The VEGA-*VEnice GAteway for Science and Technology Park*: Is It a Generative Infrastructure?

Michela Cozza

Abstract

Most literature has analysed Science Parks (SPs) as an economic space. However, I propose to analyse them as a *relational place* where knowledge and productive processes are intertwined. Applying the concept of *infrastructure*–as defined in Science and Technology Studies (STS)–this chapter is devoted to understanding if SPs are *generative infrastructures* which enact innovation. This concept is related to the *seedbed* metaphor meaning an environment where innovation can grow through *convergence* between people and things. This theoretical framework will frame the analysis of empirical data collected from my qualitative research on Italian SPs, conducted from 2011 to 2013. Precisely, I will present the case-study of *VEGA-VEnice GAteway for Science and Technology* and the failure of its project regarding the construction of the smart building Pandora. The case-study embodies common dynamics of Italian SPs, and it contributes to addressing challenges for future research.

1 Introduction

Science Parks (SPs) are an international phenomenon, however few academic studies discuss their performance from a sociotechnical perspective, analysing how social and material aspects are interrelated in generating innovation (Orlikowski, 2007). Theory about SPs is usually an inventory of their typologies, causations and outcomes. In this chapter I will present the case-study of an Italian SP, shedding light on aspects that influenced its capability to *generate* innovation.

Firstly, I will review the literature about SPs, and I will compare and contrast their definition with the concept of *innovative milieus* as discussed in this book. The

M. Cozza (✉)
Department of Information Engineering and Computer Science, University of Trento, Trento, Italy
e-mail: michela.cozza@unitn.it

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metaphor of *seedbed* will support my reasoning. Then, I will pinpoint my analytical framework for interpreting the empirical data. The concept of *infrastructure*, as conceptualised in Science and Technology Studies (STS), will orient my understanding of SPs as possible innovative milieus. I will interpret innovation as a dialectical accomplishment enacted by a process of *convergence* between different actors. An *ecological approach* will be applied to the presentation of my case-study that is *VEGA-VEnice GAteway for Science and Technology*. Telling the history of this Italian park, I will shed light on the failure of its innovative Pandora project, managed by the past Director of VEGA, Michele Vianello. This story is meaningful to understanding the relationship between the process of infrastructural *disalignment* between heterogeneous actors and the *generativity* of innovation. My discussion is meant to be suggestive, rather than conclusive but, finally, it shows the possibility to extend the infrastructural framework to the understanding of the process of innovation within SPs. In the final remarks I will combine the previous concepts, addressing future research on SPs.

2 Literature Review: The Controversial Definition of SPs

Since the 1930s, when the very first SP was developed around Boston's Route 128, SPs have become an international phenomenon. However, there is not a single and uniformly accepted definition of them (Amirahmadi & Saff, 1993; Löfsten & Lindelöf, 2002). There are several terms used to describe similar developments, such as research park, technology park, business park, or innovation centre. Allesch (1985) focuses on the difference between research parks, innovation centres and science parks. According to him, in *research parks* young firms carry on research and development in relatively close cooperation with a nearby university or research establishment. Then, Allesch defines *innovation centres* as providing new technology-based firms (NTBFs) with an optimum chance of survival and development by offering an extensive range of services, the proximity to universities and the possibility of integration into the local and regional innovation network. Finally, the author describes *science parks* as an attractive way of locating industries near research establishments. The main limitation of the Allesch's classification is that actually SPs are, more often, a combination of these organisational models. MacDonald (1987) says that these models can be associated both with (a) property-based initiatives close to a place of learning, and (b) initiatives which provide high quality units in a pleasant environment.

According to the main international associations of SPs–such as the International Association of Science Parks and Areas of Innovation (IASP), the Association of University Research Parks (AURP) and the United Kingdom Science Parks Associations (UKSPA)–a SP (Durão, Sarmento, Varela, & Maltez, 2005): (1) should be economically sustainable, (2) it should have operational links with universities, R&D centres and/or other institutions of higher education, (3) it should encourage and support the start-ups and incubation of innovative, high-growth and technology based companies, (4) it should stimulate the transfer of technology and

business knowledge, and (5) it should be a property-based-initiative. However, Amirahmadi and Saff (1993) stress that the definition of SPs as property-based initiative is particularly vague because it can be confused with other similar business models.

The second aspect suggested by MacDonald–SPs are initiatives which provide high quality units in a pleasant environment–can be interpreted according to the Felsenstein's metaphor of *seedbed* (1994, pp. 93–94):

> implicit in the *seedbed* metaphor is the notion of the nurturing process that eventually creates an *environment for growth*. The science park as a seedbed therefore refers to the conditions created to promote *innovation* [...] As such, they are said to create a supportive environment for the development of innovation, creativity and entrepreneurship.

Actually, the worldwide history of SPs shows that they have not always been successful as *supportive environments*. For instance, Kihlgren (2003) analyses the SPs in St. Petersburg maintaining that they are lacking in collaboration with local industry. Similar results are attained by Ratinho and Henriques (2010) studying the Portuguese SPs. The authors conclude that the SPs contribution to job creation and economic growth is modest. Similarly, Watkins-Mathys and Foster (2006) examine the performance of hi-tech companies situated in science and technology industry parks in Beijing and Shanghai, highlighting the limited benefits of such environments for the national economy. Overall, these results show that the performance of SPs depends on a vast array of social, political and economic factors. However, other researchers have identified successful experiences, in different national contexts.

Starting from a longitudinal comparison between firms on and off SPs in Sweden, Löfsten and Lindelöf say that "the park *milieu* appears to have a positive impact on their firms growth as measured in terms of sales and jobs" (2002, p. 860, my emphasis). No Western countries have documented similar experiences. Vaidyanathan (2008), regarding the SPs in Taiwan, South Korea, Hong Kong and Malaysia, says that they are successful especially in attracting foreign investment and promoting growth of knowledge-based industries. Similarly, technology parks in India are export-oriented whereas the west SPs lack an analogous attitude. Vaidyanathan argues that SPs as *seedbeds* have a complementary set of expectations that relates to a spatial perspective, as Felsenstein specifies (1994, p. 94, my emphasis):

> the common ground between the behavioural and spatial conceptions of the seedbed lies in the notion of the seedbed as creating an environment. This environment, while occupying dimensions in geometric space, is not exclusively spatial. It represents a *milieu* in both the *functional* and *behavioural* sense, as well as the *geographic*.

From a spatial perspective, *exogenous* factors (e.g., city size, level of urbanization, institutional structures and community characteristics) contribute to nurture and promote innovation, becoming integral components of a seedbed environment. Also *endogenous* features (i.e., attitude towards knowledge) are crucial for innovation. Both exogenous and endogenous aspects usually influence the

performances of SPs orienting their success as a seedbed. The meaning of this metaphor is empowered when combined with the concept of *infrastructure*.

3 Theoretical Perspective

In STS literature, the concept of infrastructure refers to interrelated technical, social and organizational arrangements involving technologies, standards, procedures, practices and policies (Bowker, Baker, Millerand, & Ribes, 2010; Karasti, Baker, & Millerand, 2010). Superadded to the term *information*, infrastructure refers to digital facilities and services usually associated with the Internet. Internet is a generative infrastructure able to enact innovation (Monteiro, Pollock, Hanseth, & Williams, 2013). From this viewpoint, *generativity* is "the essential quality animating the trajectory of information technology innovation" (Zittrain, 2006). I maintain that an infrastructure displays its generativity in so far as it enables the continuous and rapid development of new innovative infrastructures. In this way, infrastructure contributes to the transformation of a set of isolated sociotechnical systems into an ecology of interacting human (people) and nonhuman actors (things such as devices and technological artifacts). A working infrastructure is characterised by *openness* to number and types of actors and *interconnections* of a multiplicity of purposes, agendas, strategies. It is a dynamically *evolving* ecology of people and things that *mutually constitute* themselves. The co-evolution of social and material factors also characterises the hermeneutic approach to knowledge adopted in this book and, specifically, by Augusto Cusinato's chapter.

Geoffrey Bowker and Susan Leigh Star (1999), with their famous book *Sorting Things Out. Classification and its Consequences*, have notably contributed to shedding light on the (information) infrastructure concept, showing that, first of all, it is the connection between classifications and standards as objects for the cooperation across social worlds (see "The Firm as a Knowledge-Creating Milieu: The Role of the ICT" by Carla Simone's). Classifications and standards are imbricated in everyday life. People classify objects, human beings, and data, and these classifications may or may not become standardized. According to Star and Ruhleder (1996), infrastructure is something that emerges in situ, in relation to organized practices, when it is connected to some particular activities. There are two relevant aspects of infrastructure. First, infrastructure typically exists in the background, it is *invisible* and taken for granted. People commonly envision infrastructure as a substrate that is something upon which something else "runs" or "operates". Infrastructure is put in the background where practices and activities sink (Bowker et al., 2010; Star, 1999; Star & Ruhleder, 1996). Second, infrastructure could be defined as a *relational property* associated to political, ethical and social choices (Clarke & Star, 2008). Such properties can be identified as "going backstage" (Goffman, 1956; Star, 1999) or doing an "infrastructural inversion" (Bowker & Star, 1999). This inversion allows us to recognise the depths of interdependence of social and material components that influence the

infrastructural *growing*[1] (Edwards et al., 2007; Edwards, Jackson, Bowker, & Williams, 2009). Methodologically, the infrastructural inversion leads to inquiry into the conflicting interests of different worlds (e.g., research, business). Studying this type of interaction favours a better understanding of innovation as a controversial process.

3.1 Infrastructural Convergence

Working infrastructure is based on the interactions between actors (humans and artifacts) (Suchman, 2000). This mutual engagement implies a number of secondary activities of mediating and controlling relationships between heterogeneous actors and their social worlds (Clarke & Star, 2008; Schmidt & Bannon, 1992; Strauss, 1978). To this end, the concept of *articulation work* (Strauss, 1988) refers to the work of putting together different tasks and coordinating the consequences of distributed activities (Gerson & Star, 1986; Star & Strauss, 1999). For instance, the articulation work is needed when an existing infrastructure *generates* new infrastructures interconnected with the generative one. Articulation work refers to the division, allocation, coordination, scheduling, meshing, connection of infrastructural activities, and it consists in managing tensions between divergent viewpoints, without silencing any voice[2] (Suchman & Trigg, 1993).

In SPs, "tenants"[3] have an evolving nature and different strategies, competing interests and objectives, discordant languages, specific knowledge and situated histories. This heterogeneity characterizes the identity of a park. Also the diversity of external factors (e.g., politics, industry) influences, for better or for worse, the parks' life. For instance, according to Amirahmadi and Saff (1993, p. 113, my emphasis):

> [policymakers] often see science parks as a panacea for solving a wide range of *divergent* economic, social, and developmental problems. Policymakers hope science parks will cure economic problems by providing employment, generating regional multipliers, promoting exports and foreign investment. They also look to science parks to promote regional equality, upgrade the skills of the local workforce, increase revenue to the university, and perhaps even improve the mental health to those employed in the tranquil surroundings.

Multiplicity and heterogeneity of actors influence their interaction (Bell & Callon, 1994; Bowker & Star, 1999; Hanseth, Monteiro, & Hatling, 1996). Then, to tackle this effect, a process of multiple translations is needed (Bruun & Hukkinen, 2003;

[1] According to Edwards, Jackson, Bowker, and Knobel (2007) the metaphor of "growing" rather than design or building infrastructure enables to capture, in their words, the "sense of an organic unfolding within an existing (and changing) environment (2007, 369).

[2] The capacity for appreciating differences in other's mental habit compared with one's own, and questioning them, is crucial for a hermeneutic approach, as suggested by Cusinato in this book.

[3] This is the term generally referring to organizations and institutions (such as companies, universities, research and development units, foundations and associations) working in different lines of business and fields of science and technology, located in a science park.

Latour, 1987; Law, 1992). The translation can generate ordering effects (Law, 1992) but, basically, it implies a translator, something that is translated and a medium in which that translation is inscribed. In other words, translation is a multifaceted interaction in which actors construct–through the translator's action–common definitions and new meanings, and co-opt each other in the pursuit of individual and collective purposes. This collaborative work can be interpreted as the seedbed for innovation because it enacts a process of *convergence*, that is the production of shared interpretations of things (Callon, 1986).

Convergence measures the extent to which the process of translation leads to agreement. More precisely it is the agreement regarding something genuinely new. However, even though the meanings associated with the word "convergence" refers to a general sense of commonality, uniformity, consensus, integration and homogeneity, convergence is "inextricably ambivalent, linked to distribution and diversity" (Pellegrino, 2008, p. 82). A successful process of translation generates a shared space (*alignment*), while an unsuccessful translation means that the actors are not able to communicate. Through a process of *disalignment* actors reconfigure themselves in separate spaces. A lack of agreement between actors should not be surprising because the convergence is neither obvious nor unproblematic. Conflict characterises the infrastructural life, even though literature often neglects the role of disagreement in innovative processes (Star, Bowker, & Neumann, 2003). Conflict can occur when an infrastructure develops while *bootstrapping* itself (Zittrain, 2006). I use this concept to denote the sociotechnical process according to which an existing infrastructure grows, empowering itself as *innovative milieu* by extending its networks and improving its material structure. Accordingly the infrastructural actors multiply, increasing also the intrinsic heterogeneity of the original infrastructure. For this reason, a working infrastructure needs standardisation because, by standards, different actors can cooperate sharing a common "language" or *modus operandi* (Star & Griesemer, 1989). At the same time, the infrastructure *must be flexible or open* (Hanseth et al., 1996) to different viewpoints (Galison, 1997). The balance between standardization and flexibility should characterise the infrastructural ecology.

4 The Ecological Approach

Looking at SPs as sociotechnical infrastructures allows an understanding of their complexity as *relational spaces*. Complexity is neither predictable nor quantifiable so that it becomes a research challenge.

I faced this challenge in conducting qualitative research–from April 2011 to March 2013–principally based on semi-structured interviews. The research was aimed at analysing SPs as sociotechnical infrastructures. The project involved six Italian parks: the Science and Technology Park Kilometro Rosso (Bergamo), the AREA Science Park (Trieste), the VEGA-Venice Gateway for Science and Technology (Venezia), the Toscana Life Sciences (Siena), the Technology Park of Lodi Cluster (Lodi), and the Technology Park of Navacchio (Pisa). Firstly, I selected

these parks in order to have a representative sample of the Italian scenario (three SPs are cross-thematic, the other three are thematic parks). Furthermore, applying this criteria of representativeness, I selected the SPs according to their shareholding (in this sample, one park is public, another one is private and four have a mixed nature) and I also considered the incubation of University spin-offs[4], as a typical activity of SPs (Carlile, 2004). Then, I defined a set of actors to interview:

- Academic experts on SPs and innovation processes (4)
- The President of the Italian Association of Science and Technology Parks (APSTI) (1)
- Coordinators[5] of three thematic APSTI's Committees (3)
- Professionals of academic Industrial Liaison Offices (5)
- Directors[6] of SPs (6)
- The President of the Italian Network for the Valorisation of University Research (Netval) (1)
- Business Incubator[7] managers (5)
- Founders of the University spin-offs localised into the SPs (10)

In this chapter I present the case-study of VEGA park that, at the time of my research, displayed different organisational features. Then, in preparing my contribution to this book, in July 2013 I came back to the research field in order to interview the architect originally involved in the construction of the VEGA building, and I interviewed again, one year later the first meeting, the founder of Unisky s.r.l which is the unique University spin-off hosted by VEGA. These two additional interviews were motivated by a meaningful change of the VEGA governing body that occurred after the end of my research. So in order to properly discuss the case-study, I took this initiative.

I completely transcribed all interviews. The software Atlas.ti supported the codification of the empirical data, according to the rationale of Grounded Theory (Glaser & Strauss, 1967). The iterative process of moving back and forth between

[4] A standard definition of "University spin-off" can be retrieved in Wikipedia: "University spin-offs transform technological inventions developed from university research that are likely to remain unexploited otherwise" (Wikipedia, 2013b). The number of University spin-offs' founders that I have interviewed at that time corresponds to the total number of spin-off localized into the involved Parks, taking into account one "unattainable" spin-off.

[5] One interviewed Coordinator is also Director of one involved park: I counted this person two times. Overall, there are seven APSTI Committees.

[6] In two cases, I interviewed the Director's spokesperson instead of the Director.

[7] At that time, one park didn't have an internal Incubator. A basic definition of "Business Incubator" or "Incubator" can be retrieved in Wikipedia: "Business incubators are programs designed to support the successful development of entrepreneurial companies through an array of business support resources and services, developed and orchestrated by incubator management and offered both in the incubator and through its network of contacts. Incubators vary in the way they deliver their services, in their organizational structure, and in the types of clients they serve" (Wikipedia, 2013a).

empirical data and emerging analysis made the data progressively more focused and the analysis successively more theoretical (Bryant & Charmaz, 2007). The codification was influenced by my STS background according to Susan Leigh Star's suggestion (2007) to distance yourself as a researcher from a strictly inductive approach, legitimising a more embedded pathway to Grounded Theory. I complemented the interviews with the analysis of documents about SPs, principally retrieved on websites, in magazines, and institutional reports. Web research was particularly useful to reconstruct Michele Vianello's perspective: he was the Director of VEGA till July 2013. Unfortunately, I was not able to interview him, but there is a remarkable amount of documentation on the web about his work as past VEGA Director. Vianello's role has often been publicly criticised in the media, but his work has also been frequently discussed as a positive contribution to the improvement and innovation within VEGA. These secondary sources of information enabled me to better understand the case overall.

5 VEGA-VEnice GAteway for Science and Technology

"Venice Gateway for Science and Technology" is the extended name of the greatest SP of the Veneto region, in Northern Italy. It is particularly interesting to consider this case-study because it enables us to pinpoint past and present troubles related to national SPs.

From a legal viewpoint, VEGA is a company founded in 1993 as part of a European project within the SPRINT Programme (DG12 of the European Commission). Until July 2013, the company was controlled by the Municipality of Venice, the Provincial Administration, the Chamber of Commerce, and also by the agency for regional development "Veneto Innovazione" and Enichem, which is both a State chemical company and the owner of the old industrial plants where VEGA is located. Several private companies and the two Venetian Universities were part of the company as well. However, this private-public partnership drastically changed after July 2013, shaping the recent history of VEGA. The park's site covers about 35 ha and its development involves four areas (Fig. 1).

Until now, the construction of VEGA corresponded to Area 1 (Fig. 2), while the neighbouring Areas 2, 3 and 4 have yet to be completed.

I will present area by area in order to give an overall image of this SP.

AREA 1 (about 9.4 ha) (Fig. 3). The VEGA project was born from the conversion of this first area where, until 1993, the raw materials for the production of chemical fertilizers were produced. Modern buildings have taken the place of the abandoned factories: more than 28,000 mq were built by VEGA with the help of EU funding, European Regional Development Funds, allocated and managed by the Veneto Region. The remaining 35,000 sq m were completed through the intervention of the first private investor: the company Nova Marghera.

AREA 2 (about 8.8 ha). In continuity with Area 1, Area 2–historically known as *Depositi Costieri* (Coastal Deposits) of Agip Petroleum–overlooks an important waterway that leads to the Venetian lagoon. Initially, the soil improvement was

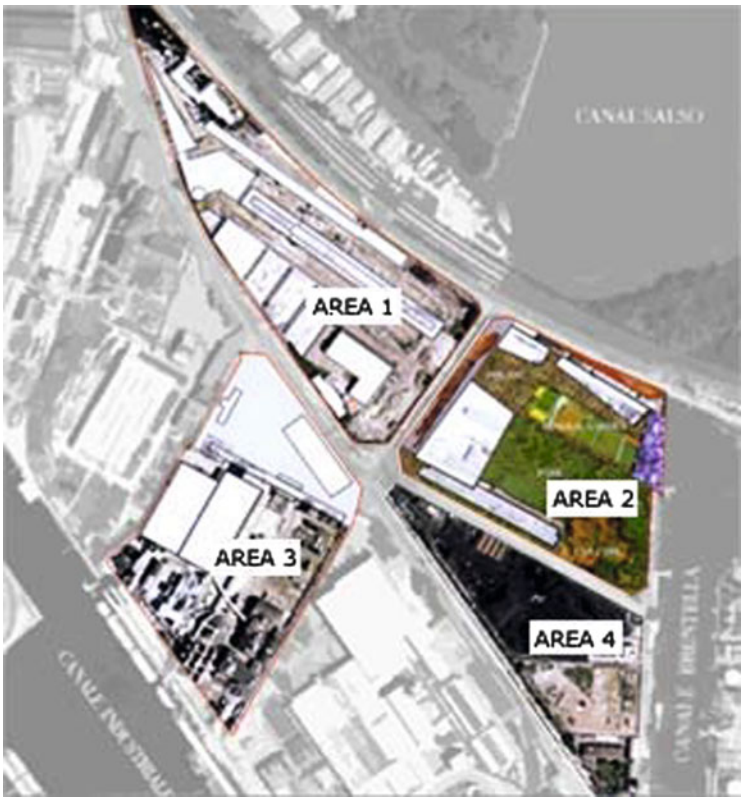

Fig. 1 The four areas of VEGA

carried out by Agip using biological technology. The further development of the area was assigned to VEGA and Condotte Immobiliari Società per Azioni (a private company).

AREA 3 (about 11 ha). It is the continuation of the road joining AREA 1 and AREA 2. It is named *ex-Complessi* ("ex-Compounds") because "complex" fertilizers (NPK—Nitrogen, Phosphorus and Potassium) were produced and stored here. This area is privately owned and is not yet completed.

AREA 4 (about 5.4 ha). This area is not yet developed and–as Area 3–it constitutes a site for the future development of VEGA. The project involves the functional and environmental redevelopment of an area named "ex-Cargo System", originally used as a coal deposit. This area is privately owned.

Historically, VEGA has been oriented by two missions (Bigliardi, Dormio, Nosella, & Petroni, 2006). The first aim is to contribute to the re-industrialization of the old part of the industrial manufacturing area of Porto Marghera, which up to the end of the 80s was one of the most industrialized areas in Europe with over 70,000 workers. This industrial area was populated by petrochemical factories that produced polymers and chemical products for agriculture and mechanical

Fig. 2 VEGA Area 1

components for heavy industry and steel. The second goal is to elicit advanced technology transfer to companies operating in the Province of Venice in order to improve the local technological knowledge. The companies and research laboratories located on the VEGA site–which are start-ups, high-tech companies and other enterprises (among which, one academic spin-off)–work mainly in the Nanotechnology, ICT and Green Economy fields. The description of the four areas and the identification of project's missions enable us to approach the Venetian SP from both a spatial and a relational viewpoint.

Fig. 3 View of VEGA Area 1

5.1 Zoom-in VEGA

In July 2013 I interviewed the architect involved in the original design of VEGA. He mentioned a problematic situation at the beginning of VEGA, sketching a condition of *disalignment* between different actors: the architect and his team, the interacting public and private organizations. Such *disalignment* deeply influenced the development of VEGA. Specific situations occurred, for example, during the construction of an underpass, a footbridge and a support beam.

> [VEGA] began with an international bidding competition [. . .] this bidding competition had to solve two problems: urban problems and architectural problems . . . then, [we could start talking about] the urban problems. We must connect [the park] to the university area in Via Torino (. . .). We had to establish a system of ways, tunnels (. . .). The [available] underpass (. . .) was [and is] owned by ANAS[8] and Ferrovie dello Stato[9]. These two organizations do not communicate with each other. [For this reason] we were running the risk of losing the European funding because we would not be able, at that time, to build the underpass without their active involvement (. . .). Our project envisioned also a footbridge (. . .) leading right in the middle of Via Torino (. . .), and there was another thing: now you see that there's a viaduct passing over the rail and down along Via della Libertà, and you see in the science park's building a big beam [for support] and a big hole. This was not a stylistic choice: the viaduct had to pass through (. . .) and this would have given rise to an extremely interesting circulation system (. . .). All these things were not completed (. . .). During the project realization I encountered many difficulties. The project was not realized with a computer programme, but was drawn in ink, with subsequent consequences: since we had to change it frequently in dialogue with the clients, we could not control the costs (. . .). When you launch a project like this, you need an administrative centre that updates the

[8] Anas is the technical manager of the Italian road and highway network.

[9] State Railways.

> costs in real time. So, in total solitude, the chief engineer of the Civil Engineering Office and I (. . .) removed [several] pieces of the project for the park's architectural design, cutting the related costs . . . If you look at it, the building does not have a piece of thermal insulation (. . .) nowadays, such a building would be unacceptable! (July, 23 2013, Venice)

The architect talked about other prickly situations due to political interests such as the operations of ordnance clearance and environment reclaim. Such interests damaged the development of VEGA. At the origin, it was planned to be a relational place rather than a space merely aimed to host different actors.

In this book (see "A Hermeneutic Approach to the Knowledge Economy" by Augusto Cusinato's), *place* means a space filled up by people, practices, objects, and symbolic representations. Here, the concept of place refers to human practices and interactions and the mutual shaping. A SP works as an *innovative infrastructure* when social and material factors are properly designed to *generate* convergence between actors. Such designs arise from a visionary management able to organise different viewpoints leading them to agreement. Then, the manager should know the available resources and be able to align actors according to a shared vision of innovation. At the managerial level, also the economic sustainability of material structure should be carefully evaluated (e.g., eco-save building) because it could influence the future infrastructural development. In order to further analyse the VEGA history, I give voice to the past Director of VEGA, Michele Vianello, presenting his striking Pandora project.

5.2 The Pandora Project

"Pandora" is the name of the fictional world imagined by James Cameron for his film "Avatar". In this film, Pandora's ecology forms a vast *neural network* into which the indigenous humanoid species can *connect* and *cooperate* to gain shared objectives. The choice to use this name for a new building at VEGA is not a coincidence, as Vianello writes[10]:

> A while ago, VEGA, the Venice science and technology park, still had some spare buildable land available on its site.
>
> So VEGA commissioned its professionals to construct an environmentally sustainable building covered with solar panels, with minimal energy consumption, and with water-recycling capabilities. A whole floor was envisioned as a garden. They scoured the market for the most innovative materials, including nanotechnology components and aerogels. In short, it was to be an environmentally virtuous building with futuristic architecture and components; a zero-emissions building. The result would have been a smart building, if the VEGA people had allowed themselves to be satisfied with the commonplace and gone ahead with the mooted design. But satisfied they were not. They believed that a building can be conceived as a barometer of environmental sustainability, as a living organism. But this dream can be achieved only if *people* and *objects* are allowed to *dialogue* with one another through the internet, if knowledge can be shared and spread, if a building can communicate with other buildings and with the surrounding environment, if an edifice becomes a means

[10] By courtesy of Maggioli Editore and the author, Michele Vianello.

> of displaying data. Their vision was not to settle for the ordinary but to *imagine* a different future, in the form of the Pandora project, a prototype building for intelligent cities. In the process of devising the Pandora design idea and selecting a name for the project, the cultural influence of James Cameron's superb film "Avatar" proved inspirational. As anyone who has seen the film will know, planet Pandora is a unique living organism, for its various different inhabitants interact together organically. The Pandora building is a single brain fed by the data generated by people, plants and things. Hence the idea of a "building-organism". Such a building can be conceived to accommodate a new generation of nomadic workers. Why limit yourself to constructing a building for generic office uses, albeit intelligent ones? This thought led to the idea of a structure where the rooms are unpartitioned—non-rooms—where internet connectivity is ubiquitous, where there are no desks, where shared spaces predominate, where space and time acquire a new dimension. Naturally, a culture imbued with a people-centred concept of work and with the use of social networking pervades the entire building. Thus, the sentiment-analysis data on the satisfaction of "Pandora's inhabitants" can be seen through the flutterings of the little Twitter birds. Above all, Pandora is the place of "flexible interactions" between people and between people and things.
>
> So how did the Pandora concept come about? It arose because the VEGA management decided to depart from convention, because they wanted to dream, to go beyond the obvious, to do something completely different from the surrounding environment, even from the buildings in the science and technology park.
>
> Porto Marghera is a place of rigid, heavy-industrial interactions, a place based on Fordist principles of working, a place where production has a major environmental impact. Porto Marghera is, in the popular sense, the emblem of twentieth-century methods of working and production.
>
> Pandora is the opposite: it is environmental sustainability; it is knowledge networks; it is *flexibility in spatial and human relationships*.

This story is drawn from the Michele Vianello's book titled "Smart Cities" (2013, pp. 112–114, my emphasis). I quote it extensively because this excerpt describes very well Vianello's vision, when he was Director of the VEGA. This project was designed by Vianello and his team with a group of researchers of the Massachusetts Institute of Technology. The smart infrastructure was designed starting from a new idea of work as people-centred, nomadic and socially networked. The Pandora project is, at the same time, a symbol and a developmental plan. Describing the Pandora building, Vianello talks about a new infrastructure *generated* by the existing one (VEGA) where social and material factors converge. In order to enable innovation, the working spaces were imagined as unstructured as much as possible ("non-rooms") and easy-fitting for the tenants. This "building-organism" was technologically advanced and open to social relationships, reflecting the idea of innovation as a dialectical process.

Among the remarkable amount of documents uploaded by Vianello on the web, I found two presentations[11] (http://www.slideshare.net/michelevianello; accessed 19 November 2013) of the Pandora building. It is sketched as a "flexible, light and eco-friendly building, based on an *interactive* architecture"; it is designed as "a creative laboratory, a mobile, changeable and plural space" and "a place that adapts to the characteristics of those who work inside, such as knowledge workers who

[11] "Il VEGA, l'innovazione, il riuso del territorio" and "Pandora un organismo vivente a Marghera".

treat numbers, images, symbols". Pandora is "a place with Internet-based sharing and sales systems" based on "new approaches to support learning, co-working and team working". These characteristics reflect the principal requirements of a generative infrastructure able to enact learning and knowledge processes while bootstrapping itself.

VEGA achieved the authorization to build Pandora in January 2013. However, the necessity to manage a growing economic loss threatened the park's development.

5.3 Coming Back to VEGA

The conversion of the Pandora "dream" into a "living-building" was interrupted because of "heavy economic losses"[12] that daily newspapers[13] attributed to expensive real estate politics. This event compromised the construction of the new building, nullifying the overall effort to innovate VEGA. Networking, technological innovation, environmental sustainability, cooperative work and learning processes were not the exclusive ingredients of Pandora: they appear in many of Vianello's online documents oriented by his vision about innovation.

However, due to the unsustainable financial situation of VEGA, the governing body decided to separate the property management of the park from its innovation management, employing new managers coming from the real estate industry. Michele Vianello disagreed with this politic choice and ultimately resigned. Effects of this change will be understandable in the future, but its symbolic relevance is clear. The separation between the property management and the innovation management is paradoxical, given that the innovation is a process requiring a convergent attention both to social and material dimensions. Seeing VEGA as a mere space (i.e., building) nullifies Vianello's efforts to innovate. Pandora would not have solved the pre-existing problems of VEGA. Even though smart technologies would have contributed to make this place attractive, the development of VEGA as an innovative infrastructure would have required a wider convergence of intentions between strategic entities such as politicians, the governing body of VEGA and the Director. Then, Pandora remained a visionary project aimed to transform the existing material structure of VEGA by generating new sophisticated sociotechnical infrastructures.

At the time of my research, the incubator manager and the founder of the University spin-off talked about the radical changes introduced by Vianello when he become Director. VEGA was previously characterised by its scant attention to

[12] Venice Mayor Giorgio Orsoni's answer about the Michele Vianello's responsibilities (http://consiglio.comune.venezia.it/?pag=risp_1_2437&m=; accessed 19 November 2013).

[13] In general, it is very hard to obtain such information from a park's administration and this is the reason why I have drawn such details from newspapers and other public sources.

the park as a relational place. Vianello's perspective was the reason why the spin-off decided to settle in this park, not elsewhere;

> Park in itself means nothing, of course. Basically, this park has quite a long history, it is the history of a park that has not been a real *system* [. . .] but a real-estate transaction so far. We [. . .] [appreciated] the *change of management* [. . .] What pushed us to settle here was the [Vianello's] new cultural and political model [. . .] strongly anchored to the social dimension [of innovation]. (June, 5 2012, Venice).

One year later, after Vianello's resignation, the same interviewee commented:

> [Current situation is] very different from Michele Vianello's project, that is the creation of a network structure [. . .] And this political and cultural model is in crisis because of an absolute and total reorientation towards a real-estate management. We really are in a dramatic situation. (July, 23 2013, Venice).

This research has taken place during a transition period in the history of VEGA, when the identity of the park seemed to go beyond a linear, closed and idiosyncratic system that is common for Italian SPs. From this point of view, I would stress that the VEGA Incubator–devoted to providing technological and business services to new firms–was built in 2012 by Vianello, 10 years after the park's creation. Vianello's idea of an Incubator was inspired by Google style, giving special attention to leisure spaces and aesthetic aspects (e.g., the colours of the walls) in order to favour knowledge and interaction among people. However, the pre-existing "positivist architecture" (Galison, 1997) of VEGA has limited also the sociotechnical improvement.

The delay of Incubator's development can be interpreted as the sign of an inherited managerial disinvestment in supporting the innovation of tenants. We could debate about how effective technology incubators in parks are, but this would lead out of the subject matter. However, I stress that there is scientific evidence that in Italy on-site incubator firms perform better than off-site incubator firms (Colombo & Delmastro, 2002). At the time of my research, VEGA hosted only *one* academic spin-off. This is a meaningful aspect because it shows the limits of VEGA as a unitary agent and an attractive seedbed for innovation across organisations (i.e., Universities, firms and politics). I do not mean that academic research is better or worse if it is transferred into SPs. I mean that innovation may also follow this trajectory and, if so, it requires a seedbed where it can become entrenched and grow. The late birth of VEGA's incubator and the scant presence of on-site incubator University spin-offs, are two signs of scarce infrastructural generativity.

6 Final Remarks

Literature about innovation processes has paid little attention to the relationships between social and material factors. However the interaction between social and material aspects deserves our attention because it reminds us of the complexity of innovation as a human, organisational and technological process. This complexity,

then, is related to the heterogeneity of actors and interests at stake. Throughout the chapter, I discussed the controversial nature of convergence as a basic accomplishment to produce innovative infrastructure. Furthermore, I stressed that bootstrapping can be a promising strategy in order to enable infrastructural growth, *generating* new related infrastructures. The concepts of bootstrapping and generativity are closely associated with the rationale of large-scale networks that historically are lacking within the ecology of Italian SPs. Conflicting interests and both local and national politics have made the process of convergence particularly frail within the Italian SPs, preventing a seedbed effect.

SPs cannot continue to be mere spaces unable to enact processes of articulation and innovation between tenants and external actors. It is all the more essential that they reinterpret their actual role taking into account the ongoing transformations both at the social and technological levels. Cusinato and Philippopoulos, in the introduction to this book, talk about "the changed epistemologies of collectives", stressing the increasing need of a pragmatic approach to knowledge. Such an approach is based on the capacity to scale up from local to social, recognising and legitimising the hybrid nature of all parties involved in innovative processes. This is a cultural change that could act as a turning point in the history of Italian SPs. SPs are actors within a larger and unpredictable sociomaterial assembly that need to be further analysed.

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