based production, we deem it can be considered an example of these new collective-based forms of (knowledge) production.

Our contribution touched upon two other issues little considered in the present ethnographic literature on architectural practices and construction sites.

First, we tried to look at the ways in which architecture in the studio and construction in the construction sites are connected and, especially, how a design project gets translated into a construction. Despite our case is peculiar, given that the translation was carried out directly by the architect and the design project basically disappeared, we deem that our paper, though limited, opens up an issue that has been to our knowledge disregarded in both studies of architectural practices, as well of construction sites.

Secondly, we took into consideration not only the collective aspects of architecture and, especially construction, but also the ways in which a figure emerges from this collective work, with a different role from the others. It seems to us that also this aspect has been in part disregarded, in part not focused enough. For instance, Yaneva (2009) noticed various mediations through which Rem Koolhaas, the archistar head of the studio she observed, constructs his different role (e.g. having an office which has view on the studio or writing books that architects of his studio read and consider). However she never really addressed the issue. Nevertheless, as emerges clearly also from Smitheram and Kidd (2018), studio owner or associates have a different role in the design process and this should be accounted for. Despite the fact that this issue can be seen as a more traditional ethnography of work issue, we think that STS could relevantly contribute in analyzing how work hierarchies are built and maintained through heterogeneous practices.

Finally, through our reflection, we raised the issue of the role of the design project intended mainly as drawings of various kinds (blueprint, renderings, sketches), within processes of co-production that tend to be biased toward making. We deem instead that design projects in the form of visualization artifacts could have a relevant role in providing an actual ground for discussion, for collective reflections, for co-designing, for shifting from designing to making and *vice-versa* and for allowing others entering in

these processes, thus granting the actual development of a shared collective process.

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User and design innovation in fashion practices within urban collaborative spaces: Potentials and challenges

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This paper explores the recent development of open and collaborative fashion design and making practices in urban context. More specifically, it analyses how the fab lab experience modifies or could affect the innovation process in fashion.

The fashion system usually follows hierarchical and very structured innovation processes. In recent years, digital fabrication technologies and the renaissance of DIY have fostered the diffusion of urban manufacturing laboratories. They represent open platforms for making, innovation, and invention, giving access to digital fabrication tools and open knowledge. In particular, fab labs and makerspaces provide services and promote collaborative activities open to citizens, educational institutions, designers, entrepreneurs, and Small and Medium Enterprises (SMEs), allowing creative communities to prototype personal and professional product/service solutions.

Therefore a crucial issue is understanding if a change in design and production processes towards a collaborative approach – as fab labs do – can stimulate innovative solutions in the production of fashion innovation.

In order to identify activities, projects and main players involved in fashion-oriented initiatives, a web-based extensive research was conducted through certified channels and global courses of the fab lab network. Furthermore, an empirical study on the Italian scene was carried out through in-depth interviews to fab lab staff members and other professional figures related to labs. This paper aims at understanding the real impact of this phenomenon and highlighting opportunities and critical areas. It also points out the main challenges to overcome in order to start and develop collaborative fashion practices within fab labs and foster new design paths.

Keywords: *fab labs; (open)design; digital fashion; user innovation; collaborative practices*

Introduction

The fashion system (Leopold 1992) usually follows hierarchical and very structured innovation processes. When forms of innovation emerge from below, these are often rebound by the system, reviewed by professionals and finalized according to the logic of the fashion industry.

Nevertheless, in recent years, the evolution of digital technologies is fostering the emergence of open and collaborative fashion design and making practices that are challenging the established dynamics. Emergent digital-mediated communication experiences are transforming the relationship between production and consumption, companies/designers and consumers (Crewe 2013: 761) – and among users themselves – giving rise to co-creation of products (Wu 2010) and values (Prahalad and Ramaswamy 2004: 2; Brand and Rocchi 2011: 11-12). Software developments, new digital fabrication tools and open source practices are generating unprecedented cross-fertilization paths. According to Mazzucotelli and Lunghi (2015: 5), 'new digital forms of production are giving rise to a new industrial model centered on start-up, digital craftsmanship and on-demand & tailor-made production as an alternative to large-scale production', enabling and fostering self-production and self-entrepreneurship (Ferrara 2011). Moreover, the contamination of fashion with engineering, Information Technology (IT), and architecture is transforming the creative process, encouraging experimentations (Musto 2017: 138).

Already 20 years ago, the most avant-garde fashion companies began to offer digitally mediated mass customization services (Wu 2010), probing the territory and consumer readiness. Today, the connection potential offered by Web 2.0 and social media, as well as the development of interactive interfaces to configure desired products are supporting and implementing these practices. Nevertheless, the market study carried out by Strähle and Wagner (2016) on the degree of user involvement and prosumer concept in the outdoor fashion industry, shows how much this phenomenon is still being consolidated.

Therefore, the fashion system is showing signs of adaptation to these transformations through experimental forms of collaborative production. Aim of this work is to observe collaborative fashion practices related to the fab lab phenomenon.

Nowadays, the easier access to digital fabrication technologies is stimulating the rise of advanced forms of Do-It-Yourself practices, from

Digital DIY to Do-it-Together (Gauntlett 2011; Anderson 2012); at the same time, it is also fostering the spreading of co-creation labs in urban contexts, as makerspaces and fab labs. These spaces are expressions of a broader cultural phenomenon called 'collaborative economy', based on access instead of ownership, peer-to-peer relationships, the importance of the community, reputation capital and trust (Botsman and Roger 2010; Mainieri 2013; Novel 2014). Indeed, fab labs and makerspaces enable citizens and creative communities to meet and socialize knowledge and competences; to access digital and analogue fabrication tools; to design and manufacture customized products (materialize personalized things) through a learning by doing approach (Gershenfeld 2012).

In addition, they offer services and promote training activities to enhance local entrepreneurship and support users, designers, educational institutions, and SMEs in prototyping personal and professional solutions (Stacey 2014). Many experts see the innovation potential developed by these spaces in an optimistic perspective (Dougherty 2012; Anderson 2012), while others underline limits and contradictions, breaking with the ideological vision of the 'maker movement' (Nkoudou 2017: 80-82; Greenfield 2017).

To better observe the phenomenon and survey fashion-oriented experiences in collaborative urban spaces, a sociological study focused on fab labs – a codified typology of makerspaces – was carried out. The main goal of this research is to address how the fab lab experience could affect design and manufacturing processes in fashion, through a collaborative approach. This article reports the first set of results of an ongoing research, a further development of the author's Fashion Design Master Thesis (Di Lodovico 2018).

Fab labs are trademarked (Cavalcanti 2013) and networked 'fabrication laboratories', based on open-source knowledge and equipped with a set of common digital tools, such as basic electronics equipment, 3D printers, laser-cutters, vinyl cutters, CNC machines, and more[1].

After the setup of the first fab lab, the number of laboratories across the world has grown exponentially. In March 2018, the global fab lab community counted almost 1300 certified labs from more than 100

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[1] The first Fab Lab was founded in 2003 in Boston, after the success of MIT's Center of Bit and Atom (CBA) course 'How to Make (Almost) Anything', directed by Neil Gershenfeld and aimed at exploring the interaction between computer science and physical science through digital fabrication (Gershenfeld 2012).

countries, attended by people and communities with different professional backgrounds and needs.

The diffusion of fab labs was favored by agencies as Fab Foundation (https://fabfoundation.org) and educational programs as FabAcademy, a 6-month global and distributed course, which is held in most of the fab labs simultaneously. The purpose of the course is to transfer the necessary knowledge to use properly the tools available in a fab lab through learning by doing, weekly projects, real time conferences with experts and hands-on activities supervised by the local fab lab tutor.

In 2017, a textile-oriented FabAcademy called Fabricademy (https://textile-academy.org/) was established, as a transdisciplinary course focused on the development of new technologies applied to the textile and apparel industry, in its broad range of applications, from fabrics to wearables. The birth and development of a fashion related structured course within the fab lab network, as Fabricademy, demonstrate the growing interest of laboratories towards this topic, making it an interesting subject for analysis.

Despite some design, market-oriented and sociological studies that have analyzed how digital-mediated experiences can enable open, shared and collaborative fashion practices (Gwilt 2009: 114-119; Niessen et al. 2010; Wu 2010; Mazzucotelli and Lunghi 2015; Mehtälä et al. 2016), there are no researches fully focused on the relationship between the fashion system and fab labs. Yet, it is crucial to understand how a change in design and production processes towards a collaborative approach – as fab labs do – can stimulate alternative innovation paths and affect established features of the fashion system.

Research methodology

To tackle the research question it has been necessary to collect information about what kind of fashion-related activities were played within fab labs, who were the users involved, what kind of culture inspired them; as well as outline potentials, limits and conditions that can favor – or not – the birth and the growth of collaborative fashion practices.

The novelty of the subject has required an empirical study based on a qualitative sociological approach, conducted following two parallel paths applying two different methodologies: a web-based extensive research and a field research performed by means of in-depth interviews.

Web-based extensive research

In order to identify activities and main players, a web-based extensive research – through fab lab network certified channels – was firstly conducted, combining different methods.

At first, a keyword research was carried out starting from the consultation of the fab lab list document (https://api.fablabs.io/v0/labs.json) downloadable at www.fablabs.io, the website where all the certified laboratories of the international fab lab network are registered. From this first attempt 50 laboratories were detected. Further investigations revealed this method not sufficient to fulfill the task. Data were scarce and not updated: the list did not show some of the laboratories that, from previous knowledge, the author knew were active in promoting fashion-oriented initiatives.

Secondly, the study focused on the analysis of Fabricademy case study. The participating laboratories (nodes), classes, and students' outcomes (http://wiki.textile-academy.org/start) were investigated.

The course was partially funded by the European project 'Textile and Clothing Business Lab' (TCBL), which aimed at reinventing the textile and apparel industry exploring new ways to design, make and work in a sustainable and collaborative manner. Fabricademy first edition (September-April 2017) – mainly promoted by FabTextiles from Fab Lab Barcelona and TextileLab from Fab Lab Amsterdam – was attended by 39 students from 15 international fab labs (Figure 1).

At national level, the research was developed consulting web pages and social media profiles of the 134 Italian certified laboratories registered on Fablabs.io website, 28 labs have reported to perform fashion practices (Figure 2).

Italy is the third nation for number of fab labs and, at the same time, it is one of the most relevant country considering the textile and fashion manufacturing reality, fashion capitals and educational institutions. For these reasons, the research has been focused on the Italian context.

During data collection, it was not possible to extract meaningful information from all detected laboratories. For several ones, no confirmation of significant initiatives were found. In many cases, the lack of information on the website has led to in-depth analysis on social media profiles, often richer in content than the dedicated web pages. This did not allow the collection of qualitatively significant information on the activities, initiatives, and services promoted, but the observation of their existence. In some cases the information of collaborative activities between fab labs and

fashion companies has been retraced in online magazines rather than on the fab labs' sites themselves.

Despite these facts, even the presence of partial information on the initiatives, or simply photos shared, have contributed to the construction of the fab lab scene.

Other laboratories, however, have distinguished themselves for quality and quantity of shared information related to the performed initiatives. This has been crucial to identify significant examples, illustrated in detail within this report.

The results of the web-based extensive research allowed to collect and analyze data on: fashion and textile experimentations, research and educational activities, as well as services to third parties; running applications of digital fabrication technologies to the design and production of textiles and apparels; prominent actors involved in the ecosystem.

Field research

In a second phase, a field research on the Italian scene was performed through in-depth interviews to fab lab staff members and professional figures identified during the desk research, including members of trade and industry associations, professors, and designers experienced in digital fabrication. A qualitative content analysis followed, in order to draw data regarding the interviewees' attitudes, expectations and outlooks.

The research was partly developed within Polifactory, the interdepartmental fab lab of Politecnico di Milano. Furthermore, hands on courses have been attended within the Milanese fab lab WeMake, one of the most engaged laboratory in fashion-oriented initiatives. Such experiences provided useful additional ethnographic materials to corroborate the outcomes of the research.

Figure 1. Map of Fabricademy nodes, 1st edition 2017-18.

Spain
Fab Lab Barcelona IAAC (Barcelona)
Thinkerers Fab Lab (Barcelona)
Fab Lab Léon (Léon)

Netherlands
Fab Lab Amsterdam Waag Society
(Amsterdam)

Germany
Fab Lab Kamp-Lintfort (Kamp-Lintfort)

France
Fab Lab Digiscope (Gif-sur-Yvette)
Fab Lab Artilect (Toulouse)

Iceland
Fab Lab Reykjavik (Reykjavik)

Italy
Fab Lab WeMake (Milan)

Canada
Fab Lab Vancouver (Vancouver)
Fab Lab Echofab (Montreal)

Messico
Fab Lab Yucatan (Merida)

Perù
Fab Lab ESAN (Lima)

Brazil
Ellora Aleliê (São Paulo)

China
Fab Lab O Shangai (Shanghai)

Figure 2. Map of Italian fab labs that reported fashion-related practices in March 2018 (Di Lodovico 2018) and Italian fashion industrial districts (ISTAT 2015)

Campania
Fab Lab D.R.E.A.M. (Napoli, NA)
Mediterranean Fab Lab (Cava de' Tirreni, SA)

Emilia Romagna
Fab Lab Makers Modena (Modena, MO)

Lazio
Fab Lab Roma Makers (Roma, RM)
Fab Lab Frosinone (Frosinone, FR)
Fab Lab Lazio (Ferentino, FR)

Lombardia
Fab Lab WeMake (Milano, MI)
Fab Lab Opendot (Milano, MI)
The Fab Lab (Milano, MI)
Fab Lab Milano (Milano, MI)
Fab Lab Polifactory (Milano, MI)
Faberlab (Varese, VA)
Fab Lab Make in Progress (Sulbiate, MB)

Marche
Fab Lab FAMO (Civitanova Marche, MC)

Fab Lab Creaticity (Tolentino, MC)

Piemonte
Fab Lab Torino (Torino, TO)
Fab Lab Biella (Biella, BI)

Sardegna
Fab Lab Sassari (Sassari, SS)
Fab Lab Sardegna Ricerche (Pula, CA)
Fab Lab Cagliari (Cagliari, CA)

Sicilia
Fab Lab Catania (Catania, CT)

Toscana
Fab Lab Toscana (Pisa, FI)
Fab Lab Firenze (Firenze, FI)
Fab Lab Santa Chiara (Siena, SI)

Veneto
Fab Lab Venezia (Venezia, VE)
Fab Lab Treviso (Treviso, TV)

Places, activities, and actors involved

Fab labs promote many different kind of activities. The analysis of results from web-based research and interviews, compared with MIT (2013) codified laboratory categories (Design Research, Design Consultancy, Design Incubator, Design Workshop, Design Studio, Design Contracting), made possible to perform the following classification of fab lab potential services and collect related examples. It is possible to group three main categories: activities dedicated to research and experimentation; didactic and training activities (from the introduction to tools and techniques, to creative workshops and initiatives to spread the culture of sharing); service activities to companies, professionals and any other kind of stakeholder.

Purpose of this work was not to deliver an extensive mapping of experiences, but to provide a representation of potential fashion-related initiatives to be performed within fab labs. The identified activities are supported by representative examples coming from both the international and the national context.

I will now try to describe a detailed picture of activities cited above, related to the fashion/textile field.

Research and experimentation

Research and experimentation can be pursued as a personal activity from the labs' community members, it can be managed in collaboration with the international network, or it can be commissioned by third parties, e.g. fashion companies. When the staff of the fab lab directly promotes training courses, experimentation can be considered a necessary step to achieve the competences in order to convey them to the community (Mikhak et al. 2002: 6).

Fashion/textile-oriented research in fab labs can focus on different topics. The following list of experimentations – drawn from the analysis of the Fabricademy case and equally found in Italian fab labs – is indicative of the wide spectrum of addressed topics:

- creation of sustainable materials – such as bioplastics – and natural and bacterial dyes;
- revamping of textile production tools through hacking or the building of new instruments;
- development of wearable technologies, e-textiles and soft-robotics;
- use of 3D scanning, 3D modelling and digital fabrication tools to design and produce customized and made to measure products;

- creative use of laser-cutter to produce modular and reconfigurable garments;
- use of generative software and digital fabrication tools to create apparel and accessories;
- use of 3D printing on fabric, for both structural and decorative aims.

According to collected data, fab labs' approach to research and experimentation – compared to traditional processes – seems to be more collaborative and open to both expert and non-expert users. The culture of sharing online the experimentations is considered mostly important by laboratories already active in participating to the fab lab network initiatives. The possibility to download detailed information about materials, processes, failures, and best practices of research projects, allows the global community to expand knowledge on digital fabrication running potentials in the fashion and textile field, laying the groundwork for further innovative developments.

Training and education

Among the most advertised activities it is worth focusing on the initiatives dedicated to training. Educational initiatives are a useful vehicle to expand the community, to gain financial resources and accredit the laboratory as able to meet the user demand for innovation and digital empowerment related to fashion. Moreover, the transfer of technical skills can foster autonomous use of spaces and tools stimulating self-employment.

According to the performed analysis, it seems that there are no substantial differences between the way fashion-oriented workshops/courses are performed and the format of other training initiatives within fab labs. Learning by doing and peer education are still at the core.

Training activities basically follow the same topics as research, but are proposed in a lighter format open to everyone willing to learn, adjusting the difficulty level according to participants' actual skills. It is possible to find workshops dedicated to manufacturing of customized products and courses specifically aimed at improving digital knowledge on software and hardware, as well as sessions focused on the building of textile production tools and on making of interactive textile samples. Hybrid experiences mixing analogical and digital methods were detected.

Fab labs' staff members can act as trainers in several occasions: promoting short-term independent workshops, providing more structured and specialized courses in partnership with companies and public bodies and/or in collaboration with academic institutions. In this respect, WeMake is one of the most active fab labs, engaged since 2014 in providing several fashion/textile-oriented educational initiatives in support of different stakeholders, both from private and public environment.

The investigation work has also evidenced the presence of fab labs inside fashion schools and universities. Even if not many, the analysis of case studies allowed to extract pragmatic examples of MIT (2013: 111) classification of fab lab potential uses in an academic ecosystem. The researchers outlined three approaches, often adopted simultaneously within the laboratories: 'Students+Faculty', 'University+Corporations', and 'University+University'.

The 'Students+Faculty' model aims at encouraging students in learning how to use digital fabrication tools, giving them the opportunity to conduct practical exercises and to develop personal/collaborative design and research paths.

In the 'University+Corporations' model, the laboratory enables connections between universities, external companies and designers, encouraging the development of joint interdisciplinary projects.

The 'University+University' mode is based on relationships with various academic realities, and pursues the creation of an extensive network of design laboratories within which the participating institutions can mutually benefit from shared resources and experiences.

The fab lab Polifactory, from Politecnico di Milano, appears to be a best practice since it embraces all three approaches, actively participating in various projects related to fashion, also thanks to the proximity of the laboratory to the Design Department and to professors and students from Fashion Design courses.

Beside the cases of established educational institutions equipped with a fab lab, a special case appeared in Milan in 2018: the Numen Institute. Numen is an educational institution born from the collaboration of Fab Lab Milano, the rapid-prototyping studio ShapeMode, professors and professionals, and a network of Italian companies. The institute is focused on technological innovation related to new digital tools for design, manufacturing and communication. Its aim is to connect companies and skilled students. As a matter of fact, it also offers highly specializing professional and academic courses on accessory design, wearable

technologies and virtual prototyping for fashion events, providing students support and guidance in the entry phase into the job's world. At the same time, the institute allows ShapeMode partner companies to access professionals with specific skills in the fashion digital environment.

Services to third players

Thanks to the human and technological capital available to them, fab labs can provide their resources to third parties, structuring tailored services according to the addressee's needs and goals. The laboratories can foster consultancy service, can act as an incubator and can be employed as a prototyping, micro-production, and distributed manufacturing facility.

Fab lab as consultant

Regarding consulting, fab labs can deliver different services. Fab lab staff members can: help professionals and SMEs in speeding up the production process through technological solutions, co-design specific product/service solutions, and transfer technical competences on digital fabrication to specific operators.

The research The Fab Lab Toscana Project carried out by MIT Mobile Experience Lab and Prospera Association (MIT 2013) documents the experiences of collaboration between MIT experts on digital fabrication and regional artisans and SMEs. Among others, the project involved the shoe artisan Saskia that used to spend weeks to customize standard molds for tailored shoes. Thanks to a team of digital fabrication experts, programmers, and the availability of a fab lab, the artisan had the possibility to test a way to speed up the customization process, without compromising the end product quality. A tailor-made digital interface was developed to customize feet molds, a milling machine from a fab lab was used to obtain it.

Another significant experience is the consultancy provided by Milanese lab The FabLab to the Italian eyewear company Marcolin Spa (Temporelli 2017). The latter used to sub-contract 3D printed eyewear prototypes to an external facility. The consulting activity started with an accurate analysis on the company needs and technologies available in the market. It ended up with the configuration of a digital fabrication center inside the company. The training of selected professional figures within the company, performed by The FabLab staff members, enabled direct control on the prototyping activity, reducing time and production costs.

Fab lab as incubator

The fab lab can also act as incubator: a place for designers and young entrepreneurs to develop and test ideas and projects. The lab becomes a place to build networks, share experiences and get in touch with the fab lab community.

The case of AnOtherShoe is emblematic. AnOtherShoe is an experimental project, launched in 2015, on 'a new model for shoe production based on shared knowledge and local manufacturing, through small scale and on demand digital fabrication'. All the components of the shoes are laser-cut, the assembly process is handmade and reversible, enabling the consumer to assemble the pair of shoes and to repair it when necessary. The design and the aesthetic of the shoes has evolved over the years thanks to the fab labs that have hosted the founders allowing them to research and deal with different professional figures and digital tools, always sharing results of the experimentations. The designers adopted an open design approach, in order to test the project validity, providing workshops to prosumers, designers, artisans, and companies, fostering aesthetic and structural evolution of the prototype. Although the project has been active for three years, the designers have not yet started production, which is expected in the coming years.

Fab lab as prototyping, auto-production, small-scale production, distributed manufacturing facility

Besides cited services – in addition to the rent of space and digital fabrication tools for small-scale production – fab labs can provide a facility for auto-production and distributed manufacturing.

The distributed manufacturing business model is very different from fashion system traditional dynamics, it gives the chance to buy the digital file and make the garment autonomously, buy the assembly kit or buy the finished garment, proportionally priced.

The users can download and manufacture apparel and accessories made available as digital files from brands, i.e. The Post-Couture Collective and Maquinar.io from Fab Lab Santiago. Both brands are collectives of designers whose business model conceive locally designed and globally produced items. As a matter of fact, prosumers around the globe can buy and download desired items from official website and manufacture them directly inside a fab lab or a makerspace equipped with laser cutters.

Actors involved

The main actors involved in fashion-oriented activities that could start innovative design and production processes are: the fab lab staff members themselves, designers and other professionals (such as engineers, IT professionals, architects), academic institutions, artisans, SMEs, big companies and amateurs.

Moreover, as outlined in the section *Fab lab as incubator*, the laboratories can play an active role in hosting and connecting multiple stakeholders. The following experience represents an example of how a fab lab can mediate and facilitate the relationship between fashion designers and manufacturing companies, at both national and multinational level.

Since 2013, FaberLab Varese – the fab lab of the Italian trade association Confartigianato Varese – has taken part, together with the University of the Arts London and five SMEs from the footwear district of Vigevano (Italy), to the Progetto Londra. The project aimed at demonstrating both the efficiency of including digital fabrication processes within the production chain and the potentials of collaboration among international fashion designers, fab labs, and Italian SMEs. Specifically, a student from the University of the Arts London has sent Faberlab Varese sketches of his graduate project, a pair of sneakers. Faberlab Varese has evaluated and tested the design by manufacturing the shoes prototype using 3D printing with Color Jet Printing (CJP) technology. The companies involved, once received the tridimensional model, coordinated production phases to obtain the final product from pattern development to material selection, from sole manufacturing to assembly, and packaging. According to Iolanda Alfonsi, from Confartigianato Lomellina, the possibility to materialize a design through rapid prototyping, before the actual production process, allows to minimize costs and technical misunderstandings, and makes possible to simplify communication between clients and manufacturing enterprises.

All experiences reported in this article demonstrate the dynamic DNA of a fab lab, as well as the different roles it can virtually play in fashion-oriented practices. Since every user can interact with the fab lab ecosystem at different stages and pursuing diverse goals and needs – as described above – in the next section fab lab potentials and critical areas related to identified actors are presented.

Potentials and critical areas

The research revealed various features that can contribute to define: current potentials of fab labs engaged in activities in the fashion/textile sector, difficulties to face in building relationships with the traditional productive and academic systems, and the conditions that could favor or hinder the implementation of initiatives in these contexts.

After the analysis of data collected through extensive web-based research and interviews, the fab lab appears to be a real tool potentially capable of producing multiple opportunities for all the actors that operate and interact within it.

To *fab lab staff members*, the lab could allow to deepen daily the possible applications of digital fabrication tools in fashion/textile field through: personal research, synergistic exploration of product/service solutions during consultancies, supervision of experiments conducted by members of the community, and interaction with external experts. Moreover, being active part of a fab lab allows to practice interdisciplinary paths in collaboration with skilled professionals from the community, in order to implement didactic offers and ongoing projects.

Fab labs could offer to *fashion designers* space, tools and knowledge to: enhance digital fabrication skills; enable experimentation, self-production, micro-production, and rapid prototyping; allow the implementation and testing of projects/systems through networking and collaborative initiatives. Connections can take place with other actors from the fashion system (designers, artisans and companies) or with professionals unrelated to it (IT, engineers, architects, etc.).

Artisans and SMEs could gain value interacting with a fab lab in speeding up some production processes, in exploring new design and production paths, and in improving digital fabrication skills. As a micro-production facility, fab labs could rent – at affordable prices – technologically advanced machineries, otherwise extremely expensive for small businesses. Artisans could get in touch with digital fabrication experts, designers and other companies, with whom start collaborations and experiment synergies.

More structured fashion companies could benefit from a fab lab in different ways: for inspiration (looking for creative and unconventional design/production ideas); to research specialized personnel skilled in rapid prototyping; for consultancy on the purchase of digital fabrication tools; for knowledge and skill transfer to selected members within the company; for network creation to develop co-designed projects.

For *educational institutions*, the collaboration with a fab lab can generate opportunities for enhancement of technical skills of students, teachers and technical staff. It can be useful for the creation of interdisciplinary and interdepartmental paths, to encourage the meeting of students and craftsmen, companies and experts in digital manufacturing. It can foster the development of experimental courses, outsourcing education on subjects currently not mastered by teaching staff, such as digital manufacturing processes.

The collaborative nature of fab labs, and the coexistence of different professional figures, make possible the exchange of knowledge that can be extremely useful for the establishment of heterogeneous networks and the development of innovative projects. As Troxler (2010: 7) states, the 'power of diversity' in fab labs enables an 'innovation ecology', allowing connections among people from different disciplinary backgrounds.

According to the performed interviews, some of the fab lab intrinsic values are well perceived by the users who mostly enjoyed collaborative practices. The main shared themes were: the importance of competences over technologies, the sense of satisfaction from contributing to collaborative, stimulating and enriching experiences, and the gain from knowledge exchange between different generations and different professional figures.

The importance of competences over technologies is attested in numerous contributions (Gershenfeld 2012; Bianchini 2014; MIT 2013), as well as in some interviews as the following one:

> There is one very important thing about a fab lab, which is the difference between fab labs and suppliers: the community. People have a much higher value than the machinery [...] the tool is there because there is a person who knows how to use it correctly. So Arduino is there, but if there isn't a person who teaches you how to program it, how to use it for your project, and you do not have these skills, the Arduino remains an ornament, basically. (Fab lab staff member 1)

The fab lab staff member, in this contribution, wishes to clarify that the core value of a fab lab is not the access to manufacturing technologies, but rather the presence of people with specific skills necessary to correctly use resources and transfer the knowledge to others. The awareness of the importance of the community is felt not only by those who work within the fab lab, but also by users who interact with it.

> *There are no interesting tools that compensate for the lack of knowledge. Therefore any lack of knowledge [...] must be overcome with a person, an expert, [...] who helps you in this. [...] The beauty of fab lab is that it allows you to meet people who make you understand that what you don't know is a lot, but you can learn and make available [your knowledge] through collaborations, dialogue, [...] build[ing] things together. [...] The teaching of a competence passes through an exchange that enriches both, the addresser and the receiver. (Fashion consultant and teacher)*

The interview just mentioned highlights how the sense of satisfaction from contributing to collaborative, stimulating and enriching experiences is directly related with the gain from knowledge exchange between different professional figures, producing value for all the stakeholders involved. Nevertheless, from different interviews emerged that the Fashion System and fab labs' ethics are considered by many genetically in contrast for intrinsic dynamics. According to a fab lab staff member:

> *there is this clear division [...] a 'different' 'vision' of how the projects are managed. Fab labs are for open source. Those who work in the fashion field, whether it is a productive district, the style department of a company or a tailor, they are very closed because they are afraid of releasing their knowledge. (Fashion Designer and fab lab staff member 2)*

This perspective is partly confirmed by a designer and university professor who directed a multidisciplinary course in collaboration with a fab lab, an artisan and three fashion companies. During the organization of the course, she explained the difficulties on involving traditional manufacturing enterprises into the project, stating that it was much easier to find a positive response from start-ups that already embody a digital and collaborative DNA.

However, the economic crisis that Italian fashion SMEs are experiencing can be perceived as an opportunity to turn their attention to innovative paths (Miceli and Rullani 2017). In this case the fab lab can be an interlocutor potentially able to support this renewal and to give life to cutting-edge and tailored product/service solutions.

Fab labs engaged in fashion oriented activities continuously experiment digital fabrication processes and collaborative paths embracing a trial and

error approach, therefore their potentials are unceasingly redefined. It often happens that people unfamiliar with the maker movement and the fab lab reality can grasp only some of the possibilities described, obtaining a partial vision of opportunities that reduces participation.

Various are the limits and difficulties that emerged from interviews, related to the starting or developing collaborative practices with players from the fashion system.

Since fab labs are different from each other and topics tackled within the laboratories reflect the community interests and needs (fabfoundation.org; Mikhak 2002; Stacey 2014), the absence of fab lab internal personnel skilled in fashion practices can hinder the establishment of an active network focused on related issues and count only on sporadic services when explicitly required by clients/community members.

The evolving nature of the phenomenon and the inadequate/scarce online communication (Troxler 2010: 11-12) of fashion-related initiatives within fab labs makes uneasy for people outside the maker movement to understand the real opportunities behind active participation to the space's community. Moreover, the uncertainty of the output from experimental paths, scarcity of economic, temporal and/or human resources can push SMEs and artisans not to invest in such initiatives.

Widespread digital illiteracy discourages trust in digital tools and reduces understanding of their potentials (Mainieri 2013; Arcidiacono 2017), and the opportunities behind collaborative initiatives within fab labs. Digital illiteracy is reinforced by what Butler and Sellbom (2002: 28) identified as 'the general categories of barriers to adoption of technology' as 'reliability, lack of time to learn, uncertainty that using technology matters, and lack of support'. These factors need to be taken into account when trying to involve people not used to deal with technology. As a matter of fact, underestimating users learning time, and the basic knowledge needed to cope with digital fabrication tools, can compromise future participations, maybe due to a not successful experience in reaching the expected result.

Regarding personal fabrication, despite the increase in activities related to making and DIY in fashion (Barrocas et al. 2018), several respondents have identified as deterrent for active participation to fab lab initiatives, the consumer culture and the ease of buying fashion low-cost products (Atkinson 2006). Moreover, despite the development of some brands following the distributed manufacturing logic, the interviews revealed little participation by prosumers and little awareness of the existence of these brands from most of the fab lab staff members involved into the research.

Conclusions

Thanks to a set of technological, human and structural resources, fab labs can provide professional updates to both student/designers, artisans/entrepreneur and academic institutions, enabling connections and collaborative projects. This process can foster autonomous use of spaces and tools stimulating self-employment, as well as on-demand micro-production processes; at the same time it can improve the digitization process in SMEs by training personnel, transferring knowledge and competences.

According to the author findings, these are the challenges that have to be taken into account when trying to start and manage collaborative fashion practices and innovation processes:

- Fab labs have to cope with the rigidity of traditional production and academic organizations. A deep understanding of the dynamics and mechanisms that characterize traditional systems is needed. To persuade such realities that fab labs can contribute to effective resolution of existing problems, a proper strategy is needed according to the target.
- Fab labs have to overcome the lack of trust from potential users; as well as provide possible solutions for companies which would like to participate to the labs initiatives but cannot for the lack of time, economic or human resources. Public funding can help in this direction.
- Fab labs staff members have to overcome inadequate communication of the activities, probably due to the lack of time in updating online channels (Troxler 2010: 11-12). It is important for outsiders to envision fashion projects which succeeded, the difficulties encountered and how challenges have been solved during the collaborative path.

Among the conditions that could favor the start and development of fashion-related activities within fab labs, the following ones are fundamental:

- The presence of personnel skilled in fashion/textile practices and experienced in digital fabrication among fab lab staff members can provide a greater range of solutions and more targeted problem solving according to the target.
- Like any collaborative practice, the 'multitude' principle is fundamental (Novel 2014). Fab lab staff members need to push the

creation of profitable networks with fashion industry players and the expansion of the fashion-oriented community in order to increase the possibilities to activate collaborative and cross fertilization paths able to produce innovation. Direct contacts with other laboratories from the fab lab network – engaged in textile-related initiatives – can favor the diffusion and development of fashion practices.

- To increase trust in fab labs it is necessary to adopt the right communication tools and approaches, according to the selected targets. It could be useful to include within the laboratory staff an exponent of each target to reach (MIT 2013). Other channels could be industry and trade associations, personal contacts and word of mouth. Activities in collaboration with academic institutions can make the fab lab reality known to future fashion designers.
- To highlight the potentials of fab labs it is important to advertise successful collaborations, through direct witnesses of professionals involved. It could be useful to create a website section dedicated to the experience of those who attended the fab lab initiatives, a kind of blog managed by community members.

The combination of these factors might encourage the start of profitable activities and the development of collaborative networks able to foster innovation in fashion practices.

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