Revealing preferential circulations – how the uses of places serve collective innovation

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Résumé :

Avec pour ambition de favoriser l'émergence et la soutenabilité de communautés innovantes sur leur territoire, de nombreuses villes ont développé des stratégies axées sur les lieux afin d'encourager les interactions et les échanges de connaissances. Mais à ce jour peu de travaux ont été réalisés pour comprendre ce que les lieux font au processus d'innovation. Avec cette recherche, nous avançons que les innovateurs fréquentent différents lieux producteurs de ressources (potentiellement complémentaires) et que le pattern ainsi dessiné, appelé circulation préférentielle, révèle le processus d'innovation en cours. Sur la base d'une analyse de réseau, nous mesurons les circulations d'un ensemble d'innovateurs à Nantes (France). Nos résultats indiquent qu'ils ne se contentent pas de fréquenter quelques lieux en commun : les innovateurs fréquentent des lieux avec des trajectoires hétérogènes, révélant une communauté dispersée, fondée sur des stratégies d'acquisition de ressources différenciées.

Mots-clés : circulations préférentielles, lieux, communautés, innovation, analyse de réseaux.

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1. INTRODUCTION

The literature has long studied the complex interrelationships between knowledge-based activities and territories (Asheim, 2007; Bathelt & Cohendet, 2014). At the least, the literature has notably highlighted that combinations of places located in the same territory are conducive to knowledge and creative based activities (Silver et al., 2010; Audretsch et al., 2021). The ecology of places specific to a territory can guide the activities that will be developed there (Pedrini et al., 2021). This is particularly true for innovators in creative and knowledge based industries, who attend different sorts of places to nurture their inspiration, promote their work but also prototype some products (Currid, 2007). At a micro-spatial level, the concept of third-places (Oldenburg, 1989) has led to an interest in the functions that specific types of places have. Even if the focus on artistic activities can sometimes convey a stereotypical view of the 19[th] century bohemian life and by doing so overestimate the importance of bars and cafés (Murzyn-Kupisz & Działek, 2021), coworking, makerspace or FabLabs among others, offer a lot of promises for tech entrepreneurs (Suire, 2019).

Beyond the implicit role of spatialized resources (Parker & Corte, 2017; Oberlin & Gieryn, 2015) and that there might be also "something in the air" stimulating innovation as suggested by Marshall (1919), our knowledge of how collections of places promote innovation remains limited. This leads us to question the type of resources produced by places, their acquisition by innovators as well as the distribution of these resources over the territory, and what innovators *find* in places. In doing so comes the issue of a network of places as a resource *per se*.

Whether they are painters, musicians, or let us say creative people, these innovators choose to attend certain places because of the features of those places. This may be due to a friendly atmosphere, networking opportunities or because the place is simply inspiring and stimulating. In any case, attending a place provides *something* to the innovators, directly or not. It provides some resources necessary at different stages of the innovation journey (Perry-Smith & Mannucci, 2017; Cattani et al., 2017). In this context, places are not only defined by their unique geographical location, but also by their specific physical and social characteristics and the particular meaning they convey (Oberlin & Gieryn, 2015). They offer resources for action.

However, by observing the set of places attended by innovators, we also see a network of resources acquired in these places as well as distinctive patterns. If these collections of places are the same from one innovator to another, a self-reinforcing and localized network effect may appear. Indeed, innovators would make increasing gains by adopting the same combinations of locations as others: they would have a better access to social networks, field knowledge, reputation, opportunities of work, and other resources specific to their activities. We claim that this pattern is a structural signature of a community of innovation understood as the sum of innovators consuming the same network of places and therefore belonging to an emergent, evolving, or stabilized field.

To examine this assumption, we adopt an approach rooted in the idea that networks are not randomly constituted but provide a context for action (Burt, 2004). What we call preferential circulations, ie patterns of attendances of resource-producing places is a concept that illustrates the combinations of places attended by innovators from which a network effect could emerge. We assume that studying preferential circulations (PCs) can reveal aesthetic preferences and (competitive) visions shared by groups of actors, the maturity or immaturity of projects, or even the degree of fragmentation of an evolving innovation community. The purpose of the paper is to provide a theoretical basis for the concept of PCs and to further explore the extent to which it could help explain collective innovation processes. These findings contribute to the discussions concerning place-based innovation policies, from both a theoretical and empirical perspective, by more precisely situating the role of places in innovation processes in the field of creative industries.

To study these patterns of attendance, we focus on a single, in-depth case study of a community in Nantes (France). As our contribution is rather conceptual, we first review in detail the role of places to ground our contribution and lay the theoretical foundations for our argument. We then present the case study through which we explore our hypotheses, first by describing the territory where the community is located and then by characterizing the actors we are studying. The third part is devoted to the methodology we have put in place, which is based on a network analysis. Concluding remarks follow the presentation and discussion of the results.

2. THEORETICAL BACKGROUND

2.1 COMMUNITIES AND RESOURCES

Before defining the stage, we shall first introduce the actors of innovation. The literature on territorialized innovation processes has highlighted the central role of communities, notably in creative industries where knowledge and creativity are keys to sustaining competing advantage (Amin & Cohendet, 2004; Bettiol & Sedita, 2011). Defined as groups of individuals who share a common interest or objective, communities are autonomous, self-organized collectives of actors (Amin & Cohendet, 2004). They include both innovators, aiming to introduce something new and valuable in a creative field, and the audience, a set of actors who have an interest in the innovator or his innovations, and who control material or symbolic resources needed to pursue the innovation journey (Hsu et al. 2009; Cattani et al., 2017). Community members confront each other's visions, compare their opinions and practices regarding the object or interests that brings them together in their search for peer recognition (Amin & Roberts, 2008). They share a common cognitive space: a set of shared knowledge, values, visions and expectations that acts as a common frame of reference (Cohendet et al., 2014; Capdevila et al., 2018). Cognitive spaces serve as a collective platform helping community members to share local and global ideas, understand and recognize each other, advance their practices, and codify the knowledge they produce. In a word, a cognitive space supports collective action.

The literature breaks down the innovation process into a journey consisting of four stages (Perry-Smith & Mannucci, 2017). It includes the generation of new, creative ideas (Koestler, 1964) ; the improvement of these ideas and prototyping if required (Paris & Ben Mahmoud-Jouini, 2019) ; their promotion to the audience, and more specifically to gatekeepers (Foster et al., 2011) ; and finally, the implementation phase, composed of both the making of the innovation in its final shape and its diffusion and recognition as a new and legitimate contribution in a given field (Rogers, 1983; Cattani et al., 2017; Sgourev, 2013).

Throughout the innovation journey, innovators seek resources that help them pursue their project. The types of resources are presumably different according to the type and the stage of development of the innovation (Maoret et al., 2020). Here, resources refer to various elements, both tangible and intangible, that enable the actors to pursue the innovation process in its material and symbolic dimensions (Bathelt & Glückler, 2005; Baumann, 2007). They are both *field*-dependent – collectively shaped in the way they can be used, provided and valued by actors sharing an interpretative scheme, and *context*-dependent – they are not available or created in the same way depending on the region or time period (Bathelt & Glückler, 2005; Feldman, 2004; Oberlin & Gieryn, 2015). Among different sorts of resources that can be used to innovate, we identify four types of non-exclusive, complementary resources: *material* (technologies, tools, facilities, furniture… used to iterate, experiment or innovate); *financial* (the money needed to carry out an action); *social* (the social capital that results from an actor's relationships, providing access to opportunities, support, trust, reputation,

and other types of socially-driven resources) (Coleman, 1988); and *cognitive* (ideas, knowledge or visions that are shared and combined to create new, creative ideas or knowledge). These resources are mutually interdependent, as one can affect or generate the other, allowing innovators more or less flexibility of action. By mobilizing different types of resources, the innovator can therefore move his or her innovation from one stage of the journey to the next.

2.2 LAYING THE FOUNDATIONS: PLACES AS A RESOURCE ACQUISITION PLATFORM

Beyond their identification, we are interested in the acquisition of these resources by innovators. They can be acquired through market mechanisms - which allow actors to obtain resources within the constraints of the competitive environment, price, and market conditions (technology standards, dominance of key actors, etc.) or through social capital and non-market relationships (Coleman, 1988). We argue that places can also be conducive means of acquiring resources as they have affordances: places offer specific capacities of action to the individuals who attend them (Gibson, 1977; Oberlin & Gieryn, 2015). Resources have some idiosyncratic characteristics derived from the attendance of a place by individuals (Lancaster, 1966). To examine the "place effect" and locational resources (Corte, 2013; Oberlin & Gieryn, 2015), we assume places have a particular role in producing resources in at least two ways. Firstly, places offer a physical locus favorable to social interactions. It is characterized by the actors co-presence, physical constraints, institutions, and local practices (Punstein & Glückler, 2020). Since the formation of social relations is partly constrained by the geographical space in which individuals are located (Onnela et al., 2011; Rivera et al., 2010) and their routine mobility (González et al., 2008), places could facilitate the creation and sustainability of relations between the actors who attend them. Moreover, as stressed in the literature, recurrent, informal interactions between members of a community in a location can lead to the creation of new practices or cognitive spaces (Furnari, 2014; Sgourev, 2013).

Secondly, they can offer resources that are not acquired through social ties but through presence in (or experience of) a place. For example, attending a concert or an exhibition, i.e. being exposed to creations from various fields (Paris & Ben Mahmoud-Jouini, 2019), prototyping a new product with facilities available in a fablab (Suire, 2019), or confronting and discussing ideas during meetings organized by members of a computer club gathered in a garage or an university (Furnari, 2014; Petrick, 2017), are some resources that places can provide. The individual characteristics of innovators (i.e., their social capital, financial resources, motivation, etc.) influence their ability to seek out and acquire the resources produced by places (Corte, 2013). Similarly, access to places could depend on the resources acquired elsewhere by the innovator. This dynamic of the resources produced by the places evolves over time and is sensitive to (a) the transformations of the social networks and the attendance of the places

by groups of actors, and (b) the evolution of the network of places in a territory, modulating availability of resources.

For a place to generate resources for an innovator means that it comes from the social dimension of the place (the peers and audience attending the place); its features in relation to its ecosystem (such as its location in the territory relative to others and its size); and the actions implemented by the team managing the place, which corresponds to an organizational dimension. This dimension covers, for instance, the niche or mainstream orientation of the programming, the pricing/accessibility policy, the management mode, or the degree of freedom for experimentation allowed to innovators and artists by the teams who select them (Buchholz, 2019; Foster et al., 2011; Kloosterman, 2014).

2.3 THE ROLE OF PLACES IN THE INNOVATION JOURNEY

As mentioned before, we assume that the roles of places differ according to the phase of the innovation journey. We claim that the stage of the innovation process and the type of places attended can be paralleled: for example, some places would be attended in the ideation phase – such as a bar where a community has its habits and where an innovator can benefit from the local buzz (Bathelt et al., 2004) – and others in the implementation phase of the innovation – for instance, when an artist performs or exhibits his work in a cultural venue and gains visibility, reputation, and recognition from a specific audience (Cattani et al., 2020; Sgourev, 2013).

In the early phase of the innovation journey (generation of new ideas), places can have a crucial role, particularly because they help to create the context for informal meetings between members of a field, which is necessary for the exchange of diverse ideas and knowledge spillovers (Andrews, 2019; Cohendet et al., 2021). These encounters can allow innovators to be confronted with different types of knowledge or visions (whether from the field in which he or she evolves, or from another), and thus stimulate recombination (Capdevila et al., 2018). Moreover, places can also have an important role in the experimentation/prototyping phase. Some venues make available specific facilities for actors who attend it, allowing them to experiment or refine an idea by being confronted with the materials. These can be fablabs (Suire, 2019) or rehearsal studios (Gibson, 2005) for instance. Not only can innovators prototype and consolidate their idea in these venues, but they are also able to interact with others who attend and share their vision to perfect their innovation. For example, Bourdelle's studio described by Sgourev (2020) is a place that catalyzes artists in the core of the artistic field (Bourdelle) and others from the periphery (students). These people learned by experimentation (cognitive and material resources) which were unconventional at the time. Therefore, they participate in the formation of dense networks of relationships (social resources).

Once a prototype is crafted, or when the innovator feels that his or her idea is mature enough to be shared, attending certain venues can facilitate the championing phase. As this phase requires social relations, attendance at certain venues can trigger interactions with members of the audience within which brokers can make available other resources by bridging disconnected actors or translating the vision developed by the innovator (Foster & Ocejo, 2013). Finally, places can also produce the resources needed to implement the innovation. As with the production of innovation, there are places where innovation is exhibited or performed. The organizational dimension of the place can be critical for innovation diffusion. For instance, by booking an artist, a concert hall helps to give visibility to the artist with an audience that may be composed of connoisseurs (niche) or not (mainstream) (Foster & Ocejo, 2013). In addition, the attendance of places by particular audiences contributes to the reputation (Kloosterman & Brandellero, 2016) and to collective self-recognition of communities (Oberlin & Gieryn, 2015). The openness to experimentation or, on the contrary, the exploitation of well-established codes, are variables that can differentiate a place's audience. The visibility, legitimation and potential reputation derived from it can then be exploited elsewhere, especially when they are delivered by recognized actors in the field (Anand & Jones, 2008).

2.4 PREFERENTIAL CIRCULATIONS

Even if some venues concentrate multiple resources, we can argue that it is unlikely that all the resources needed are available indifferently for all the actors, at any time, in one place. In a word, a place cannot offer every resource needed by the actors at every stage of the innovation journey. Therefore, we assume resources are unevenly distributed among different places of a territory and, by attending distinct places, an individual can aggregate heterogeneous and potentially complementary resources.

In a continuously recomposing ecology of places, we argue that we can identify patterns of attendance with self-reinforcing dynamics, especially if innovators who share the same cognitive space or practice attend the same combinations of places. This is what we call *preferential circulations*: individual and collective patterns of attendance of resource-producing places. Our theoretical argument refers to the concept of preferential attachment – or "rich get richer effect" (Barabási & Albert, 1999), which we apply to a combination of places. Preferential attachment is based on the idea that in an evolving network, a dynamic of incoming nodes can lead to a self-reinforcing mechanism of selection of the most connected single or group of nodes. The heavy-tailed distribution of degree of nodes reveals a strong asymmetry of relative attractivity of each node (Barabási, 2005). When it comes to a socio-economic explanation, the network effect is often the usual suspect. Such a configuration can therefore be related to some PCs that are self-reinforcing through a network effect around a few highly connected nodes (i.e., highly attended places) while other less attended places remain peripheral. This

could be due to the resources generated by different types of places. Therefore, we hypothesize that resources emerging from the attendance of highly visited places are distinct from those produced in more peripheral places. To illustrate this, we can argue that a work exhibited in peripheral places is often more confidential and that the search for legitimacy goes through places with a larger audience (Phillips, 2011). If we reasonably hypothesize that market relationships are socially embedded (Granovetter, 1985; Capron et al., 2021), some places can be preferred to others when they facilitate social interactions that would support further economic or business opportunities. When it comes to gaining inspiration, attending core places would reinforce already established standards while attending peripheral places can trigger new ideas based on innovations and knowledge from niches or distinct fields (Sgourev, 2015). Following the literature on core-periphery dynamics and creativity (Cattani & Ferriani, 2008; Sgourev, 2021), a core-oriented PCs may generate more market-oriented innovations than a periphery-oriented PCs because the ideas and audiences in the margins are more tolerant to experimentation and deviant creative output. Still as a hypothesis, we can say that innovators who have a mixed PC are those who have access to various resources from core and peripheral places. At different stages of their innovation journey, they can get the "best from both worlds" (Ter Wal et al., 2016) and could therefore maximize their creative and innovative capacity in a field (Sgourev, 2021; Phillips, 2011; Cattani & Ferriani, 2008).

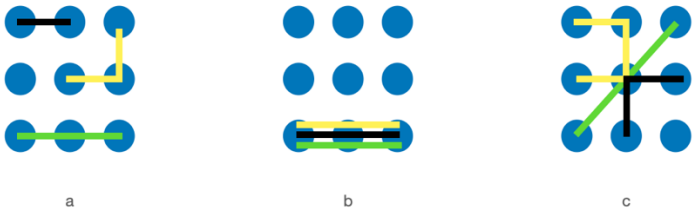
Starting from this framework, we argue that PCs could be observed on two levels. On the first, a self-reinforcement around certain places can appear: the more it gains in audience, the more it will gain in attraction and become a focal place for a community. Thus, we could expect both a direct network effect – if one attends a place because of its characteristics – and an indirect network effect emerging from the opportunities of encounters through attendance at the place by others. These focal places make it easy for community members to meet regulars of the place (peers, gatekeepers, audience), resulting in closer ties (bonding) and a strengthening of a shared cognitive space. Conversely, boundary places, in contact with other communities, are places where innovators acquire resources from distinct fields, but which make recognition, legitimization and visibility in their field more elusive.

Moreover, there can also be self-reinforcement around a circuit that combines several places. From an analytical point of view, it would also reveal the community's space and the resource-seeking behavior of its members and therefore some features of related innovations. All in all, the patterns and composition of PCs would indicate the existence or the degree of maturity of a community of innovation on the territory – the more individual PCs are homogeneous or converge toward specific places, the more mature the community is. On the contrary, if PCs are rather heterogeneous, then innovators share few resources with others, and it is difficult to refer to a community *per se*. It would also illustrate the circulation of knowledge and ideas through a core/periphery geography – where they converge and where they do not. Finally, it would reveal the geographical dimension of the cognitive spaces of

communities of innovation. Our interest is therefore less in the properties of a particular place than in the combination of attended places and how collective pattern is related to innovation.

To summarize our argument, we present with the following Figure 1, three situations with nine different places offering idiosyncratic resources. We start from situation (a) of perfectly dissimilar circulations – innovators attend no places in common, resulting in a fragmented community. Or to put it another way, referring to an *ex-ante* community is not compatible with what CPs reveal. The opposite is represented in case (b) with perfectly similar circulations: the community is integrated around a network of places attended by innovators, presumably sharing the same cognitive space. In the situation (c), the 3 PCs are heterogeneous, but one place is shared by all. This is a boundary place. It can be both at the core of one CP and on the periphery of another, and one can suspect it offers some generic resources for all three PCs while the other places offer more specific resources to the different innovators.

Figure 1 - Three situations illustrating preferential circulation



In general, we argue that innovators need various resources to generate novelty: they acquire it through different processes, including attending places, and combining them at different stages of the innovation process. Due to their social, material, and organizational dimensions, places can be crucial in producing resources for innovators in creative fields. In this context, we try to understand why innovators choose one place over another, and further explore what the combinations of places made by members of a community tell us about their mode of innovation. The presence of places common to several communities evolving in different fields can also inform us about the limits and the porosity of their cognitive space. Depending on whether these boundary places are confidential and niche oriented or multidisciplinary and mainstream, we can better understand the interpenetration of the different communities, their embeddedness on a territory as well as the maturity and legitimacy of the innovation they are currently producing. The identification of these processes, and of the roles played relatively by different places in a territory, have not been explored in this way in the literature but are possible avenues to a more precise understanding of the spatial conditions favoring innovation in creative fields.

RESEARCH HYPOTHESIS AND EMPIRICAL STRATEGIES

This paper is based on a single, in-depth case study that allows us to explore several hypotheses and to outline research avenues (Eisenhardt, 1989; Yin, 2014). From an empirical view, the case also seems interesting because its particularities highlight potentially different and similar behaviors.

First, we chose to study a community located in the city of Nantes, in western France, the "Loopiest city in France" as stated in *The Times*[1]. But Nantes is also known as one of the more active ship building port during 19 and 20 century. This ship industry has been highly inspiring for the young writer Jules Vern born in Nantes in 1828. When this industry collapsed in the 1980's, it left a huge industrial wasteland in the center of the city, on an island (see annex 4). Since this period the city is characterized by a pro-active policy of economic development through cultural and creative industries, cultural facilities and events initiated in the 1990s (Ambrosino et al., 2016). This was then articulated with a policy dedicated to the attraction of knowledge-based industries, including artistic, cultural, and digital technology activities, which finally led to the city's award as European Capital of Innovation in 2019[2]. In this context, local authorities strategically developed a "creative and innovative" cluster on the "Island of Nantes" (Schieb-Bienfait et al., 2018). It includes both companies, university, professional school, and research institutions, and on the tip of the island, a concentration of a dozen bars, music venues and art galleries (see appendix 3). In addition, Nantes has numerous bars and cultural venues in its downtown area that actively participate in a local night life conducive to social exchange. Finally, large cultural facilities located in the nearby suburbs are easily accessible. Thus, Nantes offers an interesting case where the actors can attend a varied typology of places in different parts of the territory (city center, island, suburbs).

We focus here on projection mapping, an emerging and innovative practice on this territory. It can be defined as the projection of still or moving images onto volumes using projectors and dedicated software. This practice is at the intersection of two fields, digital technologies and arts. The appearance of new technologies specifically dedicated to the creation of digital images and their projection has allowed a strong development of this practice since the mid-2000s (Watier, 2018). Regarding artistic aspect, projection mapping includes the creation of aesthetic content that can be figurative or abstract. It is regularly used by artists operating in the field of digital arts, but it is also regularly combined with music by video-jockeys (VJs). Innovators are called mappers: they master both the creation of the content, the technical dimension of the projection, and sometimes the development of specific tools (software, projection devices). According to their practice, the material and cognitive resources vary.

[1] https://www.thetimes.co.uk/article/nantes-the-loopiest-city-in-france-mqpr6k6zjh8
[2] https://horizon-magazine.eu/article/nantes-named-2019-european-capital-innovation.html

The community consists of 49 actors who we have grouped under different labels according to their activity (see Appendix for details). We consider primarily mappers, but also event organizers who regularly employ them, as well as artists from other fields who collaborate with mappers on creative projects integrating projections. We also add cultural venues employees who contribute to the community not through creation but through their position in these venues as they generate resources that can be used by the mappers (e.g., curation of an exhibition). Again, according to their practice, the reliance on certain resources from social relationships varies.

Focusing on the characteristics of the population studied seems particularly interesting for exploring PCs for at least two reasons from which we derive hypotheses. Firstly, the interviews we conducted reveal different definitions of the practice according to the groups of actors. The mappers partially agree on what projection mapping is, with a sufficient degree of adhesion to the definition of the category to accept the diversity in the forms a mapping could take (Hsu et al., 2009). But the mappers and references cited are not the same depending on whether a mapper belongs to the artist, architects or the VJ group (Capron et al, 2021). We can therefore consider that this ambiguity of field at the local level (Coman & Phillips, 2018) will be found in the patterns of PCs and which is the basis of a first research hypothesis.

H1: According to the innovator's cognitive space, the combination of places attended by the actors differ and is revealed by different patterns of PCs

Secondly, as we have pointed out, places may serve as focal places for peers, influencing the formation of collaborative networks and shared visions. However, as mappers share the same practice and interests for projections, we can expect different PCs but also places of convergence. Thus, we argue that the characteristics of the relational structure of a community will be found in the PCs.

H2: Since places densify social relations, the degree of similarity and dissimilarity of PCs would reflect the degree of cohesion (or fragmentation) of the community's relational structure, or even its absence.

In addition to the community, we rely on the local ecosystem of places attended by mappers. The sample contains 36 places and as we explained in the previous section, it covers a variety of locations. We applied a basic categorization to improve our analysis (Appendix 1 & 2). In the places cited by the members of the community, two have shut down but we have included them as they could have played an intermediation role (if two actors met there) or generated resources for actors who cited them (funding a performance or giving them visibility).

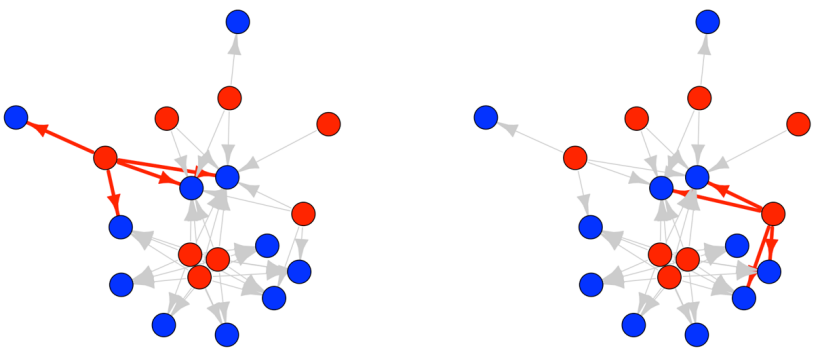
METHODOLOGY

Data were collected via first-hand and secondary-hand sources equally and in parallel. To begin with, we conducted 22 semi-structured interviews between September 2019 and March 2020. We asked respondents to cite the places they attend and explain why they mainly go there. Most of the interviews were with mappers (14). We triangulated these qualitative data with interviews of four cultural venue employees and four event organizers, and with second-hand sources (events programs, websites, social media publications). This allowed us to identify other locations that were not mentioned and to deduce that some resources may have been acquired there.

Following the analysis of interviews and documents, we anonymized and codified our data as a list of links between actors and places. A link is considered to exist between an individual and a place when (i) he or she attests to it in the interview, (ii) the information is available on the mapper's website or social media page, or (iii) a mapper's name appears in the program of an event. Some links may induce formal relationships with the venue teams that provide the resources, but this is not always the case. By cross-referencing these different data sources, we obtain 202 individuals-places links.

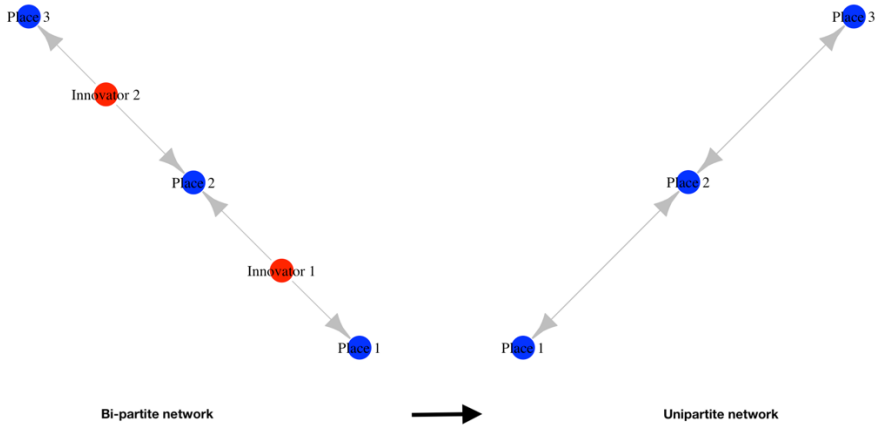
We use a two-step methodology to identify PCs. First, we study the bipartite network to identify which actors frequent which venues. Figure 2 is a sample of the whole network. Here, we observe that two innovators reveal a PCs of 4 places and they have 2 places in common. From there, innovators can be grouped into 3 distinct sets based on the similarity of the venues in common. These similarities bring out similar combinations from one actor to another, indicating they would belong to the same "group" searching for similar resources. Crossing with qualitative data, one would infer that these 3 different groups refers to Architects, Artists and Video-Jockey's.

Figure 2 - Bi-partite network of places (blue nodes) attended by innovators (red nodes).



Next, we have generated a network of places[3] by transforming the affiliation network into a unipartite network (Figure 3). Following Uzzi and Spiro (2005), we consider that a link can be drawn between two places if an individual attends both. The network created indicates links between places but reflects patterns of attendance among the set of locations previously identified.

Figure 3 - Transformation of a bi-partite network into a unipartite network (red nodes represents individuals, blue nodes places).



Several analyses were conducted to find out what the network structure reveals about place attendance. Nodes represent places and the links aggregate the number of attendances, i.e., the number of actors attending the same places. First, we use the degree of centrality, which corresponds to the number of links incoming on one node. In our case, this means counting how many mappers attend the same places and reveals how much a place is attended relative to others. The second measure used is the betweenness centrality, illustrating the fact that a node is positioned in the shortest path between any pair of nodes in the network. It reveals whether a place is either a boundary place for the community or a hub in the different individual patterns of circulation. Then, we calculated the density of the network, referring to the number of existing links compared to the number of possible links. This measure illustrates how places are connected to each other: if the actors all attend the same places, the network should be dense, and conversely, if places are poorly connected because of the dissimilarities of PCs, the network should not be dense. To improve our understanding of the structure, we studied the clustering coefficient. This allows us to identify clusters of nodes that exist within the network by analyzing the probability that in a triad, two nodes relate to a common neighbor, or what may be the likelihood that an actor who attend two distinct places also attends a third one. This measure complements the density measure and helps one to understand the interconnections between places. To put it another way, if some places are highly attended (*degree centrality*) and that these same places are important hubs (*betweenness centrality*), the

[3] Network analyses were conducted with igraph package (R).

clustering coefficient allows us to identify whether or not clusters of places providing group-specific resources exist. Finally, we examined the assortativity of the network (Barabási & Albert, 1999; Rivera et al., 2010). It describes the degree correlation, or the fact that highly attended places are connected to each other and poorly attended places are tied together. This measure allows us to identify whether PCs are structured around many (or few) connected places, or conversely if they are distributed around both many and few attended locations. In a certain way, this measure makes it possible to reveal PCs that are core-oriented, periphery-oriented, or that mix core and peripheral locations in the case of a disassortative network.

In the end, we used our qualitative data to interpret which resources are sought and acquired by the actors. This mixed method allows us to explain the differences and similarities in individual and collective patterns of PCs, which we describe next.

5.FINDINGS

5.1 NETWORK ANALYSIS

In this section, we present the results obtained *via* the network analysis. The results of the structural analysis of this network (Figure 4) are summarized in Table 1 and completed by the degree distribution in Figure 5. Finally, in order to visualize the localization of the different venues, and identify potential spatially clustered places, we plotted the places on a map of the city (Appendix).

Figure 4 - Network of places attended by the community

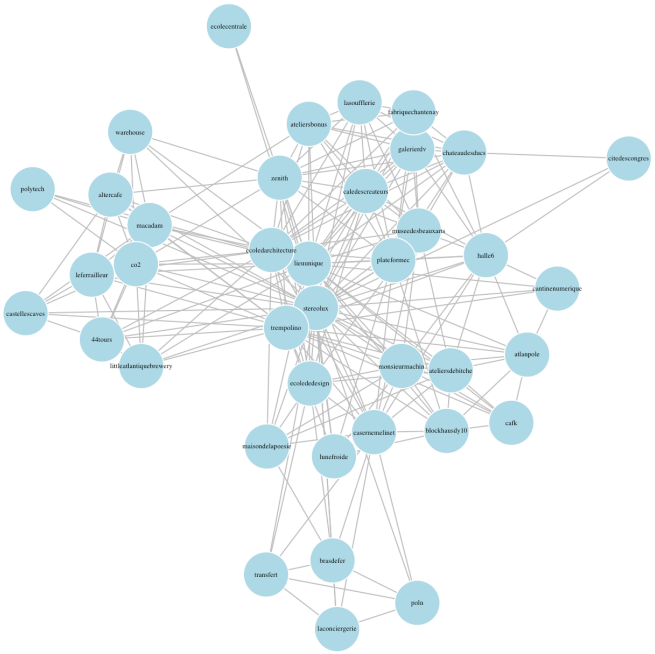
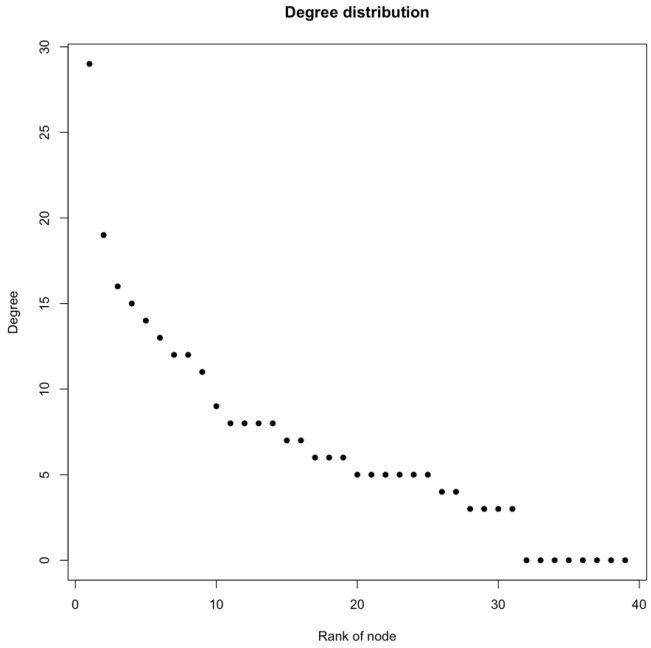


Figure 5 – Degree distribution (max: k=29)



As a first step, we conducted an in-depth analysis of the community's social network[4]. It shows a community scattered into three groups of mappers corresponding to architects, artists and VJs. We notice that the links are particularly dense within these groups (*bonding social capital*) but sparser with members of others (*bridging social capital*). This can be explained in particular by the fact that actors organize themselves into collectives, which is relatively common in the creative fields (Simon, 2009). In doing so, they maintain strong links around a shared understanding of the practice in a logic of bonding. Another explanation lies in homophily (Jackson et al., 2016) within the network: actors who are similar in their practice and cognitive space are more linked together than with dissimilar actors. These observations correlate with the three distinct PCs: architects PCs have in common the School of Architecture, VJs' is dominated by music clubs for instance.

We have plotted the degree distribution of places (Figure 5), showing most nodes having low degree, few nodes with relatively medium degree, and a minority with high degree. Mappers all attend multiple locations (5 places in average), and some are particularly attended. Among them, Stereolux (k=29), a flagship place, publicly funded venue mainly dedicated to music and digital arts, stands out. It regularly hosts events from other fields (e.g., a motion design festival), and organizes an international festival dedicated to digital arts and electronic music. Locally, it is a well-known cultural venue. Then, there is a dropoff, and some places are frequently attended but less than the first: Lieu Unique (k=19) and the

[4] The social network density – the ratio between existing links and potential links – is 0.1113946, and the clustering coefficient – the probability that two nodes with a common neighbor are connected – is 0.5712971.

School of Architecture (k=16). Finally, the rest of the places are less attended: some places are mentioned only once as being in the habit of attendances. The betweenness centrality indicates the same result, with a very similar distribution: Stereolux (b=184.70) has a very high betweenness centrality compared to other places, followed by Lieu Unique (b=30.04). The latter is a multi-activity venue (bar, restaurant, exhibition and performance hall for concert, theatre, dance, etc.) with a dense and varied program. As one artist points out, "*you cannot miss a place like this that has great program, which often has great shows and free shows for everyone. There's a real life here, that's really important*."[5] We can deduce that these places could therefore promote encounters between members of different communities (social resources) and exposure to creative productions from several fields (cognitive resources). Not only are these places highly cited as being in the habits of attendances, but they also appear to be at the intersection of the PCs of the three groups. However, other measures (table 1) relate dissimilarity in the patterns of attendance. As expected, even if the actors have common places in their PCs, they also attend venues others do not. First, the density indicates that not all places are connected to each other (0.283871). This shows that the actors do not all attend exactly the same places, but rather that they have a rather low degree of similarity in the places they attend. Moreover, the degree correlation indicates a disassortative network (-0.2036152).

Table 1 - Structural analysis of the whole network

Density	Assortativity	Clustering coefficient
0.283871	-0.2036152	0.5614286

In a way, this structural heterophily indicates that PCs combine both core and periphery places: innovators attend both places with large audiences, and others with smaller audiences. Finally, the clustering coefficient (0.5614286) indicates that not all nodes are tied to form a single, interconnected set of places. Instead, there are clusters of places loosely connected with others within the network. This therefore suggests multiple paths for different innovators, not homogeneous circulations. All in all, the PC at the collective level is fragmented: it invites us to not reject Hypothesis 2.

5.2 GROUPS' PCS ANALYSIS

As we had identified three groups of mappers, we then created distinct networks and conducted a structural analysis for each to facilitate the comparative analysis and identify which resources are

[5] Interview with an artist (25.11.19)

acquired where and by whom. The analyses should point the similarity or dissimilarity within the groups. In fact, there is a greater chance that a community exists when the resources acquired are the same, captured by the same places attended. Results are synthetized in Table 2.

Table 2 - Structural analysis of the three networks.

	Assortativity	Density	Number of attended places	Most attended places (number of actors attending this place)
Artists	-0.192617	0.3571429	21	Stereolux (10) Caserne Mellinet (6) Lieu Unique (5)
Architects	-0.278526	0.7090909	11	School of Architecture (8) Stereolux (7) Lieu Unique (4)
VJs	-0.3125	0.7777778	9	Warehouse (6) Co2 (3) Stereolux (2)

Overall, the PCs of these three groups differ. From a structural point of view, we notice that the networks of places attended by architects and VJs are very dense – therefore more cohesive – compared to that of the artists. Conversely, the artists' PCs are much more distributed: the number of places attended is higher, and the combinations are more heterogeneous. We observe that there are common places in the PCs of each group (Stereolux, Lieu Unique), but we also see places attended only by each group. These places perform a special role as they provide each group with specific resources.

5.2.1 Architects

In the network of places attended by architects, we identify the focal place as the School of Architecture: almost all members of the group cite this place as an important venue for their practice. This location has a bonding effect since it allows the actors to meet regularly (social resource). It is also a crucial place for the formation of a common space: the teachings received and the resulting approach allow the actors of this group to have common understandings. Finally, it is also a place where they can benefit from material resources to experiment with during courses or events organized on site. The School of Architecture also plays an important role in the local configuration of the field by hosting a projection mapping festival initiated by a former student[6]. For this project, the school provides rooms for the festival and gives visibility to the event.

[6] Created in Montreal, the Mapp_Nantes festival is in fact the local extension of Montreals' annual event. The first edition was supposed to take place in 2020 but was postponed.

Within this group, three mappers recently created an artistic group. They have already performed in 4 places associated with electronic music: these places allow them to generate both financial (money for performances) and social resources (new relations and opportunities to perform elsewhere). By attending these places, they gain visibility and legitimacy: from their peers but also from the local music scene. Attending these boundary places has a bridging effect for this group, who can connect with members of other fields.

5.2.2 Artists

For artists, the PCs are relatively sparse and is distinguished by the high attendance of Stereolux (Table 2). Artists can access practically all the resources necessary for their practice in this place. At different stages of the innovation process they are able to find financial resources for some projects produced by the place; material resources for residencies by accessing to top-notch facilities and tools. And finally cognitive resources because they often attend exhibitions and performances with some participating in or leading training courses on the spot. This place also allows them to extend their space and gain both legitimacy and visibility during the exhibitions that they perform there. Lastly, they maintain a relationship with the management who provides them exclusive opportunities locally and elsewhere: "*the curator also advises a lot of festivals abroad and so he also programs me on other events abroad. So it's clear that this is a real strong point, they are important partners...*"[7]

Another much attended place is where one of the artist has his studio, Caserne Mellinet. This place plays a role similar to that of the School of Architecture for architects: it allows group members to meet regularly and exchange ideas, develop skills, and share knowledge in an informal way, making the studio an important locus for the elaboration of their cognitive space. It is also a place to access tools to experiment with. As it is a working place with restricted access, its bonding effect might be greater than in public places. Finally, we note that places attended are more varied and they are less dominated by a particular space than the two other groups. The presence of places associated with other artistic fields (e.g., theater, poetry, dance) allow artists to widen their PCs with different fields and social networks which may have a bridging effect. This PCs indicates a search for complementarities: artists are looking for both generic and niche resources (or resources from other fields).

5.2.3 Video Jockey's (VJs)

Some VJs cite Stereolux and Lieu Unique as places where they go to see exhibitions or have a drink with friends, corroborating the observations made for the other groups. However, apart from a computer school, one actor cited as a cognitive resource, the other places attended by this group are all clubs, bars, and concert venues with quite similar programming (the range of music in these locations is rather

[7] Interview with an artist (09.01.20)

homogeneously dedicated to electronic dance music). These places constitute the core of their PCs and seem to reflect the space of this group, particularly because they do not seem to be shared by the whole community. Furthermore, we can think that the regular attendances of relatively few places favor the dynamic of bonding: this circulation encourages informal and unplanned encounters. Since they attend the same venues, the cognitive space shared by these actors can be further reinforced. One of the PCs clearly shows how an actor acquires different resources by attending multiple places: salary for performances; draws inspiration from performances seen elsewhere and new techniques from peers invited for an event. For him, opportunities abound when the bars near the club where he works close at 4 a.m.: managers and event organizers go to the club and have exchanges with him for future events. The geographical proximity of these locations on the island of Nantes (see appendix 3 & 4) plays a key role for him and the pattern of his PC reveals a regularity around spatially clustered places. They act as possible adjacencies (Loreto et al., 2016), places nearby which are both geographically proximate and relatively close in terms of cognitive space, that he can explore to nurture his practice.

Hypothesis 1 therefore seems to be confirmed. Even if some shared places do not create interactions between the members of the groups we interviewed. The mappers do not benefit from the same resources by attending these venues. They are more flagship locations attended by multiple audiences, but which does not favor bridging compared to boundary places that favor mutual influences and cross-fertilization. These places produce generic resources for mappers, who share a practice but not the same cognitive space. Nevertheless, some places appear to generate specific resources for the different groups, which is why they are not found in others' PCs. It is in these focal places that mappers develop their skills and develop their shared visions, leading us to admit that, to a certain extent, PCs reflects their cognitive spaces. Altogether, it is a combination of different types of places that form the PCs.

6.DISCUSSION

Regarding innovation processes in creative or artistic activities, studies have looked at the role played by particular places (Gibson, 2005; Kloosterman & Brandellero, 2016), neighborhoods (Rantisi & Leslie, 2010; Sgourev, 2013) or cities (Oberlin & Gieryn, 2015), but limited research has focused on the roles that different places play in relation to each other. By adopting a systemic perspective and conferring a resource-producing role to places, our research contributes theoretically to a better understanding of innovation processes in creative fields. We assume that it can be extended to innovation communities in other fields, as our results lead us to conclude that the attendance at multiple places seems to be a crucial process for innovators to acquire spatialized resources. In a way, this paper contributes to spatially grounding the concept of collaborative circles (Parker & Corte, 2017; Corte, 2013).

Following the theoretical background and empirical analysis, we presume that places do not have the same effect in the first or last stages of an innovation journey (Perry-Smith & Mannucci, 2017) because they do not generate the same resources. For the early stages – generation of new ideas and prototyping – we identify two strategies that are reflected in the PCs. First, actors focus on their community (or group) to access resources specific to their activity. This can take the form of information on the latest trends in their field, the confrontation of ideas, and confirmation that the project should be pursued because the new idea is valuable. Spatially, this is reflected in the combination of places specific to the community, especially the focal places, in a logic of bonding. We can relate this to an exploitative approach, which would lead to incremental innovations (March, 1991; Maoret et al., 2020). The second option is to attend more diverse places. This means interacting with other communities (or groups) in boundary-places. The cognitive distance is greater, which implies that an actor applying this strategy diversifies his sources of inspiration and knowledge. The exploration of possible adjacent (Loreto et al., 2016) from other fields can be associated to a bridging logic. This type of PCs therefore promotes cross-fertilization and combinations of knowledge that favor radical innovations (Sgourev, 2015). Compared to the first pattern, this circulation is more exploratory and could be adopted by actors whose practice is more emergent (less tied to a particular space or community) or by actors who explicitly seek to work in collaboration with artists from other fields. For the next two phases – promotion and implementation – the places attended may also be different. Following the same logic as the first two stages, actors can make their innovation grow in proximity the community they belong to. This means attending focal places of their community, looking for support from their social network and gatekeepers, and gaining more attention and visibility inside the local field by performing there. In the ecology of places attended by the community we studied, some places are more suitable for innovations that are still experimental (focal or niche locations), and that others are essential to gain visibility (mainstream or highly attended). The latter are crucial to legitimize the innovation and its creator.

The circulation between different places shows how these resources are distributed and that a combination of different focal places of the community is crucial to gain visibility and legitimacy in the field. However, this strategy includes a risk of lock-in around a set of places and the community that attends it, leading to incremental innovations. The second possibility is to broaden the audience by attending more boundary places. If for the generation and elaboration phases this allows access to different ideas and knowledge, for the promotion and implementation phases the challenge lies in the wider recognition of innovations. By performing in boundary places where different communities converge, an actor broadens the attention given to him and reaches a wider audience. These boundary places, which are on the edges of the PC in one field, can be at the core of the circulations in another. In this process, the role of gatekeepers is essential to avoid the lack of understanding of the innovation

because of conflicting visions or frame of references. The teams of the place play this role of translation (Foster & Ocejo, 2013). One can therefore obtain recognition beyond their field, which can then be transformed into other resources (Anand & Watson, 2004; Anand & Jones, 2008).

In parallel to the stages of the innovation process, the attendance of places can also depend on (i) whether or not innovators have a formal relationship with the places' management team, and (ii) the stage of the career of the innovator, who may benefit from legitimacy and visibility acquired elsewhere (Montanari et al., 2016). But more crucially, we do not clearly distinguish the effects of places on the type of innovation, even though the resources needed to produce radical innovations or incremental innovations differ (Maoret et al., 2020). Indeed, attending boundary places can help to obtain distinct knowledge from that of the field of origin – essential for developing radical innovations – because actors are in contact with actors evolving in other fields. This variety is not necessarily sought when it comes to developing incremental innovations, which require access to knowledge that is less divergent from what is accepted in the field (Maoret et al., 2020). In the example we have studied, some actors have multiple activities (architects and artists work on projects not related to mapping) and therefore attend more varied places, while others (VJs) have a mono-activity centered on few places. The latter create more incremental innovations (consisting mainly of new content but respecting accepted standards in their field) while the former introduce more innovative elements (use of specific technologies).

Although we conceive PCs as patterns combining different places, preferential attachment around venues attended by different local creative communities should not be overlooked. In our case, places cited by most of the actors (Stereolux and Lieu Unique) are institutional, mainstream, and highly visible at the local level. As activities dedicated to projection mapping are rare and irregular, actors from the three groups do not meet there: these places do not bond the community. However, this is where they are confronted with creations from other fields. These places could therefore serve for cross-fertilization and *inter*-community (embedding of two communities from different fields) as well as *inter*-group (mixing of groups of actors sharing the same practice). This requires an active strategy of connecting communities from distinct fields. From this can emerge new practices (Furnari, 2014) or new spaces that distinguish the territory and the community from others (Crossley, 2009; Phillips, 2011). Conversely, the places where groups meet are where they cultivate their differences, their specificity. This kind of places is necessary to ensure that cross-fertilization will be enriching for the various stakeholders. Promoting *intra*-group connections is essential: this is where individuals create strong ties (Granovetter, 1973, 1985), fostering relationships of trust and collaboration. It is also where frames of reference are actually formed and discussed (Cattani et al., 2020), thus enabling the development of spaces. Unlike the former, these locations have an important bonding role and are not necessarily public

places (Murzyn-Kupisz & Działek, 2021): in our case, the artist's studio shows that a private place, dedicated to experimentation, plays this role.

From these observations, we can draw a parallel with field-configuring events (Schüßler et al., 2015) and consider that places also have a field configuration role at the local level. Their influence depends on the presence/absence of other places with this function and the degree of centralization of the PCs around this place. By programming certain artists, they affirm certain standards and forms of creation at the expense of others, attracting or repelling certain communities. Further investigations in this area would improve our argument.

Our last point is precisely about how PCs, through their evolution, can show the maturity of a community. It could be spotted via the isomorphism of circulations, both in the form and composition of the PCs, and in the resulting cognitive spaces. Thus, the life cycle of the communities could correlate to the evolution of the PCs. A mature community would attend essentially core places: in this situation we would observe a very dense network with an assortative structure, where the actors acquire the same resources in highly-attended location, in an already structured/homogeneous and routinized field. By doing so, innovators run the risk of having difficulty in renewing themselves. However, the empirical case we examined can be used as a counterpoint: we observe a disassortative structure, highlighting heterogeneity in PCs. These mixed circulations may be explained by several factors, such as the lack of places explicitly dedicated to the practice, which would force mappers to seek out resources in places with a wider range of typologies. It may also be a case of ambidexterity exploration-exploitation: mappers attend places with a large audience as well as places with few visitors to acquire complementary resources. A third possibility is that some actors attend almost exclusively highly attended venues and others almost exclusively low-audience venues, with a form of disconnection between these two circulations. All this leads us to hypothesize that the more homogeneous the PCs are, the more likely it is that the actors share the same social network, the same space, and the same set of resources: it would signal a mature, stabilized community. Conversely, a circulation that remains heterogeneous would refer either to a situation of emergence of the community - as in the example we have described - or to a fragmentation that can be explained by the cognitive distance and ambiguity in the field (Coman & Phillips, 2018). As PCs reveal more than the acquisition of resources, but also a shared cognitive space for the actors who attend the same combinations of places, the fragmentation of PCs would reflect the fragmentation of spaces and a poor visibility (or even invisibility) of the community.

7.CONCLUSION AND IMPLICATIONS

This paper contributes to the literature focused on innovation processes and its spatiality. It underlines the importance of places in their ability to generate multiple, complementary resources necessary for innovation. These resources are unevenly distributed among a range of places, which explains why innovators in creative fields attend different locations depending on what they need in order to generate novelty and gain recognition for their productions. To examine this process, we introduce the concept of preferential circulation, which describes a self-reinforcing path or pattern followed by actors to acquire resources necessary for innovation. We see that places are important for creativity and the generation of new ideas because these places are where members of different communities meet and influence each other. We also stress that locations create the attention necessary for the recognition of novelties by the appropriate audiences. By giving actors the opportunity to perform, certain places play a crucial role in the recognition of novelty locally. Crucially, our study shows that there is not a single, core place where everything happens, but that actors attend a plurality of complementary locations to gain from inspiration to recognition. The role of flagship venues needs to be further examined in relation to all the other places in the territory: if they are attended, it is partly because members of different communities can acquire generic resources there. But this does not offer optimal conditions for the development of new innovative communities. Therefore, the manager faces a tradeoff between developing multiple niches (with the risk that they will not intersect) and promoting intersection of fields and practices in the same place (with no guarantee that this will generate spillovers between communities). These remarks also highlight the idea that an innovation journey passes through different places, and that a varied typology of places (covering the phases of experimentation, production, and diffusion) is required to allow the development of innovative activities. Providing performance places alone is not enough. Our study is a first step towards a more complete understanding of territorialized collective innovation in creative sectors and the underlying processes of management.

Our contribution allows us to envisage a finer categorization of places concerning the variety of resources they offer to communities and innovators. From a managerial point of view, this study underlines the interest of promoting the adaptation of places to communities, and not of creating places with the idea that the community will take them over on its own. We advocate an analysis of what is missing, what is needed by the community instead of a one-size fits-all strategy. Moreover, promotion of emerging activities by managing locations dedicated to experimentation should not be overlooked.

This research is limited on three points, allowing us to draw future research avenues. First, the network is not dynamic, i.e., we do not observe the evolution of attendances over time. However, the closure of a place can have important consequences depending on the structure of the network and/or the resources acquired in this place. In the same vein, we conducted a unique case study on one local creative field. In doing so, our understanding of interactions with other fields is limited, as is the

importance of localized resources in other territories in innovation processes. It would be interesting to make a comparative analysis with other territories to fully understand the field-configuring role of places (Schüßler et al., 2015), or with several communities of the same city evolving in different fields to further assess the role of boundary-places. Finally, from a theoretical point of view, PCs are a function of the intensity of attendance (i.e., the number of times an individual attends a place over a given period) and the number and type of places attended. This can reveal very different innovation processes, between an innovator who attends intensely a single location and another one with little attendance activity but in more heterogeneous locations. The study of this temporal dynamic, which is absent from the present research but desirable to refine the concept, would formally introduce the motives of self-reinforcement, and therefore opens up possibilities for future research.

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APPENDICES

Appendix 1 - Characteristics of the projection mapping community

Category of actors	Number of actors
Mappers	30
- *including architects*	6
- *including artists*	14
- *including VJs*	10
Event organizers	9
Employees of cultural venues	4
Artists from other fields collaborating with mappers	5
Engineers	1

It is important to note that an actor has a double role: he has his own artistic practice but also regularly intervenes as a technician on the works of another artist - we have categorized him as an artist. We also mention that an engineer as a member of an artistic collective, also develops specific devices exclusively for a few mappers categorized as "artists".

Appendix 2 - Characteristics of the places

Characteristic	Number of places
Location	
- *downtown*	15
- *island of Nantes*	17
- *suburbs*	12
Type of place	
- *bar, cafe*	11
- *cultural venue (including clubs)*	15
- *school, educational and research institution*	5
- *museum, gallery*	5
- *other*	8
Main activity	
- *production*	5
- *diffusion*	22
- *both*	5
- *neither*	22
Public funding	
- *yes*	13
- *no*	31
Events at the intersection of arts and tech	
- *yes*	6
- *no*	38

Appendix 3 - Places attended by the community plotted on a map of the city

Appendix 4 – Nantes and the Island of Nantes : a former shipyard that has become a cultural and creative cluster