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ORIGINAL ARTICLE

Creativity and science parks: more than just a physical platform?

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ABSTRACT

This study explores how managerial practices can develop and enhance a creative climate in science parks. Based on a case study of one of the most important Italian science parks, Area Science Park, our results suggest that science park management can further enhance the park's park potential and strengthen ties to its different actors by focusing on creative climate development. In particular, we identify and discuss key aspects that are relevant to this challenge, i.e. promotion of a shared identity, design of structured work processes, use of communal spaces and internal communication technology. Overall, the study contributes to show that creative climate development implies more than merely being located in the physical platform of a science park.

Keywords: Science parks; creativity; creative climate; proximity; managerial practices.

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INTRODUCTION

The focus of this is on complex and heterogeneous collaborative spaces such as science parks, exploring the interplay between physical proximity and managerial practices to enhance creative climate. Science parks have generally moved from a traditional view relying on a "linear" model of innovation, which assumes that scientific knowledge can be linearly transferred (e.g. from a research university to the park, from a firm in the park to another) (e.g. Phillimore, 1999), to a view that comprises different models of innovation (Etzkowitz and Zhou, 2018). In this context, creativity is crucial to sustaining innovation and competitiveness of firms in the park.

At the same time, we observe a relevant research gap regarding *soft* features within science parks and, in particular, creativity and the creative climate of the science park itself, with the literature traditionally more focused on specific *hard* elements, such as growth of sales and profitability for the tenants (Albahari et al., 2013).

The exploration of creativity in science parks requires consideration of both physical proximity, an essential and intrinsic spatial characteristic of science parks, and intended management of creativity and its development. Moultrie et al. (2007) underline that literature on innovation and creative environments "often focuses on the characteristics of the space itself" (p.61) while we should explore the wider context to link the environment to the strategic goals of the organisation. A managerial perspective on creativity is undoubtedly beneficial to this challenge.

Thus, this study explores creativity in science parks and how a creative climate can be managerially enhanced. Our assumption is that there is a prominent need to better understand key organisational and managerial competencies in science parks that can facilitate the development of their potential to be "something more" than just a physical platform for the organisations involved and develop their capability to generate, sustain and enhance a creative climate. Specifically, the research question underlying the study is: What aspects appear important for management to consider in order to develop practices that can purposefully develop and enhance a creative climate in the science park? To explore this research question, we build on a case study of Area Science Park, one of the most important science parks in Italy.

THEORETICAL BACKGROUND

Science parks are considered important actors in the innovation ecosystem, in terms of local development and job creation, as well as an important link between industry and academia (e.g. Colombo and Delmastro, 2002). The history of science parks dates back to the 1950's. Science parks are traditionally described as providers of spaces, services and platforms for innovation in favour of a group of different actors. At the most basic level, science parks are "property-based organizations […] focused on the mission of business acceleration through knowledge agglomeration and resource sharing" (Phan et al., 2005, p.166). At the same time, the range of possible definitions is particularly wide. According to Link and Scott "the definition of a research or science park differs almost as widely as the individual parks themselves" (Link and

Scott, 2003, p.5), due to the variety of characteristics associated with these entities. Despite some differences, two aspects are often shared: (i) physical location in proximity of research institutions; (ii) firms with high technology and/or knowledge-based core business.

Science parks "bring together high technology firms with the promise that collocation with other firms and opportunities for networking will make them more innovative and successful" (Koçak and Can, 2014, p.467). The physical location, and spatial proximity in particular, has many potential advantages. Most significantly, firms can benefit from access to knowledge exchange and collaboration with research institutions and other firms established in the park. In this context, a creative climate can be particularly beneficial to favour this knowledge flow (Staszków et al., 2017).

In fact, creative climate refers to a climate that adds value and enhances creativity within an organisational system, while "climate", in general, is an attribute of the organisation and refers to a set of attitudes, feelings and types of behaviour that emerge on a daily and collective basis within the organisational environment (Ekvall, 1996). While stimulants and obstacles to creativity in organisational environment are well established in the literature (e.g. Amabile et al., 1996), there is very limited literature about how to enhance the creative climate in science parks or similar complex organisations.

For example, Magadley and Birdi (2009), expanding the study of Lewis and Moultrie (2005), identify four aspects that are relevant to creativity in Innovation Labs, i.e. "time and place to engage in creative thinking […] technology needed to facilitate such a process […] human facilitation or people" (p.323), highlighting the 'social' side of this challenge.

If, in general, firm location is a possible element regarding the effectiveness of a creative space (Meinel et al., 2017) and shorter physical distance between actors facilitates interactions (Rosenkopf and Almeida, 2003; Capaldo and Petruzzelli, 2014), deploying the full potential of proximity in terms of creative climate development is a challenge related to the management of a science park. In fact, management can have a significant impact on developing the added value created in the science park via other key dimensions of proximity. A relevant stream of literature (Boschma, 2005; Broekel and Boschma, 2011; Villani et al., 2017) proposes a framework that complements geographical proximity with cognitive, organisational and social proximity. Cognitive proximity is related to the similarity in the way of perceiving and interpreting the world; organisational proximity is the similarity in routines and regulations; and, social proximity is the degree of common relationships, e.g. personal relationships involving trust and friendship (Villani et al., 2017, p.88). These three dimensions are viewed, in particular, as drivers of learning and innovation (e.g. Balland, 2012), thus intimately related to creativity in its social and collective interpretation (Hargadon and Bechky, 2006). This suggests the importance to adopt measures aimed at reducing cognitive distance (e.g. with a mix of backgrounds), organisational distance (e.g. bureaucracy simplification), and social distance (e.g. promoting events). There is also an interplay between spatial and non-spatial elements. For example, strategies related to spatial proximity (e.g. promoting frequent face-to-face meetings) can indirectly affect the cognitive dimension as well. More in general, "geographical proximity may also be complementary to the other forms of proximity" in processes of interactive learning and innovation (Boschma, 2005, p.70). "Although spatial proximity facilitates interaction and cooperation, it is not a prerequisite for interactive learning to take place" (p.69). At a different level, institutional proximity is associated with the institutional framework at the macro-level and refers to the degree of common formal institutions (e.g. laws and rules) and informal institutions (e.g. cultural norms and habits), further influencing the way actors and organisations are able to coordinate (Boschma, 2005).

In this context, science park management plays a crucial role. Westhead and Storey (1994) define a "managed science park" as a park with managers "on site whose principal task is to manage the Park" (p.170). Westhead and Batstone (1999) found that the role played by science park managers is clearly "identified, recognized and appreciated by firms" (p.143). Science parks with a formal structure can "actively encourage tenants to exchange competencies with one another" (p.146).

In particular, "managed science parks have gate-keepers that actively expand the social and business networks of their tenants" (p.146) and this can be particularly beneficial to new and small tenants. In fact, actors with the role of gatekeeper and knowledge broker (in this context, science park broker), supporting inter-firm knowledge transfer, can actively support collaboration and innovation (Ramirez and Dickenson, 2010). Gatekeeping skills are related to integrating and broadening knowledge (*ibidem*), aiming to reduce cognitive distances. The combination of experiences and skills, along with the involvement in inter-firm networks, lead to more successful innovation projects (*ibidem*).

Empirical evidence "suggests that science parks generally need to strengthen their managerial functions" (Westhead and Batstone, 1999, p.147), in particular becoming "more proactive in setting up systems" (p.148) related to the development of relations and link between different entities involved and fully exploiting the role of gatekeeper. This finding underlines the need to further extend and expand the role of the gatekeeper and to consider creativity and creative climate development as a critical managerial function in science parks.

METHOD AND DATA

The research is based on an exploratory, single case study, that is Area Science Park, based in Trieste, Italy. Area, established in 1978, is a national research organisation managing one of the most important science and technology parks in Italy. The nature and relevance of Area Science Park, along with the presence of a large management structure, made it a natural choice for this study. Although a limitation is the lack of comparative cases (Csikzentmihalyi, 1996), a single case in creative studies represents an approach to offer examples about the challenge of creativity by design (e.g. Kristensen, 2004).

Together with Area top management, we jointly identified the potential respondents, taking into account the specific aim of the study. We primarily focused on informants from the management structure in line with the managerial focus of the study. In total, ten interviews were conducted. Our respondents were the president of the park (two interviews), two senior managers, five middle managers from different units of the Area Science Park structure, and a CEO of a tenant company in the park. The rationale was to include informants from different managerial levels of the park and furthermore to complement the data with an interview with a representative of a key organisation within the park. Tab. 1 includes more details about the informants.

An interview protocol was prepared for conducting semi-structured interviews. Each interview lasted between 45-90 minutes. All the interviews were recorded and transcribed. This study is primarily founded on an analysis of the interview data, but we also used additional data sources, collecting relevant internal documents, hard copies of public documents and leaflets, and documents from the science park website. All the transcriptions were read through several times and preliminary themes were constructed considering statements about different views on creative climate and its development. In line with Patton (1990) and Saldaña, (2009), these themes were organised into different categories and, after a series of iterative analyses, some specific themes were chosen to reflect our interpretation of the collected materials as accurately as possible, as presented in this manuscript.

Tab. 1. Brief profiles of informants

Informants	Brief profile
President	Highest officer in Area, leads the board (composed of three members)
Senior managers	Director of Technology Transfer and Director of Business Incubator
Middle managers	Managers from different units, i.e. Park Development & Customer Care (for tenants), Business Development (Incubator), Corporate Education, Marketing and European Projects
Tenant	President of a company (software development) located in the park for almost 20 years

RESULTS

Area Science Park includes two different campuses with over 80,000 m^2 of offices, laboratories and public spaces. Area hosts approximately 75 R&D centres and high-tech companies, along with public research institutions, with over 2,600 employees – mainly researchers. The fields of research are numerous (from life sciences to nanotechnologies) and many services are provided (promotion, consultancy, training, technology transfer).

Area Science Park is organised according to a functional structure implemented with a major reorganisation of the park management in 2015. Currently the overall organisational structure of Area includes about 135 individuals (between managers and employees).

Concerning the research question, our findings suggest that the managerial role in developing creative climate is primarily related to two objectives: 1) creating favourable conditions for creative climate in particular at the cognitive and organisational level, and 2) creating opportunities for exchange between different actors.

Creating cognitive and organisational conditions

The first emerging objective is related to creating conditions for creativity in the science park. From our analysis, we find that this is linked to two critical aspects, i.e. promoting a shared identity and designing structured work processes. The promotion of a **shared identity** is mainly associated with a strong emphasis on innovation. The basic idea is that different actors (e.g. from industry and public sector) can effectively collaborate and share their knowledge using a common scientific approach. For example, this means that tenants can find in Area Science Park someone (a partner) who can easily understand their problems and help them identify possible initial solutions. In fact, Area manages a multidisciplinary park, but all fields are characterized by a strong emphasis on innovation. This is made explicit when a firm decide to settle in Area:

> *Any firm that wants to establish its office in Area [Science Park], needs to present a valid and innovative three-year research programme. This helps to create shared values (a senior manager)*

A shared, innovation-related identity comprises shared values, mission and vision. In particular, the strategic orientation of the park is to strengthen its role of socio-economic engine of development at national and international level taking advantage of three core competences, i.e. scientific network management, training, and technology transfer. Area vision is described by one of its managers:

> *Our vision is to develop a national and international system of relations in order to establish a network of centres of excellence and be an international benchmark for technology transfer and strategies regarding innovation (a senior manager)*

Thus, the mission focuses on the enhancement of the region's competitiveness and business attractiveness by creating a structured ecosystem of firms and public institutions. This includes supporting business development and spreading innovative products, processes and methods as well as distinctive knowledge and skills – through exploitation of research and business, training on business development, management of research and innovation, and promotion of scientific and business networks of excellence. To pursue this mission, key values are focused on the spirit of collaboration (between research and business, between public and private sector) and drive to support the development of the territories.

The second aspect is the design of **structured work processes**. This is seen as an important way to enhance creative efforts towards specific objectives:

> *The process really becomes a collaborative teaming up with different competences in order to create and refine ideas and achieve results at the end (a middle manager)*

Most of Area Science Park work processes, related to the services of the science park, mainly focus on matching the entrepreneurial needs with research opportunities and include a creative effort to deeply analyse what research can offer and understand which are proper ways to value it. The emerging view is to combine a collective effort in terms of creativity with a structured workflow of activities with specific schedule, deadlines, objectives and budget. In other words, the design of structured processes represents the context that determines a specific direction for the creative effort:

> *You have this constant dichotomy between how much freedom you need to be truly creative and how much structure you need to define bounds, in order to build an "honest" creativity without stiffening it (a middle manager)*
>
> *Process is absolutely rigid, while its implementation is absolutely creative (a middle manager)*

Respondents acknowledge that structures that are too strict can hinder creativity, thus a managerial challenge is about balancing creativity and control. In this respect, team working and team creativity are seen as key: individuals can follow a structured process, but, at the same time, they can develop their creativity at the team level through collaboration, dialogue and debate.

Creating opportunities for exchange

The second objective is related to creating opportunities for different kinds of exchange in the science park. In practice, our analysis reveals that this links to two critical aspects, i.e. enhancing exchange and communication thanks to communal spaces and establishing the use of internal communication technology. Concerning the use of **communal spaces** to enhance communication, this includes both informal and formal dynamics of communication. Some communal spaces are obviously related to informal interactions, such as coffee shops, restaurants and outdoor areas. These spaces, positioned at the centre of the main campus, facilitate informal interactions. Respondents highlight that these interactions, in quite unpredictable manners, are at the end triggers for informal exchange of ideas.

The science park also promotes frequent meetings on campus (including meetings between Area management and tenants and meetings between tenants) using work-related branded spaces, such as laboratories and meeting rooms. This enhances formal and informal interaction and communication between different actors, along with a feeling of reciprocal closeness. Proximity and availability of communal spaces are also exploited in terms of wider networking. Respondents mentioned a lively schedule of special events. With the participation of external guests, this is seen as an important opportunity to share ideas and experiences, promoting internal and external networking.

The final aspect is related to the use of **internal communication technology**. In Area Science Park, the current engine for internal communication is an intranet platform combined with an extranet platform for the companies hosted in the park. This system was designed to facilitate communication within teams and between different actors in the park. Although some respondents highlight this system is underutilised, they identify its potential as a trigger for sharing knowledge and ideas in a systematic way. In terms of further development, some respondents identify social media platforms as a way to reinforce internal communication and collaboration in the park.

In summary, Fig. 1 presents an illustration of our findings.

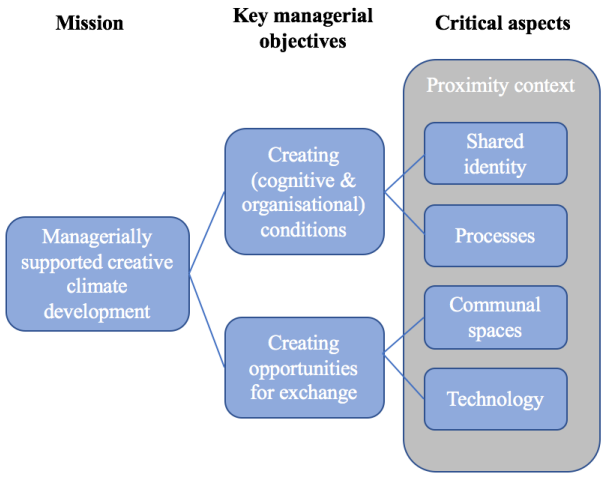

Fig. 1. Critical aspects to support creative climate development in a science park

DISCUSSION AND CONCLUSIONS

Our study has identified a few critical aspects aimed at enhancing a creative climate in a complex networked

and innovation-related organisation, such as a science park. These aspects are related to two managerial objectives.

The first objective is creating conditions for a creative climate. At the cognitive level, our study highlights the importance of building a shared identity, that can be crucial when diverse actors could potentially collaborate, for example in a context of high diversity in terms of roles and backgrounds (Hewing, 2013). This needs to be managerially supported, e.g. promoting specific values and sharing a clear and consistent mission and vision for the science park. Shared identity in science parks represents a particularly original insight since previous literature on science parks barely emphasizes this element (Tan, 2006). At the organisational level, the design of structured processes seems to complement a shared identity. A fundamental paradox about creativity, as a practised social process, is the need to combine both freedom and structure (Fortwengel et al., 2017), thus the design of structured processes concerning creative efforts can be beneficial when defining objectives, roles and activities (Cirella, 2016). The results confirm that interpreting creativity as an unstructured process can be ineffective and the design of structured process is crucial.

The second objective is creating opportunities for exchange. The physical work environment in a science park is intimately related to the spatial proximity. Spatial proximity is seen as a trigger for exchange and, in turn, creative climate. In line with the theoretical background, the use of communal space can also go beyond the interactions made possible by spatial proximity. In fact, science park management can promote the use of communal spaces in proactive ways, for example encouraging the internal use of communal branded spaces and organising a calendar of large events on a varied number of innovation-related themes. In terms of cognitive and social proximity, these aspects reinforce a collective and collaborative view within the science park. Overall, the space becomes an arena for idea sharing, debate, and networking (enhancing cognitive and social proximity between tenants involved and between tenants and guests). This, in turn, sustains a creative climate (Hoff & Öberg, 2015; Yström et al., 2015). This can be combined with technological support, in terms of communication technology (intranet and extranet), to exchange and combine knowledge and ideas (Shani et al., 2000), for example with communities of practice or internal social networking support. In this way, technology "may enable both physical and virtual group work" (Moultrie et al., 2007, p.61).

In terms of managerial implications, the findings suggest that proximity can be an important element for creative climate development, but this needs to be combined with managerial practices related to creativity. This study offers insights to managers of science parks who are keen to experiment with the managerial practices proposed. In particular, the study suggests that individuals and organisations in science parks can support experimental innovation (Mäkinen et al., 2017) with a combination of processes and platforms related to creative climate (Shani and Docherty, 2008; Cirella et al., 2016). Although some of the identified aspects to some extent confirm previous findings from other organisational settings, their presence in the context of science parks offers an original contribution (and even reinforces the importance of these aspects). Transferring managerial practices across fields, in this case moving to the social context of science parks, represents an important source of innovation (Boxenbaum and Battilana, 2005).

In terms of limitations, this study is based on a single case study. Thus, future research can include experimental longitudinal studies in various science parks that can focus on creative climate before, during and after the design and implementation of creativity-related managerial practices with particular reference to the four aspects presented in this paper. Extending the view beyond science parks, future research can inquire about the contextual conditions under which creative climate development can be supported through these managerial practices in different kinds of complex organisations focusing on experimental innovation and based on some degrees of proximity of different actors, for example CERN IdeaSquare and, more in general, innovation hubs, networks and districts.

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