Title : Are public makerspaces a means to empowering citizens? The case of Ateneus de Fabricació in Barcelona.

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A B S T R A C T

Since the beginning of the 2010s, the existence of widespread shared workshops has enabled access to digital manufacturing tools. Mainly located in urban areas, these facilities seek to make means of production, to design, prototype and repair all kinds of objects available to the citizens. These practices have been supported by activists of the "democratization" of digital manufacturing spearheaded by the maker movement. Urban authorities have gradually been won over by the these activits' promises to encourage entrepreneurship, generate new knowledge, mobilize citizens and even transform the perceptions of and the way in which manufacturing is conducted in the city. However, these activists' attractive discourse overly mechanically equates the accessibility of these digital tools to the idea of empowerment. Under what conditions can these practices of making lead to an increase in citizens' individual and collective power to act, or even to social change? This article aims to answer this question by firstly constructing an analytical framework of makerspaces empowerment, and secondly by analysing the case of the public network of makerspaces in Barcelona: the Ateneus de Fabricaci´o. To do so, our qualitative research will be based on the documentary analysis of official publications, direct observations carried out at the aforementioned workshops, and in-depth interviews with key players Barcelona makerspaces' scene. Our results will demonstrate that in the context of smart cities, the public acceptance of these places leads to the transformation of administrative practices. Free access to public makerspaces is accompanied by a change in the relationship between public organizations and users in order to promote the empowerment of the inhabitants of Barcelona thanks to these fabrication practices.

Jérémy Diaz
Université du Québec à Montréal Department of Geography
Case postale 8888, succursale Centre-ville
Montréal (Québec)
H3C 3P8 Canada
Email : diaz.jeremy@courrier.uqam.ca

Mariona Tomàs, Ph.D.
Universitat de Barcelona
Departament de ciència política
Av. Diagonal, 684, 2n pis, A211 08034
Barcelona (Spain)
Email : marionatomas@ub.edu

Sylvain Lefebvre, Ph.D.
Université du Québec à Montréal Department of Geography
Case postale 8888, succursale Centre-ville
Montréal (Québec)
H3C 3P8 Canada
Email : lefebvre.sylvain@uqam.ca

1. Introduction

Among cities' digital transformation phenomena, *makerspaces* continue to be cited as being an almost mechanical lever of large-scale economic, social, industrial or political upheaval. Specifically, they are shared spaces that provide competitive access to equipment usually reserved for professionals of manufacturing and production. Among the great diversity of these places, some train individuals in these technologies while others produce small series of complex objects. All share the ability to more or less quickly design, produce or repair prototypes by using a variety of materials (wood, plastic, ceramics, concrete, resin, etc.). Associated to design software, users of these machine tools (3D printer, laser cutting or robotic arms) have the ability to turn "data into things and things into data" (Gershenfeld, 2012, p. 44). Thus, an object designed in Barcelona can be easily manufactured in Montreal. In legal terms, the objects produced are typically associated with open *creative commons* licences which allow anyone to use the production drawings provided they cite their source and perhaps share the enhancements made to the product following a logic of the common good (Van Abel et al., 2011). Participation in these spaces would involve, among others, the use of various tools, solving technical problems, rendering sketches, engaging as a member of collectives, acquiring the necessary leadership and educational roles, as well as sharing their creations and skills with a large number of people (Sheridan et al., 2014).

In recent years, we have witnessed growing enthusiasm by the authorities to promote these practices by including them in broader action plans through public subsidies, organizing events or even in urban regeneration projects for more disadvantaged districts. A *makerspace* refers to a workshop open to the public through the provision of digitally operated machine tools, but also the digital world of information and communications emanating from it (website, databases, digital forums and chats etc.). These places gather participants around the practice of making who generate forms of interaction and sociability deriving from the digital culture. They are also places where both material and immaterial content production takes place whose local roots can be both physical and virtual due to the nature of the production means. Given the peculiarities of these places, they lead us to think simultaneously about the role of the digital, social relations, material experimentation and space in the dynamics of empowerment within a unified theoretical model of the empowerment of digital fabrication. The proliferation of these places would play a key role in a more participatory vision of the city (Niaros, Kostakis and Dreschsler, 2017; Budge, 2019). They would encourage individual and collective forms of engagement by offering a production space in which citizens can carry out all kinds of projects: from the idea to its actual realization (Dougherty, 2011; Gershenfeld, 2012; Anderson, 2014; Hatch, 2014;). However, the literature remains largely speculative as to these spaces' possibilities of action where everyone could make anything.

Indeed, several empirical studies have analysed the gap between the activist discourse and the reality on the ground. These studies observe that users' physical accessibility to these spaces is difficult (Fox, Ulgado and Rosner, 2015; Nagbot, 2016, Rosner and Fox 2016); that access to digital fabrication technology remains controlled (due to payment for services, paid subscription or community voting) (Ferchaud, 2017); that the support for the general public requires substantial human and material resources (Koh and Abbas, 2015; Crumpton, 2015); that a cliquish spirit reigns within these workshops (Cléach, Deruelle and Metzger, 2015; Ferchaud, 2017); that the flow of knowledge between workshops is limited (Wolf et al., 2014; Ferchaud, 2017); and finally, that the economic benefits remain unknown (Wolf-Power et al., 2017).

These findings contradict the optimism of activists in favour of the "democratization" of digital fabrication and the territorial impact of *makerspaces*. While it is undeniable that the opening of digital fabrication sites has the potential to include new profiles - including amateurs - in the specific design and fabrication of objects, the activist discourse should probably get out of a rut that mechanically associates the accessibility of these manufacturing tools to the idea of *empowerment*, as if the voluntary provision of technologies automatically lead to empowering individuals without the need to examine the conditions for appropriating these production means. The question then arises of finding out under what conditions these practices of *making* can lead to an increase in citizens' individual and collective power to act, and even to social change. And this, in a context where the authorities increasingly intervene in the territorial spreading of *makerspaces*. This article aims to contribute to a greater understanding of the reality of these spaces in regard to matters of empowerment. To reflect on this, we propose analysing the case of a network of public digital fabrication workshops in Barcelona: the Ateneus de Fabricació (AdF).

2. Towards a model of empowerment through digital fabrication spaces

There is a great deal of literature on the question of individual empowerment and gaining awareness of the power of collective action with respect to a dominant power. Although the term *empowerment* did not emerge until the mid-nineteenth century, it has become widespread since the mid-1970s, in various fields of theoretical and practical application (Keys et al., 2017). This approach designates both a state (being empowered) and the process of learning to achieve it. Originally, empowerment covered three dimensions: the power of the individual to change his or her life by having the ability to achieve the means for his or her personal development (*capacity building*); the power for a community to transform its living conditions by resorting to collective actions of solidarity; and finally influence over society in a broader sense, of political recognition and representation (Bacqué and Biewener, 2013). Then, gradually, from the 1980s, the liberals and conservatives use *empowerment* to designate an individual undertaking to

address a shortcoming by the States in matters of employment or the fight against poverty, for example. According to Calvès (2009), the empowerment approach would have gradually been rendered meaningless and would have lost the radicalism of its original content. As Bacqué and Biewener stress, “this state and this process can be both individual, collective and social or political - although, according to the uses of the concept, the focus is on one of these dimensions or conversely on their articulation” (2013, p. 25).

Unlike other shared working spaces, the peculiarity of makerspaces involves both sharing fabrication tools within the same space while gathering people together around shared resources and knowledge, working physically and online on individual and collective projects. The variety of makerspaces opens up promising prospects, but there is a lack of deeper reflection on the dynamics of empowerment than they can generate (Kietzmann, Pitt and Berthon, 2015; Ludwig et al., 2015; Meissnet et al., 2017; Nascimento and Pólvora, 2018). This is why we consider it necessary to examine the conditions under which these practices around making can lead to individual, collective and political empowerment.

According to Nascimento (2014), makerspaces can engage users to participate in material experimentation that would be fundamental to initiate a process of empowerment. She distinguishes two levels of empowerment. On the one hand, low-cost access to physical creation that would enable an awareness of and engagement with things, people and the world surrounding the individual. Practical experimentation would convey a form of ethics of craftsmanship (Sennett, 2009), i.e., the pleasure of making and the satisfaction of a job well done alone and with others. Also, the proximity to “productive” communities that collaborate, share their work, support each other through multiple channels of communication and exchange. Such proximity would encourage the development of knowledge through contact with complex technology and systems -the “black boxes”- whose functioning the individual would learn to discover and understand. This more direct understanding of the functioning of everyday ordinary objects would facilitate greater awareness of complex technical systems around uses and their ability to act in their environment.

But, to understand the dynamics of empowerment within makerspaces requires taking into account other dimensions that underlie the power to use, manipulate, adapt or misuse (digital) fabrication tools. We believe the concept of appropriation to be useful to add to Susana Nascimento’s theoretical proposal. The available fabrication processes, access to computer tools and the Internet or the location and configuration of the space influence the social appropriation of these workshops by the users.

Inspired by the work of Michel de Certeau (2011) describing the difference between the uses envisaged by designers and the actual uses of technical

objects by people in everyday life, the theory of the social appropriation of technology is useful for analysing through practices and representations users' rapport with technical objects as well as the individual and collective process of building their social identity. The researchers Serge Proulx, Julien Rueff and Nicolas Lecomte distinguish three levels (2007). Individually, four components are required for the appropriation of technology: access to technology; technical and cognitive mastery of technology; the integration of technology into the daily routines of the individual; creativity in its use. Collectively, these authors emphasize the importance of the mediation of a community organized around similar interests or values and common aspirations to safeguard the circulation and enhancement of individual and collective learning. Finally, on the political level, the inclusion of a collective representation of users in innovation processes or in public policies on technology is the full realization of the process of social appropriation.

In an article from 2006, Maarit Mäkinen develops an analytical model of the process of empowerment by information technology. Digital Empowerment "is an enabling process, which proceeds like a spiral from the prerequisites to the improvements in skills and knowledge, and then to the consequences, which are empowering for the community and its members" (Mäkinen, 2006, p. 391). The author distinguishes three phases in the dynamics of empowerment through information technology. Five basic prerequisites, the first being: individual and collective consciousness that refers to the understanding of the technical potential of using technology; individual motivation that has a collective dimension in the role played by encouragement by others in the learning process; the technical conditions for access (hardware and software) to the Internet; the skills for using the technology as well as the level of cognitive understanding of information flows; constructive participation that encompasses all the elements contributing to enabling the active role of individuals within the networks and society (use of new technologies, developing new tools or the capacity of influence in their use). The second phase includes progress and improvements individually and collectively based on these five basic elements: improving technical skills in the use of the technology; increased social participation, involvement and interaction in computer networks; improving access to information sources and increasing their ability to produce information by themselves; the development of new technical features or new technologies to explore and support new collective activities and actions. The third phase involves broader psychological dimensions: boosting self-confidence; awareness of one's social role and one's role within the community; greater freedom to think, choose and act; more control over one's own life. In political terms, the author writes that a political influence on social problems by using digital technologies is only possible if people and policymakers agree that the online environment has space for meaningful participation in the decision-making and decision formulation processes.

One dimension is still missing: the role of space. As Nascimento writes; “technologies aren’t neutral in any of its dimensions, and as such, the shared machine shops where people fabricate, modify or make artifacts aren’t neutral either” (2016, p. 2). The different sociological models underestimate the spatial battles in the material or symbolic appropriation of a resource, such as digital fabrication workshops. Now, any form of appropriation is marked by “effects of place” (Bourdieu, 1999) where relations to physical space by the effects of proximity and remoteness translate forms of social competition. In other words, the situation of a workshop, defined as its relative location in space, can cast light on the physical relationships of users with these places and is evaluated in terms of accessibility. A second level of understanding the role of the space in empowerment dynamics within makerspaces may lie with the concept of heterotopia developed by Michel Foucault to reflect on “absolutely different” places (Foucault, 2009, p. 24). This concept tells us about the existential relationship we have with these places. Heterotopic places would deserve far more thorough treatment, but they can be defined as different places that shape us in a unique way as we shape them in return. They would “make us invest space in a unique way, giving it the roles and values that enable us to exist differently” (Nal, 2015, p. 151). In this sense, heterotopias are places where the individual will manifest him or herself through different forms of appropriation that vary over time. Thus, makerspaces can assume a political dimension in that they allow expressing and maintaining another worldview, whereby the individual also cultivates his or her potential and enables thinking differently.

The challenge is to identify the spatial markings that condition these forms of appropriation. Fabrice Ripoll and Vincent Veschambre (2005) propose distinguishing two modalities of spatial appropriation. First, they evoke “material” markings in space. These are all the physical elements of space that influence accessibility to the place and that teach individuals on the uses suggested, tolerated or prohibited. The functions, roles and values of spaces in their material translation can then be the subject of function creep of the formal or informal, legal or illegal space. Secondly, they put forward the immaterial terms, that is to say the representations and the imaginaries involved in inhabiting it, the emotional attachment and sense of belonging to the place. They are all the mental constructs whereby an individual or a community assumes something external as their own (Lefebvre, 2011) and are involved, ultimately, in symbolic and identity appropriation.

We propose integrating all of these dimensions in the context of the analysis of empowerment in the context of makerspaces (Table 1). We have sought to articulate the three levels of empowerment, i.e., the individual, the collective and the political. The individual level defines power for the individual, in this shared space, to be able to provide themselves with the means for their personal development through the use of the technologies present. The collective level refers to the power for a community to implement solidarity actions and meaningful projects from these resources at digital fabrication sites to improve their living conditions. Lastly, the political level

refers to political representation in many forms of activities around the use of digital fabrication. This framework will guide the analysis of our case study.

Table 1: Model of digital fabrication space empowerment

Political Level	- Political recognition of the activities carried out in these places - The ability for users to be involved in the political decisions concerning specific issues - The presence of a strong identity in the common imaginary of these places
Collective Level	- Linking and forming a community of involved individuals - Implementing relevant projects to satisfy a local need - The feeling of belonging - The constitution of a wealth of information and knowledge common to the users of the place
Individual Level	- Accessibility to the place, its non-material resources and its means of fabrication - Strengthening self-confidence and awareness of the capacity to act - The development of technical and cognitive skills - The ability to generate new information and knowledge

Source: author's own.

3. Methodology

This article is based on a qualitative analysis, based on a review of the literature, interviews and observing practices of makers, their projects and the activities they carry out. We have analysed the reports and planning and policy documents published by the City of Barcelona since 2013, which saw the beginning of the public service which offers free access to digital fabrication technologies. We have thus created a corpus of activity reports, official documents, strategic plans of the City and articles from the local press. The review of these documents has allowed us to identify information regarding the vision of the City, the implementation of projects carried out as well as the reactions of the local residents of Barcelona. We were able to compare this information with the data we have collected by means of ethnographic observation and interviews.

Indeed, we conducted eighteen in-depth interviews with key players of the local maker scene between February 2017 and July 2018. The interviews provided a wealth of

information and the responses that emerged were reinforced by documentary observations. In the autumn of 2018, all of the interviews were transcribed and analysed using a coding grid to elicit themes and sub- themes. These interviews were conducted following guidelines and were semi-structured. Several additional hours were also devoted to talking to users of the places. During these days, detailed notes were collected on how the spaces operate, the contents of activities, space and project management issues. Our participation in several events organized by the Ateneus de Fabricació helped to better understand the dynamics in each community and to enhance relationships. The subject of the involvement of the authorities was very often at the centre of very frequent informal discussions.

4. Analysis

4.1 Contextualization

Since 2013, the city of Barcelona has implemented a network of public makerspaces called Ateneus de Fabricació (AdF). Ultimately, the goal is to open a workshop in each district of the Catalan metropolis. This project clearly embodies the city's desire to institutionalize making practices and encourage the creation of educational facilities conducive to scientific and technical education. It is a continuation of the political plans of previous governments. In fact, the modern history of Barcelona shows the existence of a certain entrepreneurial tradition, an intellectual climate and a social fabric that have driven the city to major changes (Capel, 2003). The city gained international recognition thanks to the urban transformations undergone during the political Transition until the 1992 Olympic Games. This period saw the shaping of the "Barcelona model", a model based on "small operations on small urban spaces" (Hall, 2014, p. 468) to improve living conditions by addressing the lack of public spaces, the poor state of housing and the permanence of obsolete infrastructure (Monclús, 2003).

This model has gradually been replaced by a neoliberal model of urban planning where public and private consortia played an important role in urban projects (Mansilla López, 2016). Several emblematic projects undertaken by prestigious architects such as the Forum of Cultures, Diagonal Mar or 22@ were strongly imbued with a discourse on sustainability, the knowledge economy and economic competitiveness. The 22@ innovation district marks a turning point in Barcelona's planning policy. Passed by Barcelona City Council in 2000, the 22@ project sought to strategically position the city by turning the industrial area of Poblenou into an area of activities related to new information and communication technologies.

The inclusion of digital technology on the Barcelona political agenda became reinforced in 2011. The strategy of the smart city became the favourite slogan of the mayor, Xavier Trias, whose minority government ruled until 2015. Trias had set as a priority goal to make Barcelona a global benchmark for smart cities and a city laboratory for innovation. However, the citizens remained on the sidelines of the "negotiations/agreements" between the authorities and the big technology companies (such as Cisco, GDF Suez, Schneider Electric, IBM, etc.) in the construction of a smart city in Barcelona (Tomàs and Cegarra, 2016).

The failure to consider the citizens in the digital city was heavily criticized by the new administration of Ada Colau, elected in May 2015. Her administration redirected the project and intended to "go beyond the smart city" by replacing the "citizen at the centre of public

policies, working with the involvement of the different agents" (Ajuntament de Barcelona, 2016a). In this context, the network of AdF was then perceived by the authorities as a favourable facility for citizen empowerment.

4.2 Political level: the fragile institutionalization of *making* practices

The inclusion of the maker movement in Barcelona's political debate began in May 2011 with the announcement by the future mayor, Xavier Trias, to open a public "Fab Lab" (*Fabrication Laboratories)* in Ciutat Meridiana, one of Barcelona's poorest neighbourhoods. The origins of this electoral announcement lie in the influence of an urban model developed at the Institute for Advanced Architecture of Catalonia by architects close to Trias: one of a connected, self-sufficient city (Guallart, 2014) that promotes a mild relocation of urban production through the sharing and exchange of data (Diez and Posada, 2013).

This project was part of the Municipal Action Plan (2012 - 2015) which defined the vision and goals for making Barcelona a smart city. The guidelines included transforming parts of the city into "productive neighbourhoods at human speed inside a hyper-connected, zero emissions metropolitan area" (Ajuntament de Barcelona, 2012). The opening of the first two public Fab Labs in Ciutat Meridiana and Les Corts should "promote a re-industrialization process". In February 2015, an internal administrative document confirmed this desire to "reintroduce production and prototyping locally in its neighbourhoods" while structuring local digital skills to support citizen initiatives: encourage the "opening up and learning of productive processes for citizens" so that these workshops become "urban laboratories to test real solutions seeking to achieve a more efficient and sustainable city" (Ajuntament de Barcelona, 2015).

After the defeat of the Trias administration in 2015, the project was relieved of its local micro-production mission to focus on learning and experimentation. Already the refusal by the municipal authority in the early stages for a public body to be sponsored by a foreign university of the MIT (which developed the first Fab Lab) presaged the project's reorientation. Hence, the name change of the workshops (Ateneus de Fabricació instead of Fab Labs) symbolized the desire of the city to include this project in the Catalan urban imaginary where Ateneus would represent places in the collective memory intended for popular education after the late nineteenth century.

Ada Colau's new administration (2015 - 2019) continued the territorial deployment of the project emphasizing the desire of the city to work for sustainable development and digital inclusiveness (Ajuntament de Barcelona, 2016b). A further three AdF were opened. But the institutionalization process remained fragile largely because of issues related to the management of these workshops. The development of this new type of workshop required the adaptation of the functioning of the public administration which did not always benefit the necessary expertise in the technical aspects, but also the management philosophy of the workshops where the activities are greatly determined by motivation and projects started by the citizens. Each AdF is currently managed by several non-profit organizations selected by means of public tender. These organizations pay for staff, consisting of three different profiles: technologists, for the projects' technical support; an educator, as a workshop facilitator; and the management, for the proper functioning of the service and cooperation with external organizations. The districts of the city provide a furnished room and the technological equipment (electronics, numerical control machines, tools, etc.) purchased by the *Xarxa d'Ateneus* (XAF) network, the small team of public employees comprising a project manager and two technicians, who coordinate the project. The AdF share common dimensions with other makerspaces (provision of the same tools, machines and software and adherence to the values of free culture). However, the AdF differ on several points, especially with respect to their public service mission. This materializes mainly by the fact that the AdF offer a free fabrication and

technical support service in exchange for a voluntary service (i.e., a workshop, a talk, etc.). In addition, each AdF has a territorial specificity in relation to the nature of the management organization and the local policies of the neighbourhood in which it is located to encourage citizen participation in the issues faced by each sub-municipal territory: the environment in Barceloneta, (un)employment in Ciutat Meridiana, social inclusion in Les Corts, and entrepreneurship in the Nou Barris technology park.

4.3 Collective level

The experimentation facilitated within the AdF aims to encourage users in forms of social engagement towards the community. Material engagement foreshadows citizen engagement in public places "where people of different backgrounds, training, stories, learning abilities, experiment, jointly creating, carrying out activities and projects related to digital fabrication that involve them throughout the process" (Ajuntament de Barcelona, 2016c).

To address the project's lack of human and financial resources, the collaborative management of each AdF is based on the implementation of a broad system of reciprocal provisions to help with the development of projects run by communities, individuals, institutions or companies. Specifically, any user can use the workshop resources free-of-charge in exchange for a personal commitment such as assistance to or the training of another user, organizing events open to the public, donating materials or objects or sharing their project documents. This system encourages a greater flow of knowledge and expertise among workshop users, but it is used to encourage the user's sense of belonging vis-à-vis their community as well as gain awareness of their capacity to act.

The thematic differentiation of each AdF aims to promote territorial cohesion with the actors in the area by giving them the opportunity to explore and prototype community projects to meet local needs. Indeed, one current affair profoundly affected the deployment of AdF demonstrating the failure to take into account the social and territorial dynamics of the first phases of the project. In 2013, a citizens' association in Ciutat Meridiana occupied the premises of the first workshop to store supplies there. Residents said that the neighbourhood's most urgent priority was to re-appropriate a place earmarked for use by an elitist project that did not meet their needs (Lopez, 2013). After several rounds of discussions, the City agreed to re-steer the programming of the space by integrating technical vocational training such as eco-construction and eco-gardening.

The result of this political crisis has shown the importance of the choice of the AdF's territorial specialization both in regard of their suitability to local policy actions, and partnerships to build with agencies and players already present and the choice of the team to manage the space. This choice seeks locally to constitute a territorial network of people-resources in each district since, as one of the interviewees stated, the important thing is not to have all the technical skills, but to have a great network of potential contributors who are skilled to contribute to the progress of any project. Currently, very few collective projects have emerged from the AdF. As the staff of each Ateneu say, it's not their place to initiate such projects. They must arise from the will of the users. Nevertheless, we observed several projects directly related to the specificity of AdFs like the inclusive label project for the visually impaired in Les Corts or the awareness-raising campaign to combat uncivil behaviour of Ciutat Meridiana district. These projects came about from the pooling of knowledge and know-how developed within the AdF by several types of actors (users, technologists, civic associations or political staff).

Yet for many outside observers, the AdFs are not yet sufficiently connected to the "global network", that is to say, to the digital world of digital platforms where open access projects are

compiled. It seems that the AdF network does not yet have the experience and the sufficient resources to build a digital archive and contribute to these banks of information and joint projects.

4.4 Individual level

The vast majority of AdF users have never attended any technical workshops before. According to one interviewee, reception is essential to allay their fears, arouse their interests and provide them with motivation. These are the prerequisites before starting a technical support process. We have observed many visits by users (approximatively 25 visits between February 2017 and June 2018). The AdF are visible from the street, barring the one located in the Nou Barris Technology Park, but the visibility of their activities from outside the buildings varies. All workshops have a window display which seeks to explain to new users the efficiency and effectiveness of the tools available.

According to the AdF managers, it is not so much the fabrication that is important, but the awareness on the part of the users of their ability to make [things]. In this sense, the free nature of the service is the guarantor not only of the equal treatment of users, but also a decisive lever enabling the user to return to the AdF more frequently, to experiment and develop their project more quickly. In addition to being free, users have stressed the importance of the technical and human assistance provided by the supervisory staff for their motivation, their awareness of their potential to act and the development of their project. Unlike most known makerspaces, the AdF support individuals. They are not left on their own. One of those interviewed stressed the importance of allaying users' fears before assuring progressive support towards the acquisition of technical skills. According to two of the interviewees, the learning process has a technical and a psychological dimension.

For instance, the AdF of Barceloneta divides users into five categories that correspond to their level of technical autonomy. First, those who are using the machine or computer program for the first time. They are completely dependent on the technician who explains the processes of creating an object and the technical capabilities of the tools. Second, those who have an idea of how the machine works, but pose many questions. Third, those who have some experience with the machine and must occasionally clear up their doubts with the technician. They know very well how to use the machine within the context of their project, but they may not know all the features of the machine. They begin to learn how to fix the errors that the machine may cause without the help of the technician. These individuals can help the first two categories of users. They have generally spent a dozen hours or so at the Ateneus. According to the technician interviewed, this is the average learning time required for the individual to feel capable of being alone with the machines and knowing how to mobilize resources to solve the problems they encounter by themselves. They can then help others in the Ateneu. Finally, we have those who can work independently. These people may be asked to give advice, support a project or help develop knowledge on specific issues. In the opinion of one of the managers, this is the hardest profile with which to keep in touch. The challenge for the managers is to develop a strong sense of belonging so that they become aware of their social role in the dissemination and popularization of the knowledge and expertise they have developed in the workshop.

User technical autonomy is necessary, but insufficient. One interviewee stated that a person becomes completely autonomous when she becomes aware of the fact that she knows, but also that she does not know and is not afraid to say so. To stimulate this self-awareness, the AdF encourage teaching others. This can take many forms whether informally helping another user or more formally through the preparation of a workshop or knowledge exchange. Even if a user forgets the operation of certain software or machines, this base is crucial because she will have assimilated the learning process needed to achieve what she wants to do. She will have fewer

inhibitions to obtain sufficient resources for her projects and will naturally tend towards exchanging and sharing knowledge.

5. Conclusion

The study of the Ateneus de Fabricació (AdF) from the perspective of empowerment aimed to understand how a public facility could create the conditions for real appropriation by the citizens of technological tools while the supporting structure - in this case the City of Barcelona - is governed by highly regulated standardized institutional practices that indirectly regulate the scope of the possible experiments (Braybrooke and Smith, 2018).

Our analysis has revealed that the opening of a network of public makerspaces in Barcelona was first a political communication tool that relayed the discourse of the maker movement on empowerment through fabrication technologies in a context of the “smart” transformation of the city. A certain idea of an active, innovative citizen engaged with the city is conveyed through personal fabrication of objects. However, the project has experienced several obstacles that have brought to the attention of the project sponsors the gap between its conceptualization and its implementation, that weakened its deployment. These events have shown forms of resistance to the conditioning of places that for the majority remain prestigious cultural facilities reserved for an urban minority. In this sense, the reception, non-paying nature and the support provided by the staff remain valuable levers to lead individuals to acquire the power to make and understand what they are making. These spaces enable seeing, discovering and experimenting alone or together.

The case of the AdF reveals other dimensions beyond their principal mission of individual teaching and learning. They are places for socializing that entail values that are involved in the region’s attractiveness. The AdF are party to reactivating local identity and represent an additional territorial resource to encourage micro-local development. Thus, the Ateneu of Ciutat Meridiana is the controversial witness of a political will to inject life into one of the poorest neighbourhoods of Barcelona while the one in Les Corts develops its expertise on new environmentally friendly modes of textile manufacture. They are places of exchange that constitute areas seeking to promote impromptu exchanges through the system of reciprocity among or the physical proximity of users. The increasing territorial coverage of the network aims to strengthen the cultural offer for the citizens of the city, especially for those who do not possess much cultural capital.

The project is still in its experimental stages. And we have, however, observed how these places are gradually being integrated into the political actions of grassroots revitalization and stimulation of the players already present. These facilities are increasingly identified as being valuable resources to support community projects in the districts in which they are found. Our analysis shows that the collective and political dimensions of empowerment around these makerspaces are not yet optimal while the vast majority of users interviewed have achieved a high degree of technical autonomy as individuals. Here, we consider that the relationship between the individual dimension of learning and training does not yet lead to the collective and political appropriation of these means of production because the spatial appropriation of these places by users only takes place partially.

Under their current form of implementation, the opening of the Ateneus has failed to free itself of the system of public tenders that condemn the opening, management and development of these places in a single act of implementation by the recipient organizations. The development of the AdF lacks meanings, individual and community involvement regarding what these places and their resources can represent for the population. Although certain standards and requirements have

been lowered, some regulatory constraints remain that hinder the full exploitation of the potential of these places, whether it be the use and misuse of the available technologies, the creation of digital archives or the implementation of alternative political projects. Here there is an impasse for public makerspaces related to their public service nature that may encounter a solution in finer complementarity with other activist, community or private makerspaces present in the territory.

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