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Barcelona**

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y emprendedores sociales en Barcelona**

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Article abstract

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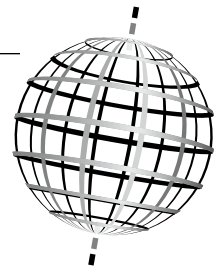
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# The Local and Global Knowledge Dynamics through Communities. The Case of Communities of Makers and Social Entrepreneurs in Barcelona



## Dynamiques de connaissances locales et globales à travers des communautés. Le cas des communautés de « makers » et entrepreneurs sociaux à Barcelone.

## Dinámicas de conocimiento locales y globales a través de comunidades. El caso de las comunidades de “makers” y emprendedores sociales en Barcelona.

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### ABSTRACT

Previous research has underlined the multiscale character of the knowledge dynamics that are involved in the localized innovation processes. The article studies two types of communities of practice (CoPs) outside organizations located in Barcelona, by taking a community-based view of their local and global linkages. At the local level, our results show that community members participate in a “local buzz” while engaging in the development of “local pipelines” with other local actors. Similarly, at the global level, local communities exchange knowledge through a “global buzz” generated around networks of practice (NoPs) while creating “global pipelines” with distant actors external to the NoP.

**Keywords:** Knowledge communities; local buzz; global pipelines; global buzz; local pipelines.

### RÉSUMÉ

La littérature précédente a souligné le caractère multiscale des dynamiques de connaissances impliquées dans les processus d'innovation localisés. L'article étudie deux types de communautés de pratique (CoPs) externes à des organisations et situées à Barcelone, en adoptant une vision communautaire de leurs liens locaux et globaux. Au niveau local, nos résultats montrent que les membres de la communauté participent à un « buzz local » tout en s'engageant dans le développement de « pipelines locaux » avec d'autres acteurs locaux. De même, au niveau global, les communautés locales échangent des connaissances à travers un « buzz global » généré autour des réseaux de pratique (NoPs) tout en créant des « pipelines globaux » avec des acteurs distants extérieurs au NoP.

**Mots-Clés :** Communautés de connaissances; buzz local; pipelines globaux; buzz global; pipelines locaux.

### RESUMEN

La literatura anterior ha subrayado el carácter multiscale de las dinámicas de conocimiento que están involucradas en los procesos de innovación localizados. El artículo estudia dos tipos de comunidades de práctica (CoPs) fuera de las organizaciones y ubicadas en Barcelona, tomando una visión comunitaria de sus vínculos locales y globales. A nivel local, nuestros resultados muestran que los miembros de la comunidad participan en un “local buzz” mientras participan en el desarrollo de “local pipelines” con otros actores locales fuera de la comunidad. Del mismo modo, a nivel global, las comunidades locales intercambian conocimientos a través el “global buzz” generado alrededor de redes de práctica (NoPs), mientras crean “global pipelines” con actores distantes externos a la NoP.

**Palabras Clave:** Comunidades del conocimiento; local buzz; global pipelines; global buzz; local pipelines.

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The literature on innovation has underlined the importance of taking into account the multiscale character of the knowledge dynamics that are involved in the localized innovation processes (Bunnell and Coe, 2001). This fact has implications for research at two levels. On the one hand, from a geographic perspective, innovation dynamics have to be considered both at the local and global levels. New knowledge creation results from the combination of locally-distributed knowledge and knowledge generated by distant actors (Bathelt *et al.*, 2004). On the other hand, from an ontological point of view, research has to consider different units of analysis as the

locus of knowledge creation: the micro-level (individuals), the meso-level (organizations and communities) and the macro-level (territories) (Bunnell and Coe, 2001; Cohendet *et al.*, 2010; Dicken *et al.*, 2001).

The geographic multiscale character of innovation processes reinforces the need of studying simultaneously local and global knowledge dynamics. Nevertheless, the most usual approach both in management and in economic geography studies has been to focus either on the local or on the global level but rarely combine both perspectives. There have been though

some exceptions like the literature on the buzz and pipelines model (Bathelt *et al.*, 2004) on one side, and, on the other, the literature on communities in general, and more specifically on communities of practice (CoP) (Brown and Duguid, 1991; Wenger, 1998) and networks of practice (NoP) (Agterberg *et al.*, 2010; Tagliaventi and Mattarelli, 2006; Vaast, 2004). Both bodies of literature have acknowledged that knowledge management dynamics have to consider collective forms of knowledge renewal beyond an individualistic perspective (Hatchuel *et al.*, 2002). The notions of CoPs and NoPs have contributed to the understanding of the localized processes of new knowledge creation and knowledge sharing but fail to explain how can the local dynamics influence the global dynamics and *vice versa*, and how communities can simultaneously engage in local and global knowledge dynamics.

Furthermore, despite that the literature on innovation has highlighted the importance of knowledge from sources that are external to organizations (Chesbrough, 2003; von Hippel, 2005), previous literature has mainly focused on intra- and inter-organizational dynamics, ignoring the study of dynamics of actors outside firms. For instance, the literature on communities of practice both in management and in economic geography has insisted in studying intra-organizational communities or networks. One notable exception is represented by the study of the “anatomy” of the creative city (Cohendet *et al.*, 2010; Grandadam *et al.*, 2013), where localized knowledge communities configure the so-called “middleground”, that represent the platforms of interaction and knowledge sharing between creative individuals (the “underground”) and formal organizations and institutions (the “upperground”). However, this multiscale approach focuses at the local level of a city, and does not explain how the “middleground” (the local communities) diffuse their knowledge at a larger scale (i.e. to other cities) or how the “middlegrounds” of different cities interact between them. In other words, using Wenger terms, it is not clear how the CoPs and the NoPs are interrelated and how the knowledge dynamics between both evolve from a geographic perspective.

To tackle the above-mentioned gaps in the current literature, this article aims to build on the concepts of CoPs and NoPs to bring some light on the intertwined local and global knowledge dynamics outside firms and to respond to the following research question: How do localized communities contribute to local and global knowledge dynamics?

Previous literature has acknowledged the importance of a lively “local buzz” of frequent and intense local interaction among local actors combined by the creation of “global pipelines” (dyadic linkages with external actors) in order to facilitate the flow of knowledge creation in territories (Bathelt *et al.*, 2004; Maskell *et al.*, 2006). This article contributes to complement the buzz-and-pipeline model by considering the action of communities that due to the cognitive proximity between their members facilitate the knowledge flows at the local and global levels. Our results provide evidence to the “local buzz” and “global pipelines” as well as support to justify the concepts of “local pipelines” and “global buzz”. The “local pipelines” represent the linkages between the members of local CoPs with other local actors outside the CoP, while the “global buzz” refers to the interaction between the members of NoPs

(that share cognitive proximity but not necessarily geographic proximity). The empirical research is based on the qualitative analysis of the CoPs that emerged in different collaborative spaces in the city of Barcelona. Such collaborative spaces might take different denominations like coworking spaces, Fab Labs, Living Labs, hackerspaces, makerspaces, etc. They represent localized spaces where local communities might gather to socialize, work, interact and share knowledge around a certain practice. The analyzed collaborative spaces are two coworking spaces focusing on social entrepreneurship, and two makerspaces. They are embedded in their local environment and at the same time, they belong to global movements like the social economy and the global ‘maker’ movement.

The article is structured as follows. First, the literature review section introduces the buzz-and-pipelines model and the role of communities in the local and global knowledge dynamics. After presenting the methodology of the qualitative study, based on the four-case comparison, the results show that, at the local level, collaborative spaces contribute to bring together local actors with common interests (developing CoPs) and to create local links with actors external to CoPs. At the global level, collaborative spaces belonging to international networks benefit from the network ties to share knowledge whereas spaces that are not integrated in a network use the members’ personal ties to interact with distant similar CoPs. The discussion presents the differences and complementarities between the local buzz, local pipelines, global buzz and global pipelines, based on the community-based view of knowledge dynamics. Finally, the conclusion summarizes the contribution of the article and its limitations.

## Literature review

### THE LOCAL AND GLOBAL KNOWLEDGE DYNAMICS THROUGH BUZZ AND PIPELINES

Geographic proximity facilitates the relationship among co-located actors leading to the creation of untraded externalities. Such interdependences have been acknowledged to play an important role in the processes of knowledge creation and sharing at a local level (Malmberg and Maskell, 2006). Extant literature has also underlined that to increase the competitiveness and economic development of territories and to avoid a lock-in effect, it is crucial not only to share tacit and codified knowledge at a local scale, but also to engage in dynamics of knowledge sharing through interactions with distant partners (Gertler and Levitte, 2005; Moodysson, 2008; Morrison *et al.*, 2013). In this same perspective, the buzz-and-pipeline model (Bathelt *et al.*, 2004; Maskell *et al.*, 2006) affirms that a combination of a rich “local buzz” together with the construction of “global pipelines” will ensure the innovation capacity of a territory.

The local buzz (Storper and Venables, 2004) refers to “the information and communication ecology created by face-to-face contacts, co-presence and co-location of people and firms within the same industry and place or region” (Bathelt *et al.*, 2004). Similar concepts have been referred as “local broadcasting” (Owen-Smith and Powell, 2004) or “noise” (Grabher, 2002a). Buzz is “largely ‘automatic’” (Bathelt *et al.*, 2004) and all co-located actors benefit from the shared knowledge and information just by “being there” (Gertler, 2003). In order to

profit from the local buzz, it is not required to engage in an active, purposeful and intentional search.

In parallel, in order to bring knowledge from external sources to the local environment, local actors engage in the construction of global pipelines with distant actors. Global pipelines consist on extra-local linkages between two distant actors that act as channels bridging distant pools of knowledge. Unlike the buzz, due to the lack of proximities, establishing new relations with distant agents requires a cost to create and maintain such networks (Grabher, 2002b; Owen-Smith and Powell, 2004; Scott, 2002).

The concept of local buzz has been extended to the concept of global buzz (Schuldt and Bathelt, 2010, 2011) that is generated by frequent “temporary clusters” of co-located individuals that exchange knowledge and information around the same profession-related topics in international trade fairs or similar events (Bathelt and Schuldt, 2008a; Ramírez-Pasillas, 2010). Nevertheless, the buzz is not exclusively limited to co-located actors and can take place at a distance, as buzz is not necessarily related to face-to-face interaction (Asheim *et al.*, 2007; Gertler, 2008). For instance, the “virtual buzz” concept (Bathelt and Schuldt, 2008b; Bathelt and Turi, 2011) reflects the increasing importance of the new information and communication technologies in the transmission and global diffusion of knowledge without the need of geographic proximity.

#### KNOWLEDGE COMMUNITIES AND KNOWLEDGE DYNAMICS AT THE LOCAL AND GLOBAL LEVELS

The buzz-and-pipeline model is based on the generalized acceptance that the “transmission” of tacit knowledge is highly contextual and related to the co-location of involved actors. Therefore, either permanent (i.e. local buzz) or temporary geographic proximity (i.e. global pipelines) are necessary for an effective knowledge sharing. However, the literature taking a community-based perspective has convincingly argued that relational proximity might be more important than geographic proximity in order to effectively create knowledge (Amin and Cohendet, 2004; Brown and Duguid, 2000). Relational proximity refers to different aspects as shared values, shared visions, shared vocabulary or to common institutional environments, including norms, regulations and legal frames (Boschma, 2005; Torre and Rallet, 2005). From this perspective, the study of the geographic aspects of knowledge communities in general, and communities of practice in particular, has brought new light in the understanding of the development of spatial knowledge dynamics.

Communities of practice can be defined as: “(...) groups of people who share a concern, set of problems or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis” (Wenger *et al.*, 2002, p. 4). The term has been extensively used to refer to a great variety of realities leading to the blurriness of the meaning (Amin and Roberts, 2008). A multiplicity of related terms has been used in the literature to refer to communities of shared practice and their knowledge outcomes. For instance, research on collectivities of practice (Lindkvist, 2005; Roberts, 2006), knowledge communities (Henry and Pinch, 2000), and professional communities (Amin and Roberts, 2008) exemplify how common interests, practices or goals bring together individuals to a situated interaction. In the initial conceptualizations of CoPs and NoPs,

communities are “emergent collection of closely connected (tightly knit) persons” (Agterberg *et al.*, 2010, p. 87). Members build strong ties among them, trusting each other both personally and in relation to their competences (Agterberg *et al.*, 2010; Wenger, 1998). These strong ties can be source of a lock-in effect within the community (Grabher, 1993; Granovetter, 1973; Uzzi, 1996)pp. 255\u2013277. London: Routledge. Grabher, G. and Stark, D. (1997 and their time-consuming construction might also lead to a “slow community” (Roberts, 2006). The notion of collectivities of practice (Lindkvist, 2005) complements the concept of CoP by distinguishing them from other types of *ad hoc* agile “collectivities” of different specialists whose ties are weaker and that interact in project-related activities (Lindkvist, 2005).

In knowledge communities, relational proximity can take a more crucial role than geographic proximity in the community building process (Amin and Cohendet, 1999, 2000). The fact that knowledge communities can develop independently of co-location has enlarged the initial concept of localized communities. For instance, research on constellations of practice (Faulconbridge, 2010; Wenger, 1998), virtual communities (Amin and Roberts, 2008), transnational communities (Coe and Bunnell, 2003; Saxenian, 2006) and networks of practice (Agterberg *et al.*, 2010; Brown and Duguid, 1991; Wenger *et al.*, 2002) have stressed the fact that shared practices can take place independently of the location of community members. This is especially relevant nowadays, when internet and online social networks contribute to the constant and intense interaction between distant actors. The literature on such communities has opened a new research perspective on the processes of knowledge creation and innovation in economic geography (Amin and Cohendet, 2004; Coe and Bunnell, 2003; Gertler, 2003; Henry and Pinch, 2000; Howells, 2002; Malmberg and Maskell, 2006; Moodysson, 2008) by underlining the social aspect of knowledge creation and diffusion and the contextual and localized character of the knowledge dynamics (Lave and Wenger, 1991). Knowledge communities present two different and apparently opposite characteristics: on the one hand, they are deeply embedded in their local context and, on the other hand, they can re-contextualize their knowledge in a geographically distant but similar cognitive context (Bunnell and Coe, 2001; Gertler, 2003).

At a local level, communities contribute to the local diffusion of tacit knowledge (Håkanson, 2005) as well as highly codified knowledge among specialists within clusters (Lissoni, 2001). They feed the local buzz with specialist knowledge thus reinforcing the development of “localized capabilities” (Maskell and Malmberg, 1999). The cognitive proximity of the community members also facilitate the knowledge transfer at a non-local level, contributing to the development of global pipelines (Moodysson, 2008). At the same time, communities can contribute to the diffusion of knowledge at a distance, tapping on the cognitive proximity among members (Coe and Bunnell, 2003; Gertler, 2003; Grabher, 2001; Henry and Pinch, 2000; Howells, 2002; Malmberg and Maskell, 2006).

However, there are still important gaps that deserve further explanation. Previous literature has focused on the shared practices within CoPs or NoPs but has failed to explain how are CoPs and NoPs outside organizations related in space and how is local knowledge developed within a CoP shared with

other local and distant CoPs and NoPs. The following section proposes a theoretical framework to analyze the local and global knowledge dynamics taking a CoP/NoP perspective.

### Theoretical framework: A community-based view of the buzz-and-pipelines model

Extant literature dealing with the buzz-and-pipeline knowledge dynamics has generally taken as unit of analysis the organization or the cluster. Nevertheless, this approach ignores the multiple knowledge flows that take place outside organizational contexts and that highly impact the territorial knowledge dynamics. By taking a community-based perspective, this article contributes to enrich the buzz-and-pipeline model to underline the importance of the dual local-global aspects of communities. Table 1 summarizes the theoretical model that introduces the concepts of global buzz and local pipelines and reinterprets the concepts of local buzz and global pipelines by taking a community perspective.

TABLE 1 A community-based view of the buzz-and-pipelines model		
	Knowledge dynamics among CoPs/NoPs insiders	Knowledge dynamics between CoPs/NoPs insiders and outsiders
<b>Local level</b>	<b>Local buzz</b> (knowledge flows between localized CoPs or between local networks of related CoPs)	<b>Local pipelines</b> (knowledge flows between localized CoPs and other local actors)
<b>Global level</b>	<b>Global buzz</b> (knowledge flows between distant similar CoPs or inside NoPs)	<b>Global pipelines</b> (knowledge flows between CoPs/NoPs and distant external actors)

The initial concept of **local buzz** referred to the knowledge and information circulating among co-located actors in a cluster (Bathelt *et al.*, 2004). In the local buzz, knowledge flows are “frequent, broad, relatively unstructured and largely ‘automatic’” (Bathelt *et al.*, 2004), due to the fact that participants are not only in geographical proximity but also share an industrial specialization. In the case of CoPs, the fact of sharing practices, interests and codes enables (added to shared location) facilitates the knowledge sharing among members.

**Global buzz** results from the “intensive face-to-face interaction between dedicated agents and firms representing global supply and demand, as well as manifold possibilities for observation, and enabling multiplex meetings between members of intersecting interpretative communities” (Schuldt and Bathelt, 2011). Like in the case of local buzz, in literature on economic geography, the concept has been mainly used in organizational contexts. Global buzz might take different forms, for example, it can result from the intense interactions among employees of multinational companies working in different locations or professionals from different firms participating in international fairs around a certain topic or industry (Bathelt and Schuldt, 2008b). When communication is done through online tools (email,

mailing lists, online social networks, etc.), it might be referred as ‘virtual buzz’ (Bathelt and Schuldt, 2008b; Bathelt and Turi, 2011). Global and virtual buzz are not about the mere co-location or interaction of actors coming from different geographic contexts as it “involves the establishment of a collective culture that generates shared interpretations of new information even if the agents are located in different places” (Bathelt and Turi, 2011). Taking a community perspective, the notion of global / virtual buzz is closely related to the notion NoP in the sense that NoP members interact at a distance but in a close cognitive distance that enables an effective communication.

**Local pipelines** represent local linkages between actors. Unlike the local buzz, where cognitive proximity of CoPs facilitates the knowledge flow, local pipelines are constructed between CoPs’ members and local actors external to the CoP. This lack of cognitive proximity implies higher efforts in their construction and maintenance (Maskell *et al.*, 2006) as they require the progressive construction of mutual trust as well as overcoming the lack of different types of proximities (Boschma, 2005).

**Global pipelines** represent ties with distant agents to access knowledge from sources external to the local context (Bathelt *et al.*, 2004; Morrison *et al.*, 2013). Contrary to the local buzz, that is mainly automatic, the construction of the pipelines requires a costly engagement of the actors that have to identify and often move to the source of external knowledge. International professional encounters, like colloquiums and trade fairs (Bathelt and Schuldt, 2008a; Maskell, 2014; Ramírez-Pasillas, 2010) can for instance represent platforms of temporary co-location that facilitate the face-to-face meetings

The development of local pipelines would normally require less efforts than global pipelines, as actors engaged in local pipelines share geographical proximity as well as institutional and cultural proximities, whereas in the case of global pipelines, the distance between them might be larger (considering all types of proximities).

To empirically study this theoretical framework, the next section presents the qualitative study that has focused on the CoPs that emerged in collaborative spaces in Barcelona and on their knowledge dynamics with local and distant actors.

## Methodology

### RESEARCH CONTEXT

The research context consists in the collaborative spaces (like coworking spaces, fab labs, makerspaces, hackerspaces, etc.) that have emerged in Barcelona (Catalonia, Spain). Catalonia in general and Barcelona in particular have a strong tradition based on grassroots associations and social movements. In the last years, a multitude of collaborative spaces have emerged, most of them related to different global movements like the maker movement, the coworking movement, the hacker movement, etc. An illustrative data: Barcelona currently is the European city with the highest density of coworking spaces per inhabitant. Most of the resulting localized spaces shared some commonalities, like openness and the will to collaborate and share. Most of these spaces are rooted in global trends like the open source software and hardware or the sharing economy.

### SAMPLING AND DATA COLLECTION

The methodological approach was qualitative, based on a multiple case study (Yin, 1984). In our study, I have selected four cases from the over one hundred collaborative spaces that were found in Barcelona through an in-depth internet search. The first criterion was to select cases with different focus: two of the selected cases are coworking spaces that are oriented to the social economy whereas the other two are makerspaces. The coworking spaces attract social entrepreneurs that combine an interest to get both a social impact and an economic benefit. The makerspaces gather hobbyists, students or entrepreneurs that share a common interest in developing their own projects by prototyping, hacking and experimenting. The second criterion was based on the integration (or not) of the spaces into a larger global network of similar spaces. One of the makerspaces is labelled and associated to the international Fab Lab network while the other is an independent makerspace with currently two facilities in Barcelona. Similarly, one coworking space is associated to a global network of similar spaces dedicated to the social entrepreneurship (The Impact Hub) while the other is a coworking space related to local cooperatives and associations of the social economy. Table 2 summarizes the four selected cases.

	<b>Collaborative space belonging to a global network</b>	<b>Independent collaborative space</b>
<b>Makerspace</b>	<b>Space MK1 (Fab Lab network)</b> Interviews to 3 managers and 2 members. 10h observation.	<b>Space MK2</b> Interviews to 1 manager and 3 members. 9h observation.
<b>Coworking space focused on social entrepreneurship</b>	<b>Space CW1 (Impact Hub network)</b> Interviews to 2 managers and 2 members. 6h observation.	<b>Space CW2</b> Interviews to 1 manager and 2 members. 7h observation.

The study is mainly based on two sources of data: semi-structured interviews, and direct observation. Secondary data like the content of the spaces' web pages, online forums and discussion mailing lists has also been taken in consideration.

**Semi-structured interviews.** The main sources of data were semi-structured interviews to managers and members of collaborative spaces. The interviews were done in two phases. In a first step, an exploratory research was conducted in the 24 different collaborative spaces that agreed to participate in the study. In total, 28 interviews were done, most of them face-to-face in the spaces' facilities. Interview questions focused on the member selection, members' activities and practices, the collaboration with other members, the activities organized to foster knowledge exchange within the community at a local level, and the type of interactions with external actors. This phase helped to identify the spaces where a community had emerged and that presented the higher intensity of knowledge-sharing practices. To ensure data triangulation (Fetterman,

1989), that first phase also included interviews to innovation specialists from Barcelona that have followed the evolution of the collaborative spaces in the city in the last twenty years. These individuals were researchers, practitioners and policy makers that represented "highly knowledgeable informants who can view the focal phenomena from diverse perspectives" (Eisenhardt and Graebner, 2007, p. 28).

The second phase consisted in deepening the research in the four selected collaborative spaces (see above section for the sampling) by doing a second round of interviews to seven managers and nine members and by engaging in direct observation. In this phase, interviews were more focused on the interactions with external actors (both local and non-local) in terms of knowledge flows, collaboration and sharing.

**Direct observation.** The second main source of data was non-participatory observation of the community activities in the selected four cases. The decision not to make participatory observation was taken to avoid interfering with the existing members' activities and knowledge sharing habits. In total, I conducted about 30 hours of formal observation and several more of informal observation. Following observations, notes were taken to build a more comprehensive understanding of the environment, the dynamics of innovation and interactions between the actors within and outside the community.

### DATA ANALYSIS

In a preliminary stage, I engaged in the open coding of the interviews, searching for relevant text segments that referred to the knowledge flows related to learning and innovation processes that implied interactions with external actors. I initially used "in vivo" terms to label these dynamics (Locke, 2001).

In a second phase, the sets of data were analyzed through an abduction process aiming at reconstructing knowledge flows between community members and external local and non-local actors based, on the one hand, based on the narratives of the informants as well as the secondary sources and, on the other hand, classifying the emerging codes based on the literature on economic geography about knowledge and innovation. This iterative and abductive process that implied to go back and forth between induction and deduction had the goal of building and refining theory based on case study research (Eisenhardt, 1989). This approach provided evidence and helped to refine existing theory concepts (i.e. local buzz and global pipelines) and also allowed new concepts to emerge (i.e. local pipelines and global buzz). Once the four distinguished theoretical concepts emerged, I turned to axial coding (Strauss and Corbin, 1990, p. 123) to uncover relationships among them.

### Results

The different collaborative spaces participate in different ways in local and global knowledge dynamics. While some of the spaces focus on the local environment, others concentrate their efforts on sharing with distant similar spaces. For instance, in the case of MK2, their goal is to develop a local community of makers, with a bottom up approach. MK2's strategy is to grow organically, to create a local "makerville". They have recently open a second space in Barcelona:

*We try to cooperate at the international level, but [our space] is very local. It is like the fruit store in the corner; they don't have contact with a fruit store in Amsterdam, it is very local. [...] We don't need to be part of a network either. Our philosophy is grassroots-based and not about a global vision. We don't pretend to open another space in Korea.*

*MK2 representative*

In opposition, the space MK1 has a completely different approach. They participate actively in the Fab Lab global network and they have a privileged contact with the MIT as they are one of the first Fab Labs to be launch outside the USA.

*[MK1] has its own projects with a local impact but in fact, [MK1] has a higher impact at a global scale rather than local. [MK1] is one of the Fab Labs that co-lead the Fab Lab network in the world. We collaborate with the MIT organizing the Fab Lab Academy, we have helped to launch a lot of Fab Labs in South America, in Africa, in Europe, in Spain [...]*

*MK1 representative*

Independently from their focus, all spaces participate in local and global knowledge dynamics even if the priority is different depending on the spaces, as it is shown in the next sections.

## LOCAL KNOWLEDGE DYNAMICS

### Local buzz: knowledge dynamics among local community insiders

Collaborative spaces tend to specialize around a certain topic. The different specializations do not have a narrow scope; they rather tend to gather people around a wide topic like the maker movement or the social entrepreneurship. Concentrating on a common purpose facilitates collaboration and to join efforts around shared interests. Specialization contributes to bring together people with common interests that are geographically disseminated in the local environment. As a representative of space MK2 commented: "Barcelona has a very high level on design, but everyone is at home, everybody is dispersed". The initiative of opening a space corresponds in some cases to the need of collaborating around certain common interests, as it is the case of space CW2:

*If we have a big space, we are able to convince others with same interest than us to come and share the space with us. The leitmotiv is not just to share a space. The leitmotiv is, from one side, a shared cooperative project. [...] The main reason to help each other is the common interest in the social economy, and the other interest is more socio-entrepreneurial, to have a cooperative group that provides more dynamism, more opportunities, more visibility and that allows us to do projects together.*

*CW2 representative*

In other cases, the attraction of the local community has been reinforced by the strength and visibility of being a member of a network. In the case of space MK1, it is a labeled member of the Fab Lab network whereas in the case of space CW1, it belongs to the Impact Hub network.

To have a physical space facilitates socialization interaction, unexpected encounters, and serendipity. The space gathers local

communities, some members in a daily regular basis and some others sporadically, in special events or in project meetings. Altogether, the localized activities contribute to the emergence of a members' feeling of belonging to a community.

*People that are here, either if they are from the group or not, they all are involved in different networks of the social economy [...]. Like there is a lot of people in spaces of interaction, it is very easy to know what is happening in other territories and in other spaces of strategic decisions and it is easy that possibilities to do new things appear and that benefit you, your cooperative, or another company that you might know.*

*CW2 representative*

The face-to-face regular interaction helps to enhance trust among local actors and to develop collaborative projects. For instance, in the case of CW2, they have engaged in the organization of a local network around the social economy and they are designing together a system to share their own "sharing currency" to provide mutually services among the network members.

Even if the different collaborative spaces differ in their orientation, there is a conscience of converging with the other collaborative spaces, in the common vision of openness, and collaboration. They are all open to collaborate with the others, considering either the commonalities or the complementarities.

### Local pipelines: knowledge dynamics between community insiders and local outsiders

Apart from gathering the local community, collaborative spaces also play the role of intermediaries in the relationship between local actors. On the one hand, the spaces act as platforms of the "middleground" (Cohendet *et al.*, 2010) and foster the emergence of bottom-up initiatives by helping individuals and local communities to develop projects around the focus of the community. On the other hand, they assess organizations and local institutions to find talented individuals and projects worth investing in.

In the case of spaces CW1 and CW2, the focus is to foster the success of social entrepreneurial initiatives, by putting together local social entrepreneurs and investors. In the case of CW2, the activities are focused at the local scale. In the case of CW1, the ambition is to enlarge their influence at the global level to attract external investors by leveraging the strength of their global network.

Excepting MK1, the collaborative spaces use to be intimately embedded in their local social environment. For instance, CW1 is actively involved in helping local associations of the district to gain visibility in front of the local administration and citizenship.

*The City Hall tell us that there are 200 cultural associations in the district. Nobody knows who they are. [...] Those 200 associations are a high potential but nobody knows what to do about it. We are trying to organize it, because among other things, we dynamize processes and ecosystems [...] It is a very uncertain process but we think that the fact of having a space, as a space to meet, to interact, and as a beginning of processes is relevant.*

*CW1 representative*

In the case of MK2, on the one hand, they organize activities to engage the neighbors to the maker movement. On the other hand, they collaborate with the City Hall to channel their initiatives around creativity and innovation to approach the neighbors:

*We have a strong relationship with the district neighbors. [...] we told the City Hall that we can activate the area. I proposed to turn this street into a "makerville" or a creative district, however you want to call it. To create a concentration of people doing things, like in our space but at the scale of a town or district. A school can teach children about robotics or coding, it doesn't matter, and then a store might sell electronic toys for children, other neighbors might turn their hotel into a hacker hostel [...]*

*MK2 representative*

## GLOBAL KNOWLEDGE DYNAMICS

### Global buzz: knowledge dynamics among non-local community insiders

All studied collaborative spaces share their experiences and their knowledge with actors in other territories. Nevertheless, the type and nature of links are different depending on the case.

In the spaces that are not integrated in a global network of similar spaces, the relationships are based on managers' personal and professional social networks and on the cognitive proximity to other non-local similar spaces. For instance, in the case of CW2, they have approached a large international network of actors of the social economy with years of experience. In the case of MK2, despite the organic and local character of their strategy, the international profile of the manager has allowed her to develop contacts and to interact with other makerspaces in USA and Japan to exchange experiences, information and knowledge.

In the case of spaces that belong to a global network, managers and community members use the network links to engage in knowledge exchange through collaborative projects, face-to-face interaction (i.e. organizing international events) or virtual tools (i.e. shared intranet, wikis and databases). For instance, in the case of MK1, the members share documentation about their projects with other members of the Fab Lab global network lead by the MIT:

*[The Fab Lab network] gives you access to a tremendous knowledge network, link to the MIT... You get knowledge because we are having the same processes and machines. All documentation is available online from people that has worked on these issues. You can have access to other Fab Labs without problems in case you have any trouble. There is the world network of Fab Labs where you get to know freaks just like you: you see that you are not alone.*

*MK1 representative*

The members of MK1 have taken a major role in the global community by organizing the Fab Academy that is a training program that consists of a curriculum in the principles and applications of digital fabrication. and also organized the 2014 annual conference of Fab Labs. Annual conferences represent a temporary relocation of community members from all around the world that allow them to interact face-to-face to learn and

discuss around shared practices and deepen the feeling of community belonging.

In the case of space CW1, they take advantage of their integration to the Impact Hub network to learn from more experienced spaces of the network and to attract new members from other non-local spaces. They also use Barcelona's image and branding as a leverage to attract outside members.

### Global pipelines: knowledge dynamics community insiders and non-local outsiders

Collaborative spaces act as intermediaries between talented individuals and organizations. As previously argued, this role is played at the local level, matching local offer and demand for new ideas, projects and talent. However, at a global level, some of the spaces also act as intermediaries, notably the ones that have developed stronger international ties. For instance, CW1 focuses on putting in contact individuals and startups with (both local and global) investors interested in social innovation.

*There are innovators that want to move here, and there are investors that think Barcelona is a good place to invest. There are two things that characterize our space. The first thing is that we like to talk with people interested in investing in [...] things with social impact but also with economic benefits. [...] On the other side, there are people with interesting projects that would like to be in Barcelona. That is what Impact Hub offers. It gives us a brand and the contact with people that have been doing this for a longer time, thus we are going to learn. They have provided us with a way of functioning, a lot of ideas and a quick acceleration.*

*CW1 representative*

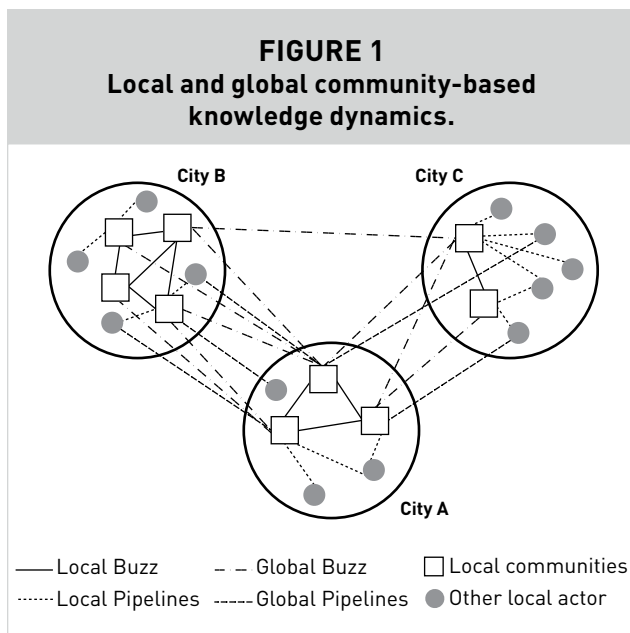
The creation of global pipelines help local communities to have access to external knowledge from a variety of different sources, contributing to feed their learning and innovation processes.

## Discussion

A group of individuals interacting in collaborative spaces will not necessarily evolve into a CoP. Therefore, the group of individuals interacting on a regular basis in a collaborative space cannot automatically be assimilated to a CoP without a previous analysis. According to Wenger (1998), a CoP is characterized by three specific features: mutual engagement, joint enterprise, and shared repertoire. In all studied cases, it can be argued that they acted as CoPs. First, about mutual engagement, people shared practices and activities whose meaning is mutually negotiated. Both in the case of makers or social entrepreneurs, they share the same values and are involved in similar activities and practices. Second, joint enterprise: space members engage in socialization processes, often discussing common problems around their projects. Repeated interaction has given them a sense of identity and shared goals. Third, a shared repertoire is constructed by the engagement in practices that take place in the collaborative spaces, and that are reinforced by the social construction of meaning. In the case of makers, the repertoire might be tangible (like 3D printers and other prototyping tools) whereas in the case of social entrepreneurs, it is rather intangible (i.e. routines, specific idioms, etc.).



The next sections present the interactions among the members of the collaborative spaces, which are assimilated to CoPs. In the case of networks of collaborative spaces (as the Fab Lab global network), the members are considered as NoPs as they fulfill the above-mentioned conditions defined by Wenger but interact in a more loose and virtual configuration. The discussion analyzes the different knowledge dynamics of the studied CoPs and NoPs, distinguishing first if the dynamics take place at the local or global level, and second, if they are among community members (buzz) or with other actors external to CoPs or NoPs (pipelines). I argue that four different phenomena can be distinguished: local buzz, local pipelines, global / virtual buzz and global pipelines, schematically represented in Figure 1.



### LOCAL DYNAMICS

Previous literature has underlined the crucial role that co-location has for different industries, notably knowledge-based industries, in terms of the effects on knowledge sharing and untraded externalities (Gertler, 2003; Howells, 2002). The concept of local buzz was initially introduced to explain the local sharing of information and knowledge between co-located economic actors (i.e. firms and formal organizations) like it is the case of industrial clusters (Bathelt *et al.*, 2004; Grabher, 2002b). The local buzz is based on informal and frequent face-to-face interaction that require places and spaces to meet. Contrary to industrial clusters, in the studied cases, the local makers and social entrepreneurs are not part of a delimited industry or a clear identifiable economic activity. As individuals, their visibility and capacity of detecting and contacting other peers is limited. Initial contact might be ensured by the use of online social networks and other virtual tools but the nature and the materiality of the involved practices require face-to-face interaction for a more effective knowledge sharing. In this perspective, collaborative spaces accomplish different roles to enhance the reach and the strength of the local buzz. First, they serve as platforms of interaction where a local dispersed community can physically meet and exchange

knowledge, notably tacit (Lave and Wenger, 1991). Second, collaborative spaces increase the visibility of the actors (by organizing events, promoting their projects...). In consequence, spaces reduce the costs involved in information and knowledge searching. The localized dynamics that take place in the spaces help individuals and organizations to identify and access needed resources and knowledge. Spaces can represent showrooms or platforms for the promotion of individuals and startups that seek to develop professional contacts and collaborations. Third, spaces bring together actors like individuals and formal organizations that, despite being in geographic proximity and cognitive proximity (sharing same interests), would not meet otherwise. Rigid organizational structures and processes often difficult firms to access outside sources of knowledge and *vice versa*, refraining outside agents to access knowledge created inside firms. By co-locating individuals from both contexts in an informal social setting, spaces' activities facilitate a fluid knowledge flow outside organizational constraints. This represents one of the roles of agents of the middleground (Capdevila, 2015; Cohendet *et al.*, 2010) that consists on dynamizing the horizontal dimension of a cluster by creating ties between specialized actors (Asheim *et al.*, 2007). Fourth, as argued previously, studied spaces represented CoPs. But in addition, the local dynamics between the different collaborative spaces can be assimilated to local NoPs, or more specifically to networks of CoPs. The CoP in a certain space does not evolve in isolation from the local environment (Capdevila, 2015). Several activities that take place in such spaces foster the interaction with external actors of the space as well as interactions with members of other similar local spaces. For instance, in the case of CW2, meetings attracted a multitude of external local actors. In the case of the different makerspaces (like MK1 and MK2), different local CoPs often collaborate in projects or participate in events or meetings that take place in the different spaces.

Local pipelines represent a different type of knowledge dynamics than the local buzz. The local buzz is based on regular constant interactions between actors that share not only geographical, cultural or institutional proximity but also other types of proximity (mainly cognitive or organizational) (Boschma, 2005; Bouba-Olga and Grossetti, 2008). Contrary to the local buzz, local pipelines relate local actors that are not in cognitive or organizational proximity, and that would hardly meet in their everyday life. Like global pipelines, the construction of local pipelines also requires an effort from involved actors, but the fact of being located in geographic proximity increases the frequency and reduces the cost of interactions (in terms of time, money and effort). The results show that CoPs try to attract local agents and to engage them with their practices. For instance, MK2 tries to involve the neighbors as well as the City Hall into the maker movement. Similarly, CW1 is in contact with the "invisible" cultural associations (of the underground) to make them visible to the district and city authorities (of the upperground). These examples illustrate another role of the middleground more related to a vertical dimension of clusters (Maskell, 2001).

Local pipelines allow the contact and coordination of local actors that might engage in collaborative projects. In this sense, the resulting community cannot be assimilated to a CoP or a NoP as they are not sharing a common practice. Like in the case of CW1, by collaborating with both the City Hall and

neighbors, the space members created local pipelines that allowed the linkage of external individuals to work together towards a common goal. In this way, CW1 contributed to the coordination of different and complementary knowledge bases. These local pipelines based on weak ties (Granovetter, 1973) might contribute to the development of so-called knowledge collectivities or collectivities of practice (Lindkvist, 2005) or epistemic collectives (Grabher, 2004). In this sense, collaborative spaces might result in platforms that are used by collectivities of practice for the development of projects that imply the intervention of a wide range of local actors.

### GLOBAL DYNAMICS

In the case of CoPs and NoPs, actors participating in the global and virtual buzz require a relatively close cognitive distance and absorptive capacity to be able to communicate effectively (Noo-teboom *et al.*, 2007). In this case, the ties within the members of a network are weaker than those in a community, despite of the fact that in both cases they share the same practices. For instance, in the case of the collaborative spaces that are associated to global networks of spaces, like in the case of MK1 and CW1, the members of the local communities participate in international events (like the Fab Lab annual meeting) that contribute to feed the global buzz and to exchange knowledge on the shared practices. In the case of the Fab Lab network, several online tools (like the Fab Academy, or websites and wikis of the different spaces) contribute to the spread of the best practices of each CoP.

The results show that in the case of CoPs that do not belong to a NoP, as it is the case of CW2 or MK2, the members tap on their personal and professional networks to get in contact with other non-local CoPs to create global pipelines. In the case of spaces MK1 and CW1, global linkages were by default developed within the network, thus contributing to the global buzz of the existing NoP.

From a community perspective, global pipelines represent opportunities for CoPs and NoPs to integrate knowledge from external sources and from other types of practices and knowledge bases. Thus, global pipelines, similarly to local pipelines, are ways to counteract the risk of a potential lock-in effect (Boschma, 2005) or “overembeddedness” (Uzzi, 1996) that CoPs and NoPs face (Roberts, 2006). Wenger argues that knowledge from external individuals can have highly positive effects for the improvement of the practices of a CoP (Wenger, 2000, p. 227).

In this view, the concept of ‘landscape of practice’ (Wenger-Trayner and Wenger-Trayner, 2014) gains importance by reflecting the interaction between CoPs in a complex ecology of a great diversity of knowledge bases and practices, where members of CoPs focus on specific practices but are also permeable to the influence of other CoPs. Individuals have to be ‘knowledgeable’ of other CoPs practices to learn from other sources. As Wenger affirms: “The ability to do this depends on the depth of one’s competence in one or more core practice(s), which ground the experience of the landscape in specific locations; and it also depends on one’s knowledgeability about other practices and significant boundaries in the landscape” (Wenger-Trayner and Wenger-Trayner, 2014).

### THE INTERRELATED LOCAL AND GLOBAL KNOWLEDGE DYNAMICS WITHIN CoPs AND NoPs

The local and global knowledge dynamics that have been described so far do not function in an independent way but rather take place simultaneously and reinforce each other.

At the local level, the local buzz is based on the frequent and informal interaction of members of different local CoPs that are linked by common values, interests and practices. For example, in our study, the members of the communities that emerge in the different makerspaces of Barcelona (like MK1 and MK2) are in contact on a regular basis, and exchange knowledge through frequent meetings and events. Similarly, members of CW1 and CW2 participate in the development of a local buzz around the social economy and social entrepreneurship. The fluidity of the interactions at the local level is reinforced by co-location, shared social trust and the creation of personal contacts. The members of similar CoPs also interact among them (i.e. makers and social entrepreneurs) looking for complementarities. In this case, these relationships might be better defined by a ‘local network of CoPs’ rather than a NoP as the practices and the focus are not the same. Localized spaces of interaction act as poles of attraction for the distributed local agents interested in the CoPs’ focus. In the case of CoPs affiliated with global NoPs (like in the case of the Fab lab and the Impact Hub), the reputation and branding of the global network might increase the local visibility of the CoP, attracting local agents external to the CoP. The links with diverse multiple actors represent ‘local pipelines’ that feed the knowledge created inside the CoP but also reciprocally feed the local environment with the CoP’s practices. For instance, on the one hand, MK2 aims to influence local governmental bodies to adopt policies fostering the maker approach. MK2 has also spread the maker movement among neighbors by launching a Fab Café (open to everybody) and by organizing Maker Fairs and other public events. On the other hand, these events offer opportunities to neighbors to publicly show their skills and prototypes and, in some cases, lead them to a higher engagement in the everyday activities of the makerspace by becoming new members. In this sense, local pipelines represent the vertical dimension of the middleground, that links the underground and the upperground, while the global buzz represents the horizontal dimension of the middleground that reinforces the ties between members of local CoPs.

At the global level, the members of local CoPs share knowledge about their common practices with non-local peers thus fostering the emergence of a NoP. These interactions can be either face-to-face or virtual. On the one hand, temporary relocation can allow members of a NoP to easily “transmit” tacit knowledge and information about their shared practices and reinforce personal and community ties. On the other hand, NoPs put in place online tools to share codified knowledge (like projects and processes) that foster the exchange among members. Both methods, temporary co-presence and virtual communication among NoP members nurture the global buzz. Considering the cognitive proximity, the shared practices and prototyping tools and machines, NoP members can effectively share knowledge even without face-to-face communication. In that case, the knowledge sharing practices correspond to the so-called virtual buzz. Nevertheless, it is important to note that virtual buzz,

unlike local buzz (where geographic proximity plays a major role), requires to take an active implication in the virtual interaction or at least, to be in contact with distant members of the NoP. In the case of actors that are not members of a CoP, it might be relatively easy to get to know about their existence and practices by just being co-located geographically through the “automatic” participation into the local buzz, but they will hardly participate to the global or virtual buzz unintentionally. In these cases, to create non-local links with actors outside the CoP or NoP, the members have to engage in the costly construction of global pipelines that represent to invest in the search, identification, and appropriation of the new knowledge accessed through these ties. That is why, CoP / NoP members by being “knowledgeable” (Wenger-Trayner and Wenger-Trayner, 2014) on other CoP / NoPs practices might have easier access to external specialized knowledge in case they require it.

### Conclusion

Our study shows that the knowledge dynamics of members of CoPs and NoPs with their external environment at a local and global levels are articulated by the combination of four mechanisms: local buzz, local pipelines, global buzz and global pipelines. Both local and global buzz are based on a frequent and continuous knowledge flow created by a mix of face-to-face and virtual interaction among members of a NoP. Local pipelines and global pipelines represent links with actors outside the CoP / NoP at a local or global levels. Unlike local pipelines that are facilitated by geographic and institutional proximity, global pipelines require higher costs to construct and maintain.

This article contributes to the current literature on communities of practice and localized knowledge dynamics in different ways. First, our research has focused on actors outside formal firms and organizations, specifically communities. Previous research has acknowledged the important role that distributed knowledge outside firms plays in innovation (Chesbrough, 2003; von Hippel, 2005) but the geographic implications have not been generally considered. In addition, previous literature on CoPs and NoPs has mainly been framed in organizational contexts. Second, our analysis considers a multiple scalar perspective to include local as well as global dynamics. As our results show, the interplay between both levels appears as being notable. Nevertheless, few works have studied the linkages between the local CoPs and global NoPs. Third, previous studies on the geographies of knowledge are grounded on permanent (i.e. local networks and buzz) or temporary geographic proximity (i.e. global pipelines), undervaluing the role that cognitive proximity plays, specifically in the knowledge flows between members of CoPs and NoPs. Our study illustrates the localized realities of CoPs and NoPs taking a geographic perspective. Fourth, the article analyses a recent phenomenon: the emergence of collaborative spaces like Fab Labs, makerspaces and coworking space. Policy makers as well as innovation managers are increasingly showing interest in this phenomenon as collaborative spaces are being constantly launched in cities and in organizations. However, little research has empirically or theoretically studied so far these spaces of collective creativity and innovation.

Our results suggest some implications for policy makers. To nurture a lively local environment, policies should provide

support to existing innovative communities. For instance, by providing public spaces for the communities’ regular activities or for the organization of public events. Some cities have even gone further. For instance, Barcelona has created a public local network of makerspaces (called “Ateneus de fabricació”). Also facilitating the creation of spaces integrated in international networks would help to the development of global knowledge dynamics and, at the same time, infuse the local buzz with external knowledge and diffuse locally-created knowledge. In this perspective, participating in the organization of important international events around the communities increases the visibility of the local community as well as might represents a way of benefitting the image and branding of the city.

It is important to highlight the limitations of the study. Our analysis has been based on the collaborative spaces that has showed a higher degree of proactivity and openness in knowledge sharing activities, and therefore the results cannot be generalizable to all spaces, nor can it be argued that lively communities and networks might emerge just by co-locating individuals that shared the same practices. It is not the goal of this research to analyze the conditions of success of CoPs or NoPs. In the studied cases, communities were explicitly advocating for knowledge sharing and collaboration. The results cannot be extrapolated to all collaborative spaces in other contexts (i.e. in firms). In the case of corporate environments, CoPs and NoPs might be focused on internally diffusing knowledge but preventing it to flow outwards the organization boundaries. Nevertheless, our results suggest that managers might facilitate the introduction of knowledge from external sources by fostering the interaction of corporate CoPs’ members with their local environment as well as helping them to create links with external actors (for instance, by participating to international fairs and conferences).

Finally, it is worth noting that global dynamics have been studied from a single perspective (referred by the community members located in Barcelona) and not by analyzing the current global exchanges. In this perspective, further research in other cities and territories would be welcome to avoid specificities related to the city of Barcelona. Also, research efforts are also needed at a micro-level to untangle the mechanisms and micro-practices of community members through which the different local and global knowledge dynamics described in this article take place.

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