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URBAN PLANNING AND POLICY DESIGN

INNOVATION BEYOND INNOVATION DISTRICTS

ANALYSIS OF PLACE BASED INNOVATION ECOSYSTEMS IN BOSTON AND MILAN

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ABSTRACT

The objectives of this paper are to examine place-based innovation ecosystems in different cases of Boston and Milan, to observe the role of innovation districts in each city context, and the spontaneous spatial nature of innovation beyond planning and policies. The study revealed two opposing practices that follow different paths to success, which are also interpreted individually across the Atlantic. These two geographic areas display a contrasting pattern in the creation of ecosystems centered on macro and micro-location, where drivers, city relationships, final results, and beneficiaries differ. Besides, while a combination of different contextual factors and policies jointly contribute to the growth of this complex environment in building conditions, research has shown the existence of unrecognized dynamics of natural innovation that arise without particular coordination in the city and emerge through spontaneous agglomerations of innovation.

Boston's goal is to become a "host city," which means reproducing the Boston Innovation District model in the rest of the city. This progressive approach promises to reinforce the role of Boston at the global level, but at the same time creates multiple tensions and unintended outcomes at the city and regional level. On the other hand, place-based innovation ecosystems are not yet spatially developed in Milan but scattered as interconnected networks not obvious at first glance. Today, Milan faces the challenge of building an Innovation District that is provoking tensions with existing diffuse networks of innovation but offering new global possibilities at the same time.

Whilst well-developed place-based innovation ecosystems are excellent instruments for contemporary cities, contextual driver assessment, and in-depth analysis is an important step in critically assessing the city's potential and deciding which path to pursue. In this transition, innovation districts can play the role of main positive enablers, but they can, on the other hand, contribute to

multiple unintended consequences. Therefore, there may not be an ultimate way to effectively construct place-based innovation systems, but maybe the only way to do it right is to bear in mind and carefully consider all the various embedded elements that together establish each city's complex nature and unique identity.

Keywords: *Innovation; Place-based; innovation-ecosystem; Innovation district; Spontaneity; Strategic planning; MIND; BID; Boston Innovation District; Triple helix; Innovation policy;*

Gli obiettivi di questo documento sono esaminare gli ecosistemi dell'innovazione basati sul luogo in diversi casi in Boston e a Milano, osservare il ruolo dei distretti dell'innovazione in ogni contesto cittadino e la natura spaziale spontanea dell'innovazione al di là della pianificazione e delle politiche. Lo studio ha rivelato due pratiche opposte che seguono percorsi diversi verso il successo, che sono anche interpretati individualmente attraverso l'Atlantico. Queste due zone geografiche mostrano uno schema contrastante nella creazione di ecosistemi incentrati su macro e micro-localizzazione, dove i fattori trainanti, le relazioni con le città, i risultati finali e i beneficiari differiscono. Inoltre, mentre una combinazione di diversi fattori contestuali e politiche contribuiscono congiuntamente alla crescita di questo ambiente complesso in condizioni edilizie, la ricerca ha dimostrato l'esistenza di dinamiche non riconosciute di innovazione naturale che sorgono senza un particolare coordinamento nella città ed emergono attraverso agglomerati spontanei di innovazione .

L'obiettivo di Boston è di diventare una "città ospitante", il che significa riprodurre il modello del Boston Innovation District nel resto della città. Questo approccio progressivo promette di rafforzare il ruolo di Boston a livello globale, ma allo stesso tempo crea molteplici tensioni e risultati imprevisti a livello cittadino e regionale. D'altra parte, gli ecosistemi dell'innovazione basata sul

luogo non sono ancora sviluppati spazialmente a Milano ma sparsi come reti interconnesse non ovvie a prima vista. Oggi Milano affronta la sfida di costruire un distretto dell'Innovazione che sta provocando tensioni con le reti diffuse di innovazione esistenti ma che offre allo stesso tempo nuove possibilità globali.

Sebbene ecosistemi di innovazione basati sul luogo ben sviluppati siano strumenti eccellenti per le città contemporanee, la valutazione contestuale dei driver e l'analisi approfondita sono un passo importante per valutare criticamente il potenziale della città e decidere quale percorso seguire. In questa transizione, i distretti dell'innovazione possono svolgere il ruolo di principali abilitatori positivi, ma possono, d'altro canto, contribuire a molteplici conseguenze indesiderate. Pertanto, potrebbe non esserci un modo definitivo per costruire efficacemente sistemi di innovazione basati sul luogo, ma forse l'unico modo per farlo nel modo giusto è tenere a mente e considerare attentamente tutti i vari elementi incorporati che insieme stabiliscono la natura complessa di ciascuna città e l'identità unica

Keywords: *Innovazione; Basato sul luogo; ecosistema dell'innovazione; Distretto dell'innovazione; Innovation District, Spontaneità; Pianificazione strategica; MIND; BID; Boston Innovation District; Triple Helix; Politica dell'innovazione;*

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CHAPTER 1. INTRODUCTION

1.1 Methodology

The methodology for this research was two-fold - desk research and case studies. The primary steps of the study was comprehensive analysis of the scientific literature, the evolution and the current research debate around the topic of Innovation and place-based innovation ecosystems. Different theories and practices were studied and reflected in the first chapters that provide contextual background for the further case studies.

The case studies were studied in parallel with two phases. The aim was to examine place-based innovation ecosystems in a broad context, analyse the full image and the other side of the story.

The primary step was a desk research and analysis of different qualitative as well as quantitative materials, official plans, documents, reports and media analysis. The primary intention of this phase was to study similar issues and datas that would be complementary for simultaneous analysis. Moreover, to understand existing local debate and methodological approaches for the similar issues. Desk research was accompanied by site visits first in Milan and in Boston afterwards to understand the user experience, urban context and dynamics of the study objectives as part of the first phase.

The second phase of the case studies was to recognize and interview the main players engaged in the Boston and Milan ecosystem and to research by communicating to the users of the different place-based innovation ecosystems. A qualitative survey was carried out using face-to-face and online interviews and a quantitative survey directed at residents of the vital communities of Boston with an online questionnaire technique. In-depth interviews were focused on data

collection by open-ended and conversational dialogue, as well as on quantitative information, statistics, and numerical data.

In total, 10 in-depth online interviews were held: 5 key actors from Boston and 5 key actors from Milan. Interviewees were identified by relevance with the topic and direct involvement or the decision making role in the processes in both cities. Interviews were recorded and then coded and analyzed with the permission of the quotations to be used in the study.

65 people participated in the quantitative survey of Boston, who volunteered to answer similar questions that enabled further qualitative assessment of the challenges in Boston. The questionnaires contained open-ended answers as well, from which the answers are used as arguments in the thesis (interviewees remain anonymous).

Final conclusions were based on the critical evaluation of the combination of desk research, qualitative and quantitative analysis that was held in Boston and Milan in parallel.

1.2 Quick Guide

The thesis is composed of four main parts where the first part (chapters 2,3,4) is dedicated to contextual analysis, the second (chapter 5) and third (chapter 6) parts study and analyze cases of Boston and Milan, and the final chapter 7 critically evaluates outcomes and discusses conclusions.

Chapter 2 gives a definition of innovation by analyzing the theoretical evolution of the concept, typologies of innovation, innovation policies through time and recent critiques, and alternative framings. Chapter 3 aims to study the general

differences of innovation concepts through the Atlantic, comparing innovation in the USA and Europe. Chapter 4 focuses on place-based macro and micro innovation systems with an important focus on the phenomena of innovation district and its development pathway until today, also the spatial dimension of innovation that often emerges spontaneously. Finally, the chapter concludes with the analysis of possible unintended outcomes of place-based innovation ecosystems that are covered by literature and open the door for the further critical study of the cases of Boston and Milan.

The structure of the case studies (chapters 5 and 6) follows several steps of the storytelling that are constructed in a parallel way but not similarly due to the major differences of the cities. The first step is to analyze the context of the geographic area and study the combination of contextual and intentional drivers, actors as well as the main enablers. The second step is to overview the challenges that arise at the city scale and link them with the topic of innovation. The third step goes deeper into the place-based innovation ecosystems, looks closer at the spatial patterns, and studies the relation of these ecosystems with the city context (or with the larger context). Finally, I focus on specific case studies of innovation districts (Boston Innovation District in Boston and MIND in Milan) and analyze outcomes with the relation of the city and its further steps.

Final chapter 7 is the conclusion of the research which critically summarizes place-based innovation ecosystems in Boston and Milan, the role of innovation districts in each case, existing tensions, and challenges, and provides further remarks and limitations of the study.

CHAPTER 2. INNOVATION

2.1 What Is Innovation?

Innovation has always been an important topic of study for a number of different disciplines, including economics, business, engineering, science, urban planning, and sociology. However, even if the phenomena are studied through various perspectives, the term is often confused with change, invention, or creativity.

There are different opinions and understandings among academics of what the term innovation actually means. While economists, sociologists, or engineers describe the phenomena from a certain point, a generally accepted definition of innovation in science doesn't exist. One of the most commonly used definition, proposed by the New Oxford Dictionary of English (1998) is the following:

"Making changes to something established by introducing something new."

Besides different opinions and understandings of the term innovation, there are debates about how innovation should be measured and assessed. Some authors as (Li 2000), (Elenkov & Manev, 2009) suggest measuring new and improved products as a direct output of innovation. (West et al., 2003) (Akgün et al., 2009) suggest measuring process and method improvement, while (Czarnitzki & Kraft, 2004) talk about innovation's market success suggesting "ratio of innovative product sold in the market to total sales". Speaking of market aspects (Elenkov & Manev, 2009), an indicator of the success of new products on a market is defined, pointing out that the success rate of new products on a market can be very vulnerable and never 100%.

Authors (Jung et al., 2008), (Zahra & Nielsen, 2002) refer to innovation patent applications, while (Makri & Scandura, 2010) suggest measuring the significance of patents in terms of citations for patents. (Drucker, 1992) emphasizes the

importance of social innovation amid the general assumption that innovation is based on topics and precise science and technology, as he argues.

There are many examples of social innovation contributing to positive societal improvements.

2.1.1 Typology Of Innovation

There exists a lot of literature in defining the typologies of innovation. In fact, Innovation is a multidimensional phenomenon (Image 2.1.1).

Incremental - radical

Schumpeter, who may be called the founder of the theory of innovation in the economy generally identified five types of innovation through the Theory of Economic Development (1934). Types vary from radical - Creating still unknown sphere of consumption to an incremental - more efficient method of production that is not associated with scientific discovery, types of innovation. This is the type of innovation approach often adopted through economic perspective and may refer to the comparison of the Innovation approach of the USA and Europe or even at the smaller scale for the innovative approach of certain firms.

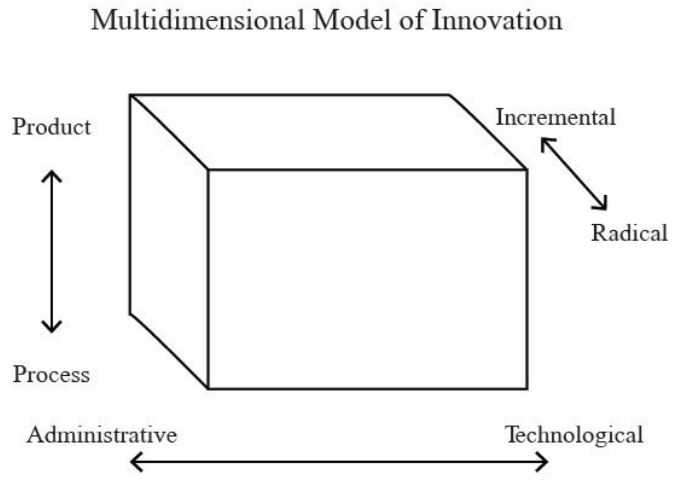


Image 2.1.1 Multidimensional Model Of Innovation,
Source: Rowley J,. Baregheh A,. Smabrock S. 2011 from Cooper, 1998

Technical - administrative

Technical and administrative types of innovations are identified as well as another typology, which makes the distinction between the products/services and the process of innovation. Firstly, technical and administrative innovation have been studied by

Evan in 1966 and are often referred to as the organizational design which better supports the creation, production, and delivery of services or products.

"Technical innovation occurs in the technical system of an organization and is usually related to technology. It can be a new product, or service or process".

"Administrative innovation occurs in the social system of an organization. It pertains to recruitment authority, rewards, and the structuring of tasks or allocation of resources". (Dubouloz, 2012)

Product - process

Another type of innovation is identified as Product and process innovation that are conceptually different (Utterback and Abernathy, 1975; Cohen and Klepper, 1996). Product innovation is focused on satisfying the needs of consumers by developing a new or substantially enhanced product, while process innovation includes operations and supply chain improvements (OECD, 2005). Thus, product innovation enables firms to achieve a competitive advantage by differentiating their products or range of products from the competition (Porter, 1985), whereas with process innovation, firms improve their efficiency. Therefore, product innovations are market-driven, while process innovations are derived by efficiency and product quality considerations (Utterback and Abernathy, 1975; Abernathy, 1978; Damanpour and Gopalakrish- nan, 2001). These are the innovation typologies that often firms choose to adopt and according to the recent evidence they are engaging in both innovation types, creating relationships between the two (Athey and Schmutzler, 1995; Pisano, 1996).

Place

While three major frames of innovation are recognized, place-based/place neutral innovations play considerate roles for urban and social innovation as well, especially concerning spatial planning, and policy implementation on different levels. It works more as a context/scale and a spatial dimension for innovation application than the type of innovation itself as place-based / place neutral

innovations create the ecosystem as a whole. Design-driven innovation, tactical urbanism, or innovation districts could be great examples of place-based innovation while regional or national innovation policies without any focus on certain developed or developing areas mostly work as a place neutral on a certain scale.

Value

Innovation is a process that transforms ideas into outputs, which increases customer value (J.Handen 2014). The importance of value-added to innovation is discussed by Verganti 2016 by describing Value innovation as "a change in parameters customers use to give value to products". Moreover, J.Handen (2014) adds the value dimension to the primary definition of innovation by describing Innovation as "*the process of making changes to something established by introducing something new that adds value to customers*."

Customers in this case are the ones who experience the added value of the product, process, or service or at least have an improved experience. This is the process that leads to growth for the organization/ firm as well. Moreover, innovation can drive value to the environment as well without any direct focus on customers or the organizational profit.

Moreover, the value generated by innovation may not, in all cases, lead to positive effects. It is recognized that technological development could lead to some short-term negative outcomes, such as unemployment in sectors experiencing rapid technical change, but in the long-term everyone will benefit from the creation of new high-quality jobs. That is why Schumpeter saw technological progress as a mechanism of creative destruction.

2.1.2 Defining innovation in general terms

More in general terms, the definition of innovation could be framed as follows:

" Innovation is the process of making changes to something established by introducing something new that generates value."

As a general concept, it does not suggest if innovation should be incremental or radical, or it is exclusively for larger organizations, society, or single entrepreneurs. Nor does it suggest introduced changes are positive or negative and what kind of result they produce or how it can be measured since it's a complex topic free for interpretation.

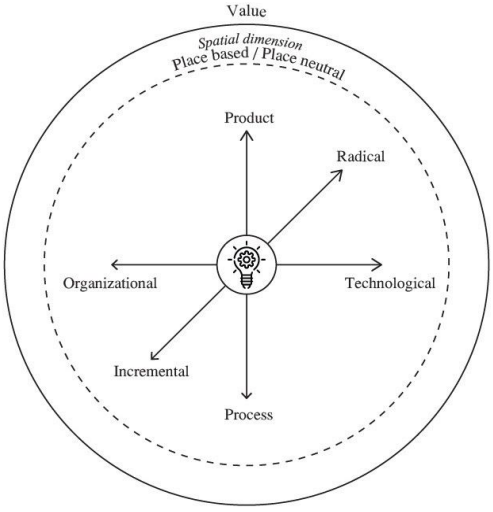


Image 2.1.1 (2) Innovation Diagram

Source: Author

Innovation works at different scales and dimensions considering context and related typologies that could be contrasting or overlapping in some cases (e.g firms could create relations through the process as well as product innovations). The spatial dimension plays a considerable role by creating a context for the innovation to be applied. Overall the process only makes sense if it's directed towards generating value, which could be positive or negative (in a short term). The latter acts as the most crucial dimension of the innovation as it responds to the question of Why a certain action is proceeding (Image 2.1.1 (2)).

2.2 Development Of Innovation Policy And Its Context

The approach towards science, technology, and innovation has been variously understood through the time since it was influenced and shaped by the historical context, ongoing challenges, and future perceptions. According to Schot and Steinmueller (2018), post World War II dynamics of this development can be framed in three categories.

The first framing - Research and Development policy was influenced by the legitimation of the state intervention after WWII and institutionalization of the government support for R&D to guarantee peace and bring industrial benefits. It was reflecting a modernist vision of the inevitability of progress and was directed towards mass production and consumption. However, the model was criticized for its negative externalities of being selective and generating two developed and developing civilizations. Sagasti (1980). The incompleteness of the R&D policy was challenged with the 2nd Framing of National Systems of Innovation due to the increased competition between countries and geographical differences in productive and innovative performance.

Framing 2 - National Systems of Innovation was a reflection of the evidence that geographical areas differ with innovation, especially at the regional level which still continues to be a relevant subject of discussion. The initial model was based on the competitiveness of domestic firms, guided by the "cluster theory" and the concept of "stickiness" of knowledge across geographical spaces, suggesting that knowledge hardly travels outside of the socio-cultural milieu where it's generated. Therefore, interest in National and Regional innovation systems increased, focusing on interrelations between technology, innovation, and location (D'Allura et al, 2012). RIS Approach relies on the literature on the Marshallian Industrial District, Economic Geography, Clusters, and national systems of innovation, and it emphasizes the idea that regions are key drivers of innovation (Asheim et al. 2011).

The Framing 2 was fundamentally revised in the 90s by moving away from the linear understanding of innovation towards more interactive models. A related line of policy was presented through the Triple Helix Model of innovation (Etzkowitz and Leydesdorff (1997), Etzkowitz (1998, 2009), suggesting an increased role of entrepreneurial universities within the government and industry partnership, reconsidering localization effects and potential of proximity to generate positive effects. As a result, governments put efforts to build technopoles, Innovation districts, and science hubs, revitalizing areas with

investments in technology-based companies. 22@ in Barcelona, Silicon Valley, Route 128, Cambridgeshire area of England are considerable examples of this model.

2.3 Critiques And Alternative-framings

Both farming 1 and framing 2 and related frameworks take for granted the idea that investment in R&D and innovations is positive. While the first framing argued how to bring R&D results into the economy, framing 2 aimed to boost the absorptive capacity of entrepreneurs through institutional linkages. The major concerns towards framing 2 arose regarding the fact that the given approach is framing technocratic politics, leading to social exclusion and lack of participatory and open processes (Schot, Steinmueller, 2018), especially for the developing countries and regions. Moreover, discussion about wider participation opened up in debates in Europe and the US since 1970 mostly through the one-way public understanding of the process (Miller, 2001), often suggesting radical alternative approaches such as Interactive Technology Assessment, Participatory Technology design, etc.

It became clear through time that technological change is an uneven process. Therefore, concerns arise if investments in innovation, research, and development reduce inequality and refer to social and environmental issues. One of the starting points of this discussion was the EU's objective to become a smart, sustainable, and inclusive economy by 2020 which was reflected in the Horizon 2020 program. Smart Specialization Strategy (S3) was part of this program, addressing the “inclusive” dimension as a key part of cohesion policy to boost regional innovation and help regions to focus on their strengths. Moreover, while the United Nations (2015) formulated 17 sustainable development goals with the notable focus on a fairer distribution of welfare, greener production, social justice, and new ways of producing economic growth, governments have recognized that they need to address these challenges through innovation objectives.

While the role of inclusiveness and environment here is clear, there is an ongoing scientific discussion of how to revise Frame 2 in order to address current and future challenges or what should be the alternative participatory and open approach that could refer to social and environmental issues.

According to Asheim and Moodysson (2017), Linking S3 with a system innovation policy could be a solution to achieving a smart, sustainable, and inclusive economy in the EU by 2020. In order to expand the RIS approach to accommodate current needs, expanding the RIS framework from a triple-helix model to a quadruple-helix model is suggested by Elias G. Carayannis and David F.J. Campbell in 2009, aiming to include civil-society and non-governmental actors in the process, and revised in 2010 as quintuple helix model including environment as an additional notable subsystem. This framework is elaborating on an increased role of the government for reshaping the market in order to respond to grand societal challenges to achieve mission-oriented innovation policies (Mazzucato, 2009). Interactions through these frameworks could be utilized to define opportunities for the knowledge society and knowledge economy, such as innovation, to address sustainable development, including climate change (Carayannis, Elias G.; Barth, Thorsten D.; Campbell, David F. J, 2012).

While Quadruple and Quintuple helix model frameworks attempt to revise innovation helical framework theory (first developed by Henry Etzkowitz and Loet Leydesdorff 2012), according to some scholars fundamentally alternative approach is needed since Frame1 and Frame2 (and its' revised alternatives) tend to be technocratic that aim to achieve social and environmental issues with top-down regulations through economic growth, productivity improvements and capacity of the elites to regulate externalities.

Departing from previous frames, Schot and Steinmueller (2018) suggest the alternative concept as Transformative change, which has gained importance since

2010 as an experimental approach, aiming to transform socio-technical systems and behavior patterns fundamentally that involves social and urban innovation.

Robinson (2015) - Urban Innovation - *"urban innovation as a break from common practice to develop long-lasting transformations in communities, neighborhoods, and cities."*

European Commission Bureau of European Policy Advisors, BEPA (2011) - Social Innovation - *"social innovations [are] new ideas (products, services, and models) that simultaneously meet social needs (more effectively than alternatives) and create new social relationships or collaborations. They are innovations that are not only good for society but also enhance society's capacity to act."*

Transformative change is discussed as an open-ended process, instead of planned. It suggests generating multiple possibilities instead of delivering blueprints which according to Moroni (2015), can be produced with simple, relational, and negative rules. The need for the anticipation of collateral consequences, experimentation, and network creation suggests new institutional arrangements and governance structures that cut across governments, markets, and civil society. Schot and Steinmueller (2018).

Which kind of approach will be shared towards innovation development depends on the broad socio-economic, political, and cultural context of the geography where it's integrated. National Innovation System policy and its revised frameworks (such as the triple-helix model) still remain relevant in the contemporary world and follow the same trajectory as it initially started in the 70s with Silicon Valley, followed by various forms of entrepreneurial clustering, finding its most common and diffused form of the innovation district in the urban practice which first emerged as 22@ in Barcelona in 2000 and keeps spreading worldwide.

CHAPTER 3. DOES THE INNOVATION CULTURE CHANGE OVER THE ATLANTIC?

(Innovation performance of Europe and the USA)

Innovation involves a complex set of processes that strongly relates to contextual factors (Vieria et al., 2010) and works at different levels (Individual, societal, organizational, national). It may differ within the same country and region through time as well and these differences are even greater between the EU and the USA as they reveal contrasting innovation cultures.

Edward B Taylor (1889) defines culture as "that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society". A closer look at the causes of different innovation performance in the EU and the USA could be explained with disparate innovation cultures across the Atlantic as they have affected innovation policies and their outputs of innovative activities over time and provide a socio-political framework through which innovation occurs in the country/region.

While the USA keeps growing with R&D and innovations, an ongoing trend shows that the EU has left behind not only the USA but also China. There is an innovation gap between the EU and the US as today, of the world's 15 largest digital firms, not one is European. Tsanova and Havenith (2019) identify the current challenges that the EU is facing through "three F-s" - (Funding, Fragmentation, and Frame of mind) as the issues that Europe needs to overcome in order to catch up. Additional elements and examples are elaborated in this framework in order to achieve a more comprehensive picture.

Fragmentation (Geography and spatial ordinance)

EU population density is 3 times higher than in the US. Moreover, the distance between US MSA is greater than EU regions. Partially, due to the geographical conditions, European regions that invest in research and development don't result

in the highest number of patents. In fact, their innovation activities are shaped by interregional knowledge spillovers, enhanced by the greeted proximity and lower distance between EU regions. Overall, the greater innovative outcome of the EU regions is correlated with innovative inputs in neighboring regions. In contrast, the US has naturally directed towards clustering and led to the creation of self-contained innovative areas that rely more on their own innovative inputs than on spillover from other states. US regions are also found more specialized and targeted than the EU regions. (G. Dosi, P. Lierena, 2009).

Fragmentation (Governance and legislative mosaic)

As told by Prescott Bush "The U.S. is not a country, it's a business", where science and technology are broadly embraced. While the US is more flexible for doing business, the EU is full of unnecessary taxes and bureaucracy that act as an obstacle to unified market growth. Moreover, when it comes to R&D and innovation-related investments in the USA, state support is considerably higher than in the EU.

In addition, when it comes to investments in research and development, the fragmentation between EU states is clear as, according to Eurostat, Sweden and Austria spent more than 3 % of GDP on research and development in 2016, while nine countries reported less than 1% of R&D spending. The single market is the key to the EU competitiveness since no European country alone has the critical mass to compete on the global stage. For this reason, startups find it hard to scale up, or if they do they move out of Europe mostly towards the US. The EU is promoting the unification of standards across member states. The abolition of roaming charges in June 2017 was an important step towards the creation of the digital single market in order to address challenges caused by fragmentation of the EU market.

Funding and patient capital

There is a contrasting difference between European and American approaches towards innovations when it comes to capital. In the US, economic and productivity growth has been driven in the last decades by technological developments and investment in intellectual property (patient capital). While, in contrast with the radical innovation approach adopted by the US, European entrepreneurs are lacking access to formidable pools of patient capital that can help them to develop to the next level.

Long-term investments are needed in order to materialize technological benefits, research, and innovation and there are two gaps where funding plays a crucial role. The first is the earliest stage of business development when innovative ideas need financial support to get commercialized. Such investments were 9 times higher in the US compared with the EU in 2015. The second stage refers to the phase when startups scale up. Over 20 times as much was spent on later-stage venture capital investments in the US as compared to the EU in 2015.

Frame of mind

The United States maintains the world's most vibrant innovation culture, where risk and failure are broadly tolerated, inquiry and discussion are encouraged, and experimentation is promoted. Therefore, the American frame of mind towards innovations is more risk-taking. Due to the absence of venture capital in Europe and its limited availability, European entrepreneurs follow the incremental innovation approach and go towards risk-averse Bank lending. As a consequence, EU companies are twice as likely to concentrate on adopting existing innovations, while only 8% are able to introduce new products to their markets. As a result, young businesses are turning to the US, where existing firms are more likely to test innovative products and experiment with new technologies.

Overall, the EU and the USA have clearly contrasting conditions and directions for developing innovations. While a set of natural pre-conditions and a market-oriented economy boost the USA to remain in the top, one way or another, considering the fact that innovation districts remain catalysts for the capitalization of innovations, the EU and USA apply different approaches for addressing social and environmental issues through place-based innovation systems and alternative approaches.

CHAPTER 4. PLACE-BASED INNOVATION ECOSYSTEMS

What do we mean by place-based innovation ecosystem?

A place-based innovation ecosystem is a complex phenomenon that is composed of interconnected networks of micro innovation ecosystems at different levels. These Micro and Macro ecosystems usually reinforce each other which makes the whole territorial system successful (G.Rissola, C.Bevilacqua, B.Monardo, C.Trillo, 2019). Every successful case of this interrelation is strongly related to the context where the ecosystem is being developed. On the other hand, a combination of multiscale policies, initiatives, actors engagement, innovation policy model, etc. together build a conscious driving force that leads the place-based innovation ecosystems in a certain direction.

One of the most commonly investigated spatial representations of the micro innovation ecosystem is an innovation district, which is a place-based strategy often adopted by cities as an enabler of innovation performance. Spatial and conceptual evolution and the transformation of the phenomena had been influenced by different theoretical frameworks. There is an increasing number of different kinds of innovation districts worldwide nowadays. I will try to overview the story behind them and their patterns for further study.

On the other hand, studies often neglect the localized innovation processes as a significant and mostly unrecognized layer of micro-scale analysis which is composed of individuals, communities, small firms and startups, entrepreneurs, freelancers, and other types of self-employed professionals. I will try to overview the spontaneous agglomeration of innovation in the cities afterward as well.

4.1 What are innovation districts and how did they emerge?

In the late 20s, an economic shift to post-Fordism, or knowledge-based economies, began to occur in capitalist countries. Technological innovation in the

knowledge economy is a precondition for higher standards of living and economic prosperity. In large urban centers, technological advances are concentrated, favoring the growth of 'superstar towns' (Edlund, Machado, and Sviatschi 2015; Gyourko, Mayer, and Sinai 2013). As cities leverage the disruptive potential of technological advances in order to become knowledge cities, the idea of an innovation district has arisen. Cities are, indeed, increasingly seen as the main administrative units to stimulate technological innovation (Florida, Adler, and Mellander 2017). The concept of an innovation district is the policy response to the knowledge economy's increasingly spatial and urban aspects (Bevilacqua, Pizzimenti, 2016; Carrillo et al. 2014).

There has been an increasing interest in innovation district phenomena during the last decades as most of the review papers are published 2011 onwards where major of the author affiliations belong to the developed geographic areas such as North America, European and Oceanic regions (Tan Yigitcanlara, Rosemary Adu-McViea, Isil Erolb 2020).

Image 4.1 Global Innovation Districts Map

Source: Global Institute of Innovation Districts

The definition of the innovation-related concept has changed and evolved through time which reflects NIS, RIS, and Triple-helix models rooted strongly in the phenomenon. While these definitions mostly share the technocratic and market-centered approach, some scholars claim that contemporary innovation

districts have changed their nature and adopted open innovation systems with mixed-use and boundary blurred environments. (Van Winden and Carvalho (2016); Jones, (2017).

4.1.1Theoretical framework behind Innovation Districts

The theory of innovation districts has grown from early work on the economic geography of clustering and agglomeration, such as Cooke's notion of the Regional Innovation System, to a recognition that innovation can be linked to specific places and cultures (Cooke, 2001; Katz and Bradley, 2014; Joroff and Frenchman, 2009). The desired output of this clustering is the knowledge exchange that happens when innovation workers interact in these places (Bottazzi and Peri 2007; Sternberg, 2007).

However, Interaction doesn't just happen spontaneously. In order to harness the spillover of knowledge production, one has to create an environment that fosters face-to-face interaction among innovation workers. Von Hippel elaborates on this principle by using the term "sticky information" to refer to the transfer of tacit knowledge and concludes that it is best transmitted through frequent face-to-face interaction (Von Hippel, 1994, Polanyi 1962). These types of chances encounter networking, conversations, social meetings--take place outside the confines of the traditional workplace. They often take place on the street, in building lobbies, in public parks and plazas, at retail establishments and cafes, and in other forms of public space

The idea that clusters of industries engender economic growth is not a new one. Jane Jacobs in The Economy of Cities helped define the concept of knowledge spillover. Jacobs promoted the importance of social interaction through public space—walkable streets, urban density, and parks—and cited random interpersonal contacts as the "small change" of a city's wealth of public life. It may be argued that such interaction also fosters an exchange of knowledge, which in turn produces economic spillovers. Extended to the context of cluster theory, these casual interactions then lead to economic growth.

Michael Porter in The Competitive Advantage of Nations (1990) posits that if one combines companies, suppliers, and service providers within a cluster, the cluster will increase productivity the resulting cost advantage will spur innovation. Porter, Stern, and Delgado published "Clusters and Entrepreneurship" in 2010 sitting data on the presence of clustering and its impact on startups and new business creation (Porter, Stern and Delgado, 2010). They found that clustering in space, or complementary economic activity, helps reduce barriers to entry for new firms. It also found that in the presence of clusters, startup firms have a greater likelihood of survival.

"Dense and interactive connectors, cities are economic and social organizing machines. They bring people and ideas together, providing the platform for them to combine and recombine in myriad ways, spurring both artistic and cultural creativity and technological innovation, entrepreneurship, and economic growth." (Florida, 2012).

Richard Florida's research on the creative class further elaborates on the clustering theory. His research focuses on the benefits of the "creative cluster" to stimulate economic growth. His main thesis is as follows: "Places that succeed in attracting and retaining creative class people prosper; those that fail don't" (Florida, 2002). He recommends an economic development framework that cultivates diversity and invests in lifestyle amenities that are more than quality-of-life amenities, such as nightlife, galleries, performances, and outdoor recreation as opposed to sports arenas and retail malls. Part of his clustering theory is also that technological creativity, economic creativity (entrepreneurship), and artistic and cultural creativity are all interrelated and reinforce each other. While there has been debate over Florida's findings and principles among some sociologists, they have been recognized by many global cities as having validity in practice and their application continues to grow.

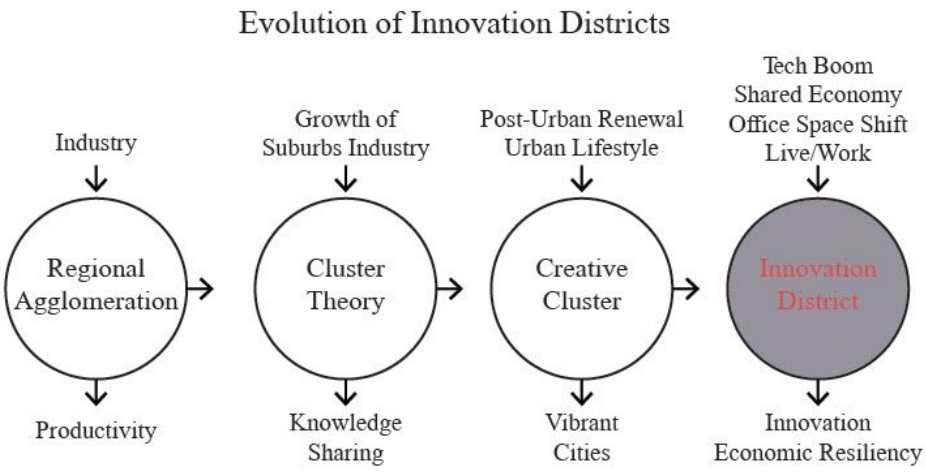


Image 4.1.1 Evolution of Innovation Districts

Source: Alice Brooks Davis, 2010_Elaborated by author

Innovation Districts and creative clusters both encourage the clustering of amenities and view the public realm as an enabler of economic growth. In both cases, the quality of the environment is a factor in attracting high-quality talent and startup firms. However, unlike Floridian creative clusters, innovation districts may not focus on cultural institutions or art galleries as a means of attracting firms. Public realm features that directly relate to skill development and business development as well as the quality of life are typically the priority within innovation districts.

4.1.2 Why do Innovation Districts emerge?

Through a combination of factors, the last decades have proved to be a perfect environment for such innovation districts to emerge as economic development and city-making strategy in many locations. First, demographics show an increase in young people living within downtown cores, fewer of which are married or have families. They are attracted by shorter commutes, more amenities, and walkable neighborhoods. Contrary to mid-century office parks and suburban home development, innovation districts recognize the value in a well-connected public realm that facilitates the collision of people and ideas (Florida, 2014).

Second, jobs were greatly impacted by the Great Recession and city development was impacted. Cities historically competed to draw large anchor corporations that carried the promise of good employment and corporate taxes with them. Although this is still valid, post-recession cities are much more conscious of the risks presented by a lack of economic diversification and are looking to grow their own economic assets, such as talent. Many communities found themselves with a large number of unemployed people within a very short period of time after 2008, real estate developers found themselves without long-term leaseholders, and businesses found themselves with too much rentable square footage. Cities will take action to buffer this degree of impact in the future by welcoming entrepreneurs and small enterprises. “Cities that create and foster a culture of innovation and entrepreneurship will be better positioned for economic recovery, job creation, greater resiliency, and the potential for regional economic transformation” (Hackler, 2012).

Third, the evolution of industrial firm location has left a significant impression on the built environment. During the 20th century, the industry was pushed outside the city, due to health and environmental concerns as well as a need for large parcels of land with highway access. The scars of highways, abandoned railroads, industrial plants, and urban neighborhoods decimated by this transition have been left on the downtowns of many cities in the US and abroad, including Boston, San Francisco, Chicago, and London. Former industrial land is expensive to remediate, complex to entitle, and hard to access. However, this land—up to one-third the total area of many former industrial cities—can also hold immense development opportunities waiting to be unlocked. These locations are where public and private sector collaboration has taken root to attract production back into cities and build better, new kinds of urban places.

At first glance, innovation districts may seem to be yet another fleeting trend in the cycle of urban planning ideology. Today, the word “innovative” seems to be ubiquitous across all industries, leading some researchers to question its significance in any context.“Innovation Districts” may also be understood as a

label for merging public and private realms and adjusting to the new realities of today's workplace. However, a true innovation district is more than putting a banner on a light pole within a mixed-use urban block that contains a startup incubator.

4.1.3 Evolution and definitions of the place-based innovation ecosystem:

Definitions of Innovation-related concepts have changed through time as the understanding of Innovation and its objectives transformed. If by the 2000s, the concept of innovation was rooted in the geography and was directed towards production and competition, relatively recent definitions represent a clear focus on the open innovation system, social benefits, and transformation. These definitions highlight changes that Innovation Policy adopted from Regional Innovation Systems, towards Triple Helix and Finally Quadruple Helix. However, the context of Environment (as an element of Quintuple Helix) or more experimental approaches towards innovation policy are still lacking while defining Innovation Districts and related phenomenons.

Lee (2001) - Innovation Cluster *"Geographic concentration of interconnected companies in a field that encompasses an array of linked industries and entities important to competition, including suppliers of specialized inputs.*

Simmie (2005) - Innovative Milieu - *"Location that concerns an incubation place of new innovation, and characterized by a set of collective and dynamic processes incorporating actors that lead to networks of synergy producing interrelationship."*

Forsyth (2014) - High-technology district - *"High-technology industry cluster that consists of a series of buildings set amidst impeccable landscaping in a campus-like atmosphere."*

Díez-Vial and Fernández-Olmos (2015) - Science and technology park - *"Location that improves local innovation outcomes by promoting knowledge development and transmission among the co-located firms"*

Yigitcanlar et al. (2016) - Knowledge (community) precinct - *"Mixed-use urban settings that include a critical mass of knowledge enterprises and advanced network infrastructures, and developed with the aim of collecting and benefits of blurring the boundaries of living, shopping, recreation, and the working facilities of knowledge community."*

Jones (2017) - Innovation and cultural district - *"District that showcases innovation, research, training, and entrepreneurship as the hub of innovation, cultural creation, and entertainment."*

Esmaeilpour Arabi et al. (2020c) - Innovation district - *"Nexus of knowledge-based development in cities, where public and private actors work towards fostering, attracting, and retaining investment and talent with an aim of revitalizing urban areas, and boosting knowledge and innovation economy activities."*

Montanari & Mizzau (2016) - Innovation districts and hub centers - *are intended as interfaces triggering energies, resources, and opportunities emerging from the territory; in other words, powerful tools able to influence and reshape the urban fabric. They are often referred to as open innovation environments*

4.2 Classification of Innovation Districts

Comprehensive literature analysis done by Yigitcanlar, Tan Adu-McVie, Rosemary Erol, Isil (2020) shows that Innovation Districts have been observed from different perspectives by a number of scholars worldwide. These perspectives often separately recognize particular dimensions of the micro place-based innovation ecosystem through the major classifications grouped by function, feature, and space use. The study shows evidence of how these different features form various environments and contrasting impacts on different levels and scales.

Classification by function:

Functional classification defines three main groups of Innovation Districts, such as 1) High- technology-intensive activity, 2) Creative intensive activity and 3) Knowledge-intensive service activity (KISA). These classifications show significant difference according to Davis et al. (2009), noting that High-technology-Innovation districts are highly extraverted, focused on the global scale, and are directed towards the district-branding, while creative-intensive innovation districts succeed better in contributing on a local scale by focusing towards local and regional customers and showing a higher number of member companies with stronger identity compared to the high-technology innovation districts.

Classification by feature:

Classification by feature is the most common practice for observing innovation districts (e.g., Feldman, 2014; Kaigorodov and Bordianu, 2014). There are mainly four features identified: 1) Economic 2) Physical 3) Operational and 4) Social features

In this classification, R&D capital investment, productivity, patterns, etc. are used as indicators for analyzing economic features, while the proximity of actors is considered as an important element for the physical aspect, which varies in space with its different spatial dimensions. The property/activities management model is mostly determined at the planning stage and is mostly supported by the state/local governments (directly or indirectly). Finally, social capital and networking across innovation districts are recognized as the core of the innovation process (Montresor and Marzetti (2008).

Classification by space-use:

Space use is the classification mostly relating to the placemaking issues and environment inside of the Innovation District as well as relationships with surrounding areas. It mainly focuses on 1) location choices, spatial design, and

configuration of innovation districts concerning open or close innovation systems, scale, and land use 2) Natural environments and unique surroundings of innovation districts (including both the natural and built environment in and around and 3) Governance model that is determined during the concept stage.

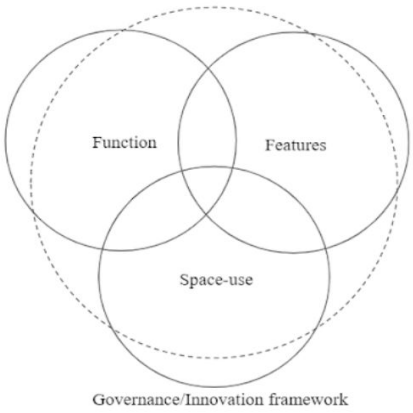


Image 4.2 Innovation District Evaluation Model

Source: Author

Unlike the classic Innovation Districts - such as science and technology parks, recent examples aim to become networked spaces, adopting an open district innovation system model (Chesbrough, 2006) that enables the involvement of various other activities and areas into the new dynamic where open architectural and urban design encourages collaborative and cooperative innovation (Yun et al.'s, 2018).

Finally, the most popular governance model remains the triple helix model as well as a double helix model known as a public-private partnership. There is rare evidence of implementing Quadruple or Quintuple helix models or the Transformative innovation approach in the development of innovation districts. To understand the complex and multilayered nature of the innovation district, the full image needs to be investigated within its context -interrelation of different aspects of classification and effects on multiple scales through various governance and management models (Image 4.2).

4.3 Spontaneous Agglomeration Of Innovation

While most of the Innovation Districts are highly planned mixed-use developments, there are some districts that emerged from spontaneous agglomeration and later got included in planned developments, for example, Monash National Employment and Innovation Cluster - in the peripheries of

Melbourne, Australia. There are different cases worldwide when entrepreneurial activities occupy districts close to the downtown areas of the cities, even when there are established and recognized place-based innovation systems in place, for example in Boston.

These patterns and matrixes behind spontaneous agglomeration of innovation are not fully studied or recognized as innovation districts. Moreover, these clusters represent not a permanent but a constantly changing natural phenomena that emerges, moves or transforms without any particular coordination. It's also not fully clear what are the key elements that create spontaneous agglomeration of innovation but based on the existing literature analysis, I will try to define certain elements for the further analysis.

The research work held mostly at the beginning of the 2000s by Amin & Cohendet, (2004); Saxenian, (1994), Coe & Brunnell, (2003); have contributed to underlining the importance of knowledge communities by contextualizing them into geography. However, how these communities and individuals participate in localized innovative dynamics is still ambiguous.

As Ignasi Capdevila, (2014) summarized in his study "Coworking Spaces and the Localized Dynamics of Innovation. The Case of Barcelona",

"Coworking Spaces contribute to the dynamics of innovation at different levels. First, at the individual level, members of CWS help each other and collaborate to advance in their professional activity. Second, at the community level, CWS represents specialized innovation communities that combine exploration and exploitation. As we have shown, in some cases these communities are able to compete with firms by coordinating heterogeneous knowledge bases. Third, at the firm level, the results of the explorative practices that take place in CWS can represent an external source of inspiration, ideas, and talent for organizations. Fourth, at the local level of the district or city, CWS are platforms that bring together distributed knowledge around specific themes. CWS can also contribute to integrating citizenship in collective innovation processes and acting as an

intermediary in top-down and bottom-up innovative initiatives. Fifth, at the global level, CWS hosts events that can represent "temporary clusters" where external actors can participate, sharing external knowledge and dynamizing the "local buzz". CWS also welcomes foreign workers, facilitating their professional and social integration in the local environment while offering local actors opportunities to get in contact with an external source of knowledge."

Besides, as a contribution to the study of Coworking Spaces, Ilaria Mariotti, Carolina Pacchi & Stefano Di Vita (2017) investigated location patterns of CWS in Milan which led to identifying three key elements that influence spatial trends of these spaces: *"the high density of business activities, that is a proxy of urbanization and localization economies, as well as the market size and potential; the proximity to universities and research centers, that is a proxy for a skilled labor force's availability and business opportunities; the presence of a good local public transport network, that is a proxy of the degree of accessibility (Mariotti, 2015). "*

These elements are necessary for further study as I assume that one of the important composing elements of spontaneous agglomeration of place-based micro innovation ecosystems within the city are coworking spaces and flexible workspaces that are usually followed by small firms, startups, entrepreneurs, and freelancers with similar lifestyles, while proximity to the center makes the areas accessible and livable. Coworking spaces usually don't have the capacity to redevelop large areas but are targeted to existing resources available within the urbanized areas. Identifying these spots in the city may lead to the identification of naturally developed unrecognized innovation systems as localized layers of innovative dynamics. However, obviously, this does not mean that the presence of coworking spaces mean the presence of innovative dynamics.

4.4 Place-based Micro-innovation Ecosystem Developments And Unintended Outcomes

Innovation districts are one of the most common representations of planned place-based micro-innovation ecosystems that represent strategic resources for the city as mentioned before. The approach to fostering innovation by placing new and existing businesses close to anchor institutions such as research-oriented colleges and hospitals has been around long enough to enter the economic development jargon, yet many communities continue to elude the 'recipe' for creating a flourishing district of innovation.

Typically, ID-s chose undeveloped areas or brownfields close to the city to insert new functions. However, as those kinds of developments require a large number of investments which cities usually are unable to fund, public-private development is the most common partnership to build Innovation Districts that often end up with some unintended outcomes that research and practice highlight.

First of all, from a strategic perspective, Innovation Districts create a large room for profit and investment for the city. Therefore, developers usually receive strong direct and indirect support from the city government regarding the building permission, taxes, increased built-up areas, or additional surrounding infrastructure that might be needed (ex: Big-dig project in Boston). On the other hand, there is a high risk for those areas to become real estate speculation at the end or to be developed differently from what was intended (ex: Bicocca in Milan).

From a spatial perspective, there are several place-based dilemmas identified by different scholars. These issues relate to the Innovation District and surrounding areas at the urban scale. However, quality of place is not just an issue related to the district but something that creates an image of the area that afterward attracts international talent. Julie Wagner (2019) summarises three place-based dilemmas as they are:

The disconnect dilemma – Lack of a common vision around focused expertise or sector by district stakeholders, including business leaders, property owners, developers, etc.

The dead zone dilemma – Development that produces large footprints or removes historic buildings, thereby reducing the area's character

The divide dilemma – Stark borders institutional properties with the rest of the district's enterprises, assets, and facilities that feel like obstacles.

Catherine S. Renault and Christa O. Franzi (2019) have recognized “One more Place-based Dilemma for Innovation Districts as a sense of place dilemma, which represents a human-experience of a place, the feeling or perception by people who engage with the place in various ways. With the further elaboration of this dilemma more in detail, privately owned public spaces and large plot developments often limit spontaneity and activities that exclude certain social groups. Moreover, it often constrains the needs of the people to be producers not only consumers of the place.

There are two other socio-economic issues identified through this research that are part of a broad debate. These issues are gentrification and segregation which are often inevitable impacts if the emergence of new developments is not coupled with strong measurements. Moreover, these effects differ from the typical large scale development cases as Innovation Districts usually attract certain dynamics and groups of people of particular needs and interests.

Gentrification - Inevitable impacts on surrounding areas, especially on the deprived neighborhoods Innovation districts can be generated through market forces or through public interventions using conceptual elements from knowledge-based urban development (KBUD) (Morisson 2014; Pancholi, Yigitcanlar, and Guaralda 2015).

Market-driven innovation districts have proved to contribute greatly to gentrification (Mirabal 2009), one of the most noticeable effects of developing a competitive information economy at the urban level (Florida 2017; Mirabal 2009; Stehlin 2016). Some theorists and practitioners, however, also argue that innovation districts do not always contribute to gentrification, especially when they are linked to appropriate policies. Arnault Morisson and Carmelina Bevilacqua (2018) argue, based on the case of Chattanooga, that the negative externalities of the knowledge economy have been limited by the implementation of strategies in three main categories: socio-economic, urban, and housing. It's true that supporting strategies might differ according to the context. However, a combination of different approaches and multiscale interventions play a significant role in the further scenario of the city where the Innovation district is being developed.

Polarization of lower-income or ethnic groups is one of the common issues for developed cities. On the other hand, many innovation districts choose certain specializations or niches. These two factors together raise the threats of increasing boundaries of different groups as well as pushing the place-based innovation ecosystem to become an innovation enclave instead of an organic part of the city. Another interesting thing about this issue is that the risks of segregation are highly connected to the type of innovation district. According to R.Florida (2017), *"Rather than being associated with patenting activity in general, economic segregation is tied to just a few knowledge-based high-tech industries, the researchers found. These include fields such as information technology, electronics, pharmaceuticals and medicine, and chemicals, which often require the most specialized and highly educated workers. By contrast, less knowledge-intensive industries, like textiles, are negatively associated with economic segregation. The rise in economic segregation is fundamentally connected to the growing concentration of knowledge-based industries and occupations in cities"*.

Finally, there are effects on multiple levels on place-based innovation environments and there is no certain recipe for how to do it correctly. Factors such as a wider regional or national context, governance, city capability, existing innovation ecosystems or urban networks, etc., play an important role in the development of site-based innovation ecosystems, which are complex phenomena that are sufficient to literally decipher them.

CHAPTER 5. MASSACHUSETTS “MIRACLE”

5.1 Route 128 In Context

Image 5.1 West Or East?

Source: Anonymus Artist

When we think about technologies in the USA, we think about Silicon Valley nowadays - the South of San Francisco that has become the world’s tech hub. However, long before Silicon Valley, when hi-tech was still in its adolescence, there was another hub that enabled the framework for today’s Silicon Valley world but only from the East coast. The East Coast, West Coast “battle” started a long time ago in tech, and just like in hip hop, the east coast significantly ruled for a long time.

Massachusetts has a long-standing tradition of creativity in technology. The state is a birthplace of numerous industries, and perhaps it’d be fair to say that the American industrial revolution started from Massachusetts itself. Moreover, originally it’s one of the American colonies that make the area embedded in the broader context of American history.

Being one of the oldest cities in the country, Boston was an intuitive choice for the capital of what was originally known as the Massachusetts Bay Colony. By entering areas that previously used to have their own cultures, societies, and dynamics in the past, the city of Boston began to extend its administrative city limits in 1804 including South Boston, East Boston, Washington Village, Roxbury, Dorchester, West Roxbury, and Hyde Park. Moreover, much of the coastline of Boston is man-made land that began in 1630, such as Back Bay,

South Boston, Mill Pond, South Bay, and Logan Airport's most notable land reclamations which represent relative technological advancement of the area back since the 17th century as well as the need for expansion (Image 5.1 (2)).

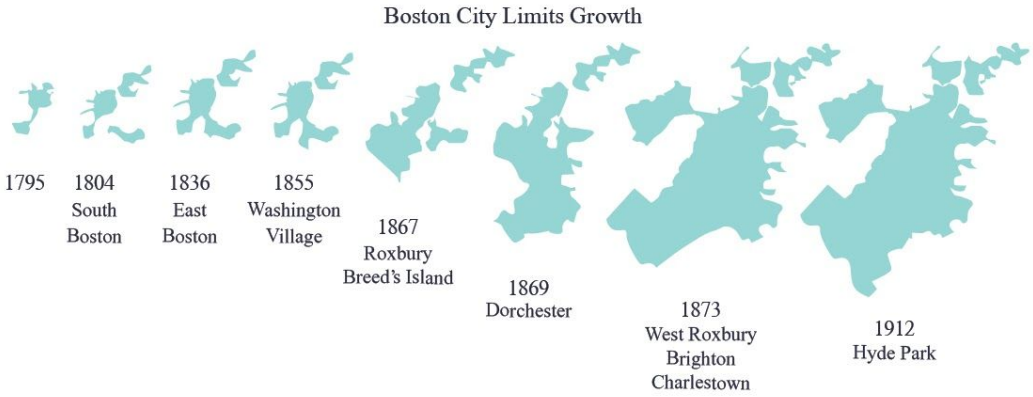


Image 5.1(2) Boston City Limits

Source:www.kesmith.blogs.wm.edu20150423immigration-elabrated by author.

The Boston area started to significantly take off in the early 1900s, when many scientists, inventors, and investors were focusing on the new field of electrical sciences which was mostly triggered by the presence of Harvard and MIT research Labs and technologies. However, WW2 was a boost to leverage academic and research infrastructure for national defense. The area became the base for microwave research for radar. This thesis resulted in the first functional digital computer and sowed the early seeds of the U.S. computer industry.

The Route 128 Highway was constructed around Boston after World War II, providing transport infrastructure to support the coming economic development. Expressway was opened in 1951 and provided a way for Boston traffic to be circumvented by drivers. It quickly grew into the first high-tech corridor in the country and became a destination rather than just a bypass. At this time, the economy of the area was going through a profound transition. Outsourced to areas rich in energy resources and cheaper labor were light industry, clothes, leather, and machinery.

Realizing that the corridor of Route 128 would be a great location for rising businesses to locate, real estate developers started constructing the first modern industrial parks. The parks were close to university labs and to each other, in addition to being inexpensive and readily accessible by car. The solid research capabilities of the Massachusetts Institute of Technology and Harvard attracted new industries and R&D bases to settle in their vicinity. In addition to open space and inexpensive land, the areas along Route 128 had a wide pool of unemployed workers with technical skills left behind with conventional industries migrating. A critical mass of scholars, entrepreneurs, and investors soon existed.

Route 128 (Image 5.1(3)) attracted a total of nearly $100 million in capital spending between 1950 and 1957. There were 53 companies along Route 128 in 1955. In the 1960s, rapid development ensued, by which time the Route 128 corridor became one of the major technology centers of the country.

Image 5.1(3) Route 128, Boston, MA

Source:httpsez.analog.combengineering-mindpoststhe-road-to-nowhere

Boston was in decline, however, from the end of World War II until the 1970s and the industry stagnated coupled with white flight and financial crisis.
The cluster effects of the high-tech sectors along Route 128 started to gradually manifest themselves in the 1970s. 225,000 new manufacturing jobs were produced between 1975 and 1980, mainly in high-technology industries. Boston became the epicenter of the minicomputer revolution at this time. New local tech giants were generated by the rapid growth in commercial demand for minicomputers. This growth has also produced numerous spinoffs that have helped solidify the local economy's transition from its manufacturing base.

Successful post-industrial shift

Minicomputer research and development have fueled such growth in the state economy that the “Massachusetts Miracle” was referred to by the media and politicians. Boston bombed, bucking the national recession of the early 1980s on the back of increased Cold War investment, the emergence of new financial services, and the emerging importance of technology, as the region shifted further away from its traditional dependency on heavy industry. A movement towards the development of new knowledge-intensive industries in Boston started with the growth of microcomputer manufacturing. By 1990, over 3,000 high-technology companies were in Massachusetts. Boston instantly became "the refuge of an entrepreneur where 39 new companies span from one big electronics corporation in one event."

In the early 1990s, the early 1990s recession impacted Massachusetts, like much of the North East, even more seriously than the nation as a whole. However, Massachusetts recovered from the recession, faster than the rest of the North East, aided by the 1990s national tech-boom. The innovation economy in the Boston area expanded and diversified from 1990 to 2000, with job growth of 313,000 shared across virtually every major industry. The unemployment rate dropped below 3 percent by the end of the decade and the population of the city was rising again.

However, as the area's technology industries suffered during the worldwide recession from 2000 to 2003, the city was about to receive a further blow, with technology manufacturing in the region taking a particular hit.

But this time, the diversity of the economy of the region at this point meant that, during the late 1980s, it did not replicate the negative effects of its dependency on three major industries. Recently, the state's high-tech sector has recovered with the creation of new fields of technology, especially software, biotechnology, and

fiber optics. In the entire country, what constitutes' high tech 'has become more diverse. Biotechnology, pharmaceuticals, and medical equipment-related research, development, and production have evolved. Corporations affiliated with the Internet are also well represented. The area remains, crucially, an important and active source of innovation and start-ups.

5.2 Boston Area And Its Innovation Ecosystem

5.2.1 What do we mean by Boston's innovation ecosystem?

"Boston area" could be defined in many ways, especially while referring to the innovation ecosystem that emerged here. The city of Boston represents just one of the elements of the existing complex ecosystem nowadays. Moreover, the innovation ecosystem in Boston is a phenomenon that goes beyond the administrative borders of Boston itself. This is because of the existing governance structure and clear jurisdiction and boundaries between Boston and surrounding cities, that despite being independent entities, also strongly share cognitive, human, and academic resources.

On the other hand, Massachusetts itself is a large area that contributes significantly at the state level but not all its composing areas are involved directly in creating place-based innovation systems. In the context of innovation in the Boston area, I particularly refer to the core of the Route 128 geography, with highly interconnected drivers of Boston and Cambridge, as well as Somerville. Moreover, understanding the complexity of a legislative arrangement on different levels sheds a light better on the role of the Route 128 area and its main composing elements in a broader context.

Governance

No American state or place is plain, but one of the most complicated political and

political structures in the nation is Massachusetts and Greater Boston. Fragmentation is the most distinctive trait of state and local governments in the United States. Massachusetts and Greater Boston are fragmented even more than other states and regions because of the legacies of the Bay State's long history. In Massachusetts and the rest of New England, the process of town-building and governance was especially intense which placed control of the whole range of issues into the hands of ordinary citizens. Communities that adopted representative forms of government also guarded their prerogative jealousy (C. Euchner, A.Flint, 2002).

There are two major levels of government that play a role in creating an innovation ecosystem. One is at the state level which not only establishes the basic parameters for local governance but also serves as the de-facto structure of regional governance, state is also a level where significant direct or indirect findings are being articulated for R&D, organizational funding, subsidies, etc. The state acts, in essence, as the general-purpose regional government on issues like housing, the environment, and economic development. Several organizations are presented as mediators at the state level, one of them is a Massachusetts Biotechnology industry council which for instance, was strongly involved in Kendall Square, by receiving state funding to help with grants specifically in the life science industry for startups to get support. Moreover, there is no formal regional planning body that ensures the link between existing cities with each other and with the regional strategy except organizations. However, these organizations don't have a function of coordinating regional strategy which is a historic problem since all the planning process in Boston is local which creates a legislative as well as informal "gap" between Boston and surrounding cities.

For the citizens of Massachusetts, the state government sets broad policies, but the local government (city or town government) remains the focus of the daily lives of most people. "Local government still provides the vast majority of public services that people use or rely on every day, notwithstanding the influence of the

state governor, legislature, and judiciary, and fulfills the essential planning and development regulatory roles that directly affect the quality of community life," Mathew MacIver, a long-time observer of local politics, writes.

However, when it comes to the drivers of the innovation ecosystem and their independent legislative competences, the situation becomes trickier. *"Major way that the cities benefit from real estate development is real estate property taxes. Boston, Cambridge, and Somerville are competing for a development that belongs to the same innovation ecosystem. Mayors know each other and try not to compete directly. Unlike other parts of the country where governments' involvement in creating innovation districts is by discounting real estate taxes (for example in Detroit where the tax reduction is significant), we don't have a competition right now that Boston and Cambridge try to reduce real estate taxes in order to attract these companies and developers."* - Mentioned Kairos Shen in the interview.

5.2.2 Key actors and their interrelation

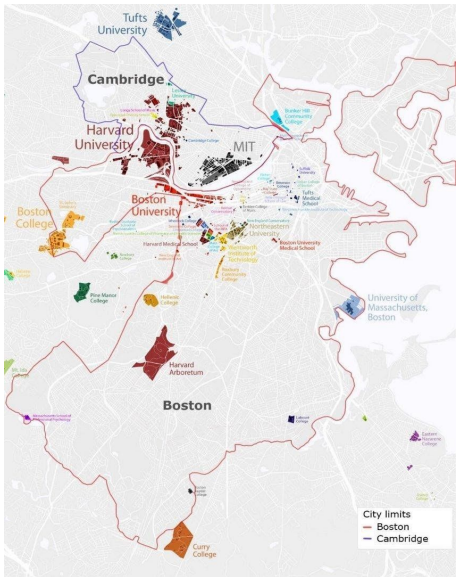
There is no single document or authority that gives Boston and surrounding areas a comprehensive planning vision as they are closely linked with each other and function as complementary elements. However, interaction happens between state authorities and institutions, or organizations while city governments are responsible for the local visions and strategies. Therefore, there are different players presented in the Boston-Cambridge-Somerville area that contrast as well as complement each other. I will try to focus on key players that act as drivers for the innovation ecosystem in the Route 128 core.

Universities and research institutions

As mentioned before, one of the main reasons for the Route128 area's success was the presence of top universities in the area and the resources that these

academic institutions generated. (5.2(2)) The role of universities (particularly anchor universities) in the Boston area remains prominent, especially when it comes to innovation as the institutions not only contribute with their scientific resources but financial investments as well.

Part of the legacy of education in Boston starts with the fact that it is home to the United States' oldest college. In 1638, less than a decade after the city's official beginnings, Harvard University was established. Harvard's mission from its inception has been to educate the world's next leaders and provide a high standard of education. For the rest of the Boston schools, this theme seemed to establish a precedent. To this day, in the Boston area, some of the top-rated universities are, including the unofficial 'Brainpower Triangle' consisting of Harvard, Massachusetts Institute of Technology, established in 1861, and Tufts University, founded in 1852. MIT, situated in Cambridge, represents one of the main drivers for generating scientific products, highly trained knowledge workers, and research in different fields but particularly in life science, engineering, and Information technologies where Boston is mostly specialized in. Operating income for MIT amounted to over $3.9 billion in 2019, with significant portions coming from research, acquisition, and tuition. In developing Kendall Square and generating an open innovation ecosystem composed of leading professionals, MIT has made a huge contribution.



Boston is most commonly referred to as a medical center, and some of the top-ranking colleges in the area are affiliated with most hospitals. Being connected to some of the oldest (and best-funded) schools means that Boston's medical institutions have the funding to devote time and money to fields of study that might be lacking in other cities.

Image 5.2 (2) Universities in Boston Area
Source:www.en.wikipedia.orgwikiFileBoston_area_college_town_map

The medical profession is not restricted to the imagination. In the fields of climate change, computer science, and engineering, schools such as MIT and the Wentworth Institute of Technology constantly conduct cutting-edge research, to name a few. This type of research ensures that Boston is also a friendly place for start-ups and well-established companies such as Microsoft and GE. Furthermore, the wish of the city is for students from Boston to stay here, which helps fuel this loop.

There are a total of 45 higher education institutions in the designated region, including six junior colleges, 11 colleges mainly awarding bachelor's and master's degrees, 8 research universities, and 20 special-focus institutions. Of these, 44 are non-profit organizations, one is a profit-making corporation, and 40 are private entities, while five are public institutions (four are managed by the City of Quincy and four by the State of Massachusetts).

Governments and organizations

The role of city governments in Boston, Cambridge, and Somerville is different, especially when it comes to involvement and funding. There are almost no direct subsidies available from the city governments but larger organizations or the state level that distribute funding for different sectors or priorities. An example of this collaboration is the Somerville subsidy program for attracting startups who need funds, that was organized in collaboration with Greentown Labs, the Northeast Advanced Manufacturing Consortium, and the Massachusetts Manufacturing Extension Partnership (MassMEP), through which the city of Somerville invites business owners involved in the creation of physical products to take part in the “Engineers-in-Residence” (EIR) program. One of the examples of organizations that operate at the state level is MassTech collaborative that helps to identify existing threats or opportunities for Massachusetts. Moreover, the vision and outcomes of these organizations and the city scale documents go hand in hand

with each other in most cases as they all address the issues that are prominent on different levels.

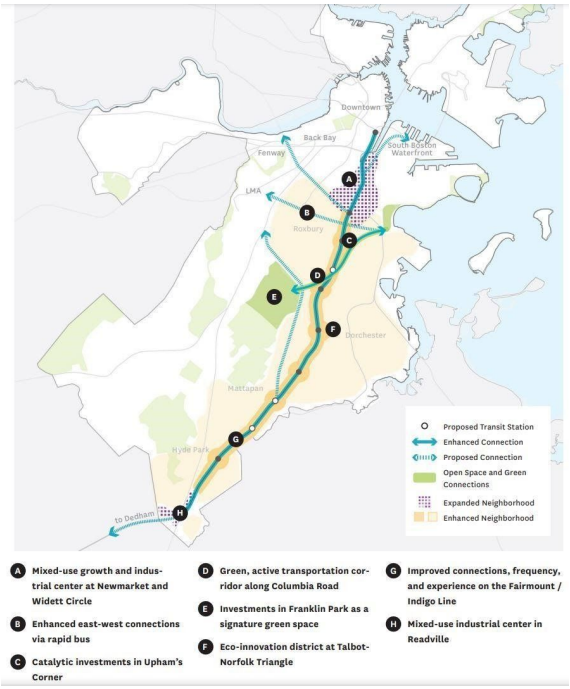


Image 5.2 (3) "Imagine Boston 2030"
Source: "Imagine Boston 2030"

One of the significant contributions of the Boston city government in the planning process was a communicative planning document "Imagine Boston 2030", published in 2017 that represents the first citywide plan of the city of Boston in 50 years providing a structure to maintain and develop Boston. As a result, five main priorities have been identified with the strategic areas for intervention and further growth possibilities. The most significant aspect of this project is that it represents the city's vision for the next 10 years keeping in mind the most crucial issues that the city is facing nowadays, which are - affordability, displacement, inclusion, segregation, etc. These issues (mainly related to the lower-middle-income ethnic groups, but also the overall city dynamics) truly are significant challenges for Boston as due to the booming innovative activities certain groups of people are being left out or even forced to move out from Boston which will be discussed afterward more in detail.

In order to achieve these goals, more than 15,000 citizen voices have expressed the issues facing Boston, set priorities for the city in 2030, and generated ideas about policies and investments. However, the absence of coordination between Boston and surrounding cities is clearly shown on the plans and schemes presented in the "Imagine Boston 2030" with no considerations of any connection at the urban or the city level.

Different engagements of actors are clearer while we look at the innovation districts in Boston and Cambridge. The example of the city government intervention here (concerning Boston Innovation District) usually was to initiate the concept of Innovation District and assist developers with permitting process and providing infrastructure which was different from Kendall Square and Longwood medical area where host institutions invested to help build an innovation ecosystem which emerged more organically.

MONUM - the "front door" to the city

While the city government contributes to providing services, programs, and initiatives, The Mayor's Office of New Urban Mechanics (MONUM) was created by the local government in 2010 in order to support civic engagement in the city of Boston and an entrepreneurial approach to local governance. It was one of the initiatives of Mayor Thomas Menino and acts as a Research and Development Lab of the city. Even though it's a public office, it serves as a typical entrepreneurial actor building partnerships through quadruple helix - a partnership with start-ups and higher educational institutions with the social groups.

"We serve as a city R&D lab with a focus on exploring new things, then going out for prototyping and testing them, and then scaling things up that work and learn from the things that don't work and going back to the process. We are often paired with different city departments to our service that might need our support, we often work with colleges and universities sometimes with researchers, we work with startups and businesses too, but the idea is to be a front door for the people who want to partner with the city."-Mentioned Kristopher Carter during the interview.

Urban Mechanics includes a set of interests such as civic engagement, racial equity, city infrastructure, and education, including housing, transport, public

spaces, cultural and social resilience. The office acts as a non-traditional city department by experimental approach towards the working process and being able to take risks, develop small prototypes that have a potential to scale up and be tested within the city e.g launching an app that encourages safer driving by nudging drivers for better driving habits, offering affordable housing to graduate students, helping older adults stay in their homes by pairing them as roommates or launching an app - "Citizens Connect" through which people take pictures of what needs to be fixed and send it to the Public Works Department. The philosophy of MONUM is people-centered and remains quite a unique experiment that is gaining interest to be replicated by developing similar offices worldwide.

Venture Cafe and innovation studios

Venture Cafe is one of the few organizations that link Boston and Cambridge through the united ecosystem. It was founded by MIT graduate Tim Raw in 2010 as a social experiment and finally turned into an international brand of start-up network creator. *"Multiple events and programming is happening here, there are different approaches to achieve our goal which is to ensure that there's equal access to the resources"* - Mentioned Kevin Wiant in the interview.

Venture cafe operates several innovation centers in the Boston-Cambridge area which got rebranded in September 2020 as Innovation Studio as it supports the movement of social equality. However, Venture Cafe itself remains its position at the international level.

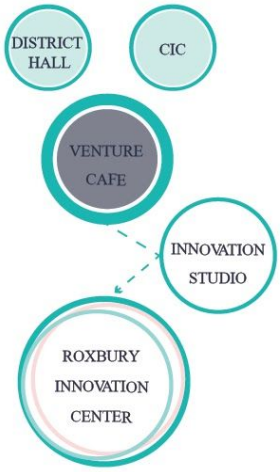


Image 5.2 (4) Innovation Studio
Source: Author

Innovation Studio has several locations in New England, which are Roxbury, Providence, Boston, and Cambridge Through the network of spaces within Venture Café Cambridge, District Hall Boston, Roxbury

Innovation Center, District Hall Providence, and Venture Café Providence (Image 5.2(4)).

The overall mission of the Innovation studio is to bring together entrepreneurs, venture capitalists, and startup communities. Moreover, to "democratize innovation by cultivating relationships and providing free resources and spaces for anyone to successfully launch and grow a business." It collaborates with universities, holding mutual programs that let students observe their work and dynamics.

However, there are different contexts where innovation studios emerge in Boston that change a scenario. While District Hall and Cambridge Innovation Studio attract capital and stakeholders, the organization works effectively at the social level by bringing positive energy to lower-income and minority groups as well. Innovation studio addresses these issues through the Roxbury Innovation Center (RIC) located in one of the most deprived neighborhoods of Boston (close to the Seaport Innovation District). Due to the public interest in Innovations' as well as the government support to a response to the local initiative, Venture cafe occupied the public space in Roxbury in 2015 in order to activate and bring entrepreneurial dynamism in the neighborhood. The mission of the Roxbury Innovation Center is to support local economic development, in Roxbury, Dorchester, and Mattapan by empowering and guiding innovation and entrepreneurship, as viable career options. RIC provides rental space and Fab Lab and hosts programs for locals in order to support innovations and entrepreneurship.

Private Sector

In the greater Boston area, there are 13 Unicorns (Crunchbase 2020) and investors pay attention to the potential of Boston startups. In March 2020 alone, 60 startups saw more than $1.5 billion in investments, while 54 startups earned $3.5 billion in

April 2020. To fund Boston's entrepreneurial ventures and build on the remarkable growth that the city has seen in the past decade, investors are enthusiastically shelling out billions of dollars each month. This increasingly exploited ability is embedded in the history of Boston. Boston is the birthplace of modern risk capital infrastructure, which was developed here by Greylock, the first modern venture with an LLC structure and many limited partners. In addition to venture capital, there are essential innovation clusters present in Boston that creates a favorable place for companies to locate. As a consequence, VCs that once occupied Route 128 relocated to and multiplied in the Financial District, Back Bay, Kendall Square, and the Seaport, forming a new capital cluster in the heart of Boston and around it. As a consequence, VCs that once occupied Route 128 relocated to and multiplied in the Financial District, Back Bay, Kendall Square, and the Seaport, forming a new capital cluster in the heart of Boston and around it.

Between 2010 and 2014, almost all industries in Boston outpaced their national growth rates. Knowledge sectors have been the basis for the recent growth of Boston. Today, healthcare is the single largest sector in the region, accounting for 20% of employment and increasing by almost 10% since 2010. Emerging sub-sectors are generating employment and developing new products through innovation and cutting-edge innovations, such as financial technology, education technology, digital health, and advanced manufacturing. Small companies are a strong source of jobs and prosperity for the citizens of the region. Small businesses are scattered throughout the neighborhoods of Boston, where they are a vital source of community vibrancy and contribute to the city's social and cultural fabric.

Worth more than $360 billion, the metropolitan area of Greater Boston has the sixth-largest economy in the US and the 12th-largest in the world. It is increasingly knowledge-based and has thrived on entrepreneurs' ability to invent, resulting in a high rate of new patentable innovations. Patents given to citizens of

Boston have risen by 8.3 percent a year in the last decade. In the last decade, the Boston metropolitan area accounted for over a fifth of all patents granted in Massachusetts. Medicine and computing are the top classifications for patents granted to citizens of Boston (Image 5.2.2).

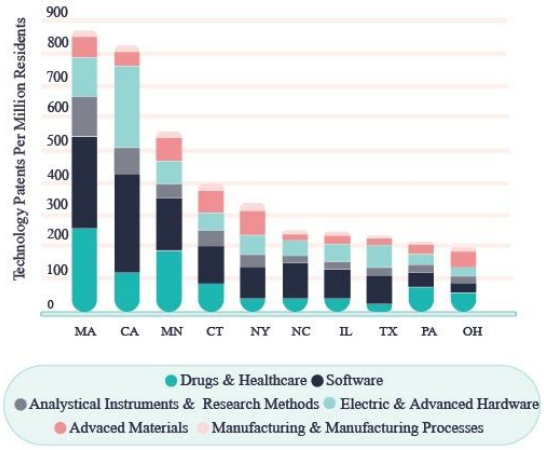


Image 5.2.2 Technology Patents
Source: The Annual Index of the Massachusetts Innovation Economy 2019 Edition

On the other hand, only 39 percent of jobs in the city are held by Boston local residents and are especially under-represented in the fast-growing, high-paying knowledge sectors of the city, which also happen to be the sectors that have seen the most substantial wage rises since 2001.20 Bostonians make up the majority of the workforce only in the retail and lodging and foodservice industries, the sectors As a result, many residents of Boston struggle with higher living costs stimulated by a fast-growing economy without reaping the rewards of higher salaries.

Boston plans to add more than 100,000 jobs by 2030.21 In industries such as healthcare and technical services, growth is projected to be particularly rapid in the future. Sectors like advanced manufacturing can build off synergies with the grow- ing knowledge economy and institutional anchors.

5.3 Enabling Factors

Studying what were the major enabling factors that made Boston successful as an innovation system is a complex phenomenon to be simply described. It’s a

combination of contextual factors and intentional drivers that worked well together with strong market forces. Moreover, It's challenging to speak about the innovation model and its role in the Greater Boston area, since the actors presented in Boston, Cambridge, and Somerville are independent and separated from the legislative perspective but at the same time play a significant complementary role for each-other. Therefore, Boston is not a typical case of Triple Helix collaboration, nor is it a full market-driven or a policy-driven development. It's a complex phenomenon, of which I try to summarize the major elements that brought Boston to the top through contextual factors, Regulatory & Institutional factors, and innovation policy framework.

1. Contextual enabling factors

The success of the area starts with its strategic location, proximity to the port, and existing highways that link the area to the region and attracted industries, later the presence of the airport that all together made Boston the gateway city and helped to build global links after the transaction to the knowledge economy which happened faster than in many deindustrialized cities. Moreover, abandoned industries gifted significant physical resources in the city that were created later on areas to intervene, and to insert new innovative functions.

Secondly, in building Greater Boston's innovation environment, universities have played a major role. Through the development of highly trained knowledge workers, especially in life sciences, engineering, and technology, these institutions have triggered further Boston specializations. Talent has been a primary factor in Massachusetts' attractiveness for new business growth and a catalyst for the powerful innovation economy of the state. "(Massachusetts Innovation Economy's Annual Index, 2017). In addition, Massachusetts is the leading state in STEM degrees, especially in Computer and Information Science, Engineering and Biological and Biomedical Sciences. Massachusetts had the most per capita technology patents of any of the LTS (871 per million inhabitants in

2018), as well as the most scholarly science & engineering publications per doctorate holder of any of the LTSs in academia.

Institutions have also contributed greatly to science and technology and its advancement to the next level. For example, there are now strong ties between MIT and Kendall in Cambridge and Harvard and medical clusters in Boston. Two of the innovation clusters presented in the Greater Boston region were the product of higher education institutions and also their direct financial support.

Moreover, startups are where investors go. Once again the emerging large number of creative start-ups in the region was strongly influenced by the universities that first attracted bright minds and then created excellent human resources that developed, formed, and managed the information industry of Boston. However, because of the reasons that will be addressed afterward, maintaining this resource in the Greater Boston area remains a critical challenge nowadays.

Finally, the scale of the sector in which Boston operates gives a competitive advantage to the involvement of large private investors, venture capitalists, and market forces in the region that facilitate the transformation of the city's economic development. On the other hand, in 2016, over 65 percent of R&D was financed by industry. In Massachusetts, venture capitalists spent more cash compared to GDP than all of the LTS in 2019, bar California. Massachusetts earned the most support compared to GDP for Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR). Such powers are profit-oriented, but they make a major contribution to research & development. However, strong regulatory and institutional variables are also presented that direct and form these dynamics into a creative ecosystem.

2. Regulatory and institutional enabling factors

Institutional and regulatory factors are powerful for developing the innovation

ecosystem in Boston, especially when it comes to funding. It's clear that Massachusetts has a good position in attracting federal resources to invest in Research & Development that is a crucial precondition for creating a lasting innovation ecosystem. Massachusetts received more R&D investment ($30.9B) as a % of GDP than any of the LTS in 2016 and received the most federal funding for R&D relative to GDP as well. In 2017, the Commonwealth received $3.5 billion federal funding for R&D initiatives at universities, colleges, and other non-profits. Not surprisingly, life-science plays a significant role here, healthcare R&D in particular, with the National Institute of Health (NIH) awarding $2.9 billion to Massachusetts institutions in 2018.

Public support is significant besides the funding. It's true that governmental bodies are not always directly involved in the planning processes that are fully held by private developers (such as Seaport District). However, city governments play a significant mediating role between investors and public interests, in the process of concept creation (ex: Mayors' suggestion of the concept of Boston Innovation District) but also contributing to infrastructural projects itself, such as additional Metro Lines, slow mobility infrastructure or Big Dig project which has a great impact for the pedestrian mobility and livability of the downtown area close to Seaport.

Housing remains one of the alerting topics for Boston and the affordability of the real estate prices. This issue has a direct impact on the innovation ecosystem and threats of the brain drain towards more affordable areas. The Metro Mayors Coalition, made up of 15 cities and towns in the Greater Boston Area announced a Regional Housing Partnership in 2018 with the goal of building 185,000 new units by 2030. In 2019, the Baker-Polito Administration has proposed a Housing Choice Initiative that would incentivize local governments to plan and build the diverse housing stock needed around the state.

Finally, Boston uses a progressive approach to innovation, remains a leader in

patent numbers (particularly in the life sciences, IT, research, and engineering), and is highly technical and product-oriented. Different contextual elements form this path of disruptive innovation but are influenced by regulatory and structural influences as well as the demand that is derived towards growth and performance.

3. Innovation Policy Framework

Massachusetts Technology Collaborative report (2017) summarizes its intentions to create a successful triple helix model for generating economic opportunities.-*"We develop meaningful collaborations across industry, academia, and government which serve as powerful catalysts, helping turn good ideas into economic opportunity."*. On the other hand, Organizations (ex: Innovation Studio) and some of the governmental departments (ex: MONUM) have the ambitions to deliver innovations to the people as well and address issues together. Moreover, the city of Boston managed to include 15.000 voices in the planning process to create a communicative process. However, communities and individuals hardly represent the so-called Fourth Helix within the whole context due to the fragmentation of institutional bodies in different independent cities and the diversity of social groups where priorities towards white collars dominate.

Moreover, these partnerships across academia, government, and private sector vary according to different cases the government usually plays a mediator and enabler role, which is particularly clear while discussing place-based innovation systems, and more precisely -innovation districts that significantly contribute to creating a successful innovation ecosystem.

However, each case of these clusters located within the Route128 area represents partnership scenarios where different actors dominate which makes them challenging to be covered by Triple Helix innovation policy.

5.4 What Happened, Boston?

Several factors are raised at different levels: the state, the Greater Boston area, and the city of Boston, which contribute to creating obstacles for the inclusive growth of the innovation ecosystem in Boston. At the state level, MassTech Collaborative has summarized problems that are closely connected with the creative dynamics that exist within the area of route 128. These concerns primarily concern housing and traffic problems, financing for R&D and venture capital, and eventually migration flows, which are the product of the mechanism and the most critical threat to the future.

Firstly, one of the big problems that Boston has to tackle is traffic congestion combined with rising house prices. In the last decade, population growth has driven people to live farther away from Boston, creating shortages of affordable housing and traffic congestion in other parts of the state. Growing home prices, on the other hand, are forcing new graduates and young professional couples to leave the state for opportunities elsewhere and making it more difficult to draw talent from lower-cost housing regions. 30 percent of full-time employees commuting to work have considered changing jobs for a better commute, 52 percent of drivers have recently been late to work due to traffic, and that figure was 63 percent for transit users, according to The MassINC Poll on Transportation (2019). 23 percent of drivers reported thinking about leaving the area altogether, and that rises to 32 percent inside Route 128.

"We can't sustainably maintain an innovation district if we don't address these issues now, I really do believe if we don't solve this, it'll impact an [future] innovation that could change the course of humanity."- YeSeul Kim, Vice President of the Kendall Square Association (Curbed, 2018)

Healthcare, which is currently the leading sector, is another important factor that represents strength and at the same time risks for Massachusetts and particularly

for the greater Boston area. In the same span, investment in California increased by 270 percent and New York by 228 percent. Massachusetts is also at risk of being disproportionately focused on healthcare, which accounts for more than half (57%) of the investment in Venture Capital. In addition, the healthcare and life science industries are aimed at a narrow demographic that eliminates multiple potential customer markets from which the innovation ecosystem would benefit. The health spillover effects of the innovation economy also lead to a number of issues, especially high housing prices and growing travel times, all of which are commonly seen as obstacles for the economy of the Commonwealth. This sector can also potentially crowd out other entrepreneurs that may be looking elsewhere for opportunities.

These threats are partly expressed in the recent changes in the dynamics of R&D funding where, in 2017, Massachusetts still earned more than twice as much federal funding compared to its GDP as any other R&D LTS, but it has declined since 2012. Although federal R&D funding has decreased in the country as a whole from 2012 to 2017, Massachusetts had the highest decrease, falling 4.6 percent, while California dropped just 1.7 percent in total federal funding, and New York increased 3.3 percent with the 2nd largest total federal funding. Venture Capital increased from 2012 until 2015 but it showed significant instability after then, followed by the Number of Deals that almost halved from 2015 until 2018(Image 5.4).

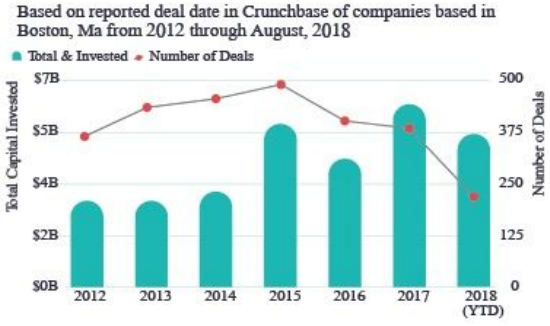


Image 5.4 Boston Area Venture Capital Investment Activity

Source:crunshbase news 2018, elaborated by author

Finally, economic growth in Massachusetts is driven by the state's well-educated workforce, many of whom could choose to live elsewhere. Moreover, the Route 128 area is where the mentioned workforce is generated. On the other hand, "*Tech companies can*

locate anywhere in the world and often choose places where they can attract young creative and technical talent. These people want funky bars and restaurants, an art scene, music, and museums. While these features exist in Massachusetts across all of its regions, that message does not seem to be resonating through existing promotional channels with young talent and with the start-up audience. Boston, for instance, is not seen as a 24/7 global city at the same level of social engagement and entertainment as what is perceived is happening in peer regions such as New York and San Francisco." The annual index of the Massachusetts Innovation Economy (2017)

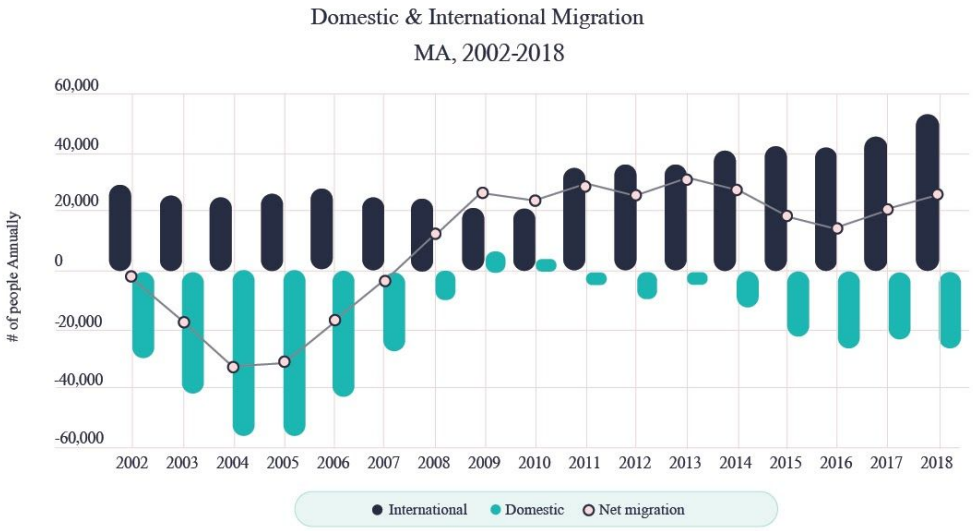


Image 5.4 (2) Domestic and International Migration

Source: The Annual Index of the Massachusetts Innovation Economy 2019 Edition

What occurs as a result and is quite clearly expressed in the statistics is a domestic migration that remains a primary challenge for Massachusetts and is triggered primarily by factors listed above (Image 5.4(2)). Since 2011, Massachusetts residents have undergone out-migration and this continues to grow over time. In 2011, on the other hand, international immigration began to increase. This was the time when the planning campaign began in the Boston Innovation District and the purpose of Boston to host innovations became clearer than ever. The total figures reflect population growth, which has begun to increase since 2016. Therefore, when we hear about the "population boom" in Boston, what it actually refers to is displacement of locals by an increasing number of new residents.

The query, however, arises: who are the new foreign Massachusetts residents who can afford to live in Boston, who are the individuals who after all, choose to leave Boston, and what does this process have to do with the current dynamics of innovation in greater Boston?

Massachusetts students, and U.S. students in general, are being outperformed by their international peers at the elementary and secondary levels in science and mathematics, where Massachusetts students scored 6th and 20th respectively (The Annual Index of the Massachusetts Innovation Economy, 2019). Moreover, students in Massachusetts have a comparative disadvantage due to the extremely high standards for the incoming international students that existing universities and colleges set as a "filter" for the bright minds. Beyond not being top performers, this shows a significant gap between the subjects, the third-largest gap between scores after North Carolina and Vietnam. As a result, the gap in education and socio-economic prosperity after all, between the existing population and incoming international labor force is higher than usual.

All the above-mentioned issues take shape in a clearer way when we look at Boston at the city scale. Six key trends were identified through "imagine Boston 2030" that address issues that the city of Boston is facing nowadays. These issues are Productive economy (through which diversification is critical as identified); housing affordability (to avoid displacement of lower-income groups); growing population (which is identified as a reflection of Boston's economic vitality); Changing climate (as Boston is the fourth most exposed city in the nation to flooding); Inequality (due to the existing wealth gaps between races and neighborhoods) and Transformative Technology (which mostly refers to the smart city tools).

Out of these identified issues, the most relevant subjects for further discussion about innovation districts are the Productive economy, affordability, growing

population, and inequality in Boston that are directly linked with the issue of gentrification and segregation.

"Boston is experiencing a housing crisis with rapid gentrification, rising costs, and segregation. Increasingly, Bostonians — particularly in communities of color - can no longer afford to live in the neighborhoods they used to call home." Mentioned Mayor Marty Walsh in January 2020.

So what happened, Boston?

"Unlike so many places in the world, the problem in Boston isn't finding talent. It's keeping it. And in this city, that problem has a prominent face" says Mark Zuckerberg, and the comprehensive media overview coupled with questionnaires and interviews held with residents prove the same. While the innovation ecosystem succeeded in creating new jobs for highly skilled white-collar professionals and shaped an excellent scientific environment, there are the second half of the people who got left behind. Moreover, the city is not affordable for the highly paid workers either, as Chris May (30 years old Boston resident, engineer) mentioned in the personal interview:

"You can not get the same value for living in Boston as before. I would choose to move elsewhere (but not in California, there are the same issues), earning the same income, and living a better life."

"Boston is catering to high tech and contributes to a widening schism between a wealthy upper class that can afford astronomical housing prices, dining, etc., and everyone else. There are quite enough people in those industries here already and I become angry the more and more Boston caters to them, and courts them, ignoring all other sectors and demographics." - Added anonymously a millennial artist, Boston resident in the online questionnaire poll.

Finally, Andrea Campbell with the headline of her article published in 2020 summarizes the outcomes of "Boston's success story" perfectly:

"Is Boston's booming economy making our city better or destroying it? The truth lies somewhere in between"

5.5 Where Innovations Cluster In The Boston Area?

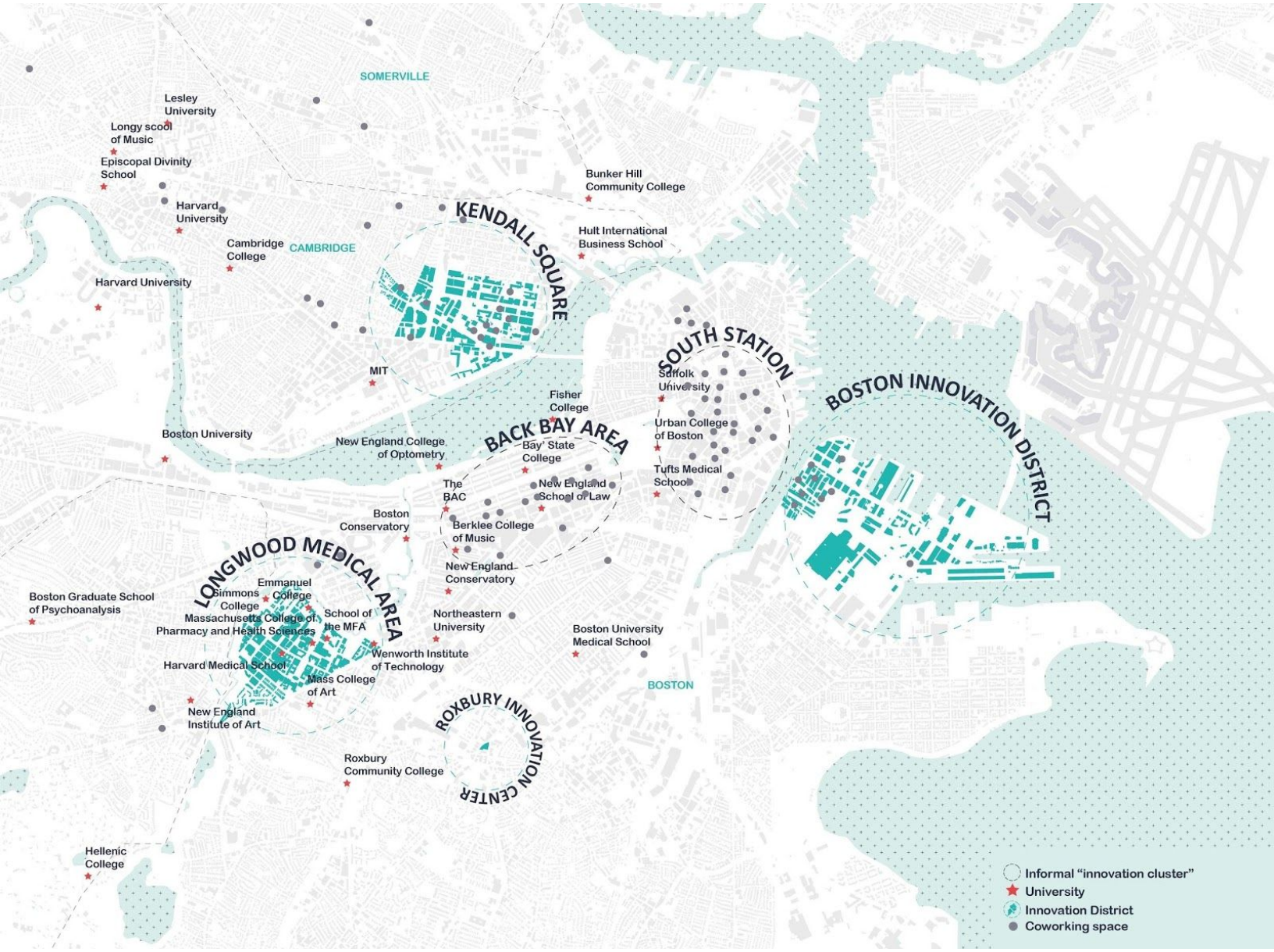


Image 5.5 Place-Based Innovation Ecosystems Map Of Boston

Source: Author

There are several areas in the Boston-Cambridge area which might be called innovation clusters or be considered as a place based innovation ecosystems (Image 5.5). These ecosystems represent different partnership models with different players. The most interesting thing about innovation clusters in the Route128 area is that they are independent as well as extremely interconnected with each other and with the existing resources that are present in the area. Kendall Square and a Longwood medical academic area (which was built through the teaching hospitals) are historic models that were very much linked to a host academic institution at one case MIT and another- Harvard medical school. They are knowledge-driven and very much depend on the role that universities played, especially at the Kendall square case where MIT was not only an actor representing an academic institution but a land owner-developer of the property which isn't only for the academic use but for the spinoff of industries.

Innovation focused on places is situated spatially in districts of innovation, whose urban fabric is considered to promote social contact and the sharing of tacit information. The city of Boston represents a paradigmatic case of original and convincing convergence between innovation and urban regeneration policies through the introduction of an explicit policy that focuses on the relationship between urban redevelopment initiatives and the potential of growing ecosystems linked to innovation.

The strategy of spurring innovation within the city can be interpreted at the economic, real estate level as promoting "excellence poles" (ex: Seaport district). Boston Innovation District is different from than above-mentioned cases as it's market-driven development (influenced by the city government in the Innovation District concept but minor support provided) which was strongly triggered by the success of Kendall Square in Cambridge, presence of firms and startups in the area and Mayor's desire to replicate the same place-based innovation dynamics in Boston as well. One of the crucial things about a BID is that it doesn't contain any anchor institution, which was the subject of a debate from the beginning.

However, Seaport district managed to achieve great results as an innovation district which will be discussed afterward more in-depth.

Roxbury Innovation center represents a government initiative at the social level by connecting disadvantaged populations to employment and educational opportunities. The need to insert new innovative functions in Roxbury was caused by the development of the Boston Innovation District nearby and its impacts on surrounding areas. Roxbury is one of the most rapidly gentrified areas in Boston with a high presence of different ethnic groups, people of color, and lower-income communities. The case of Roxbury will be also discussed with the Boston Innovation District afterward.

Moreover, while branded and recognized innovation districts in the Boston-Cambridge area have become unaffordable over time, small firms, startups, and coworking spaces have found less expensive areas close to downtown in Boston as well as close to existing innovation districts where spontaneous agglomerations of innovation have started to emerge Around South Station and Back Bay area. Therefore, while innovation policy supports the placement of innovation hubs within different neighborhoods, a new generation of redevelopment projects and market-driven processes are changing urban geography in the Boston area.

Finally, there are significant links between different innovation clusters, however, I will focus on the Boston Innovation District, Roxbury, and spontaneous agglomerations of innovation with the consideration of Kendall Square and Longwood medical area as well. I will try to address the mentioned synergies and interconnections between these clusters and Route128 in the following chapters.

In the Boston-Cambridge area and in the mentioned clusters, players are also different. South Boston waterfront innovation district is a place where companies that may have started from one of the institutions have left to become more

autonomous and independent. In this case, the support provided either by academic institutions directly or the government, the program is very minor and almost non-existent in the South Boston case. It's mostly market-driven while the government was playing the role of making connections through real estate control mechanisms to create partnerships. The difference between Kendall square around MIT is that it very much depends on the very active role that MIT played, not only as an academic institution but as a land owner-developer of the property that isn't only for academic use but for the spinoff of industries.

5.5.1 Seaport Boston Innovation District (BID)

The story behind the BID

Boston Innovation District is one of the most important elements of not only the city of Boston but the whole innovation ecosystem accumulated in Massachusetts and specifically the route 128 area. It was built to restore the South Boston Waterfront, a 400-hectare underutilized area that formerly housed manufacturing operations and parking, and turns it into a vibrant center of innovation and entrepreneurship along with new mixed-use residential, commercial, and retail spaces.

One of the most interesting elements in the process of formation of the Boston Innovation District was that the major and the most valuable area of the waterfront land was primarily owned by several private developers. The discussion about the project started in 2006 and during the first years innovation wasn’t a specific requirement discussed. The idea about innovation showed up in 2009-2010 when the city government started negotiation for inserting the innovation components in it with an exchange of upscaled built-up area considering mutual benefits and Mayor Manino launched the city vision towards the presence of Innovation District in the Seaport area.

However, the start of a debate about developing a place-based innovation ecosystem in Boston goes back to 2004 when the Boston Planning Development Agency (BPDA) proposed the policy initiative 'LifeTech Boston', which was a major incubatory step towards the eventual development of a new redevelopment mode, Boston's first Innovation District. Its original goal was to support the development of the life sciences and high technology sectors of Boston by nurturing the city's incumbent companies and attracting national and foreign companies. Three distinct domains were targeted: biopharmaceuticals, ICT, and medical devices.

Therefore, the idea to establish an innovation district in the Seaport area and move the emphasis to the new district on the waterfront from existing innovation clusters developed thanks to Mayor Manino's aggressive approach towards innovations in order to have something tangible. Therefore, the Mayor's office was involved in trying to do what MIT had cultivated in Kendall square over the last 30 years. The difference between the MIT square around Kendall as an innovation district depends very much on the very active role played by MIT in that. On the other hand, there is no actual presence of an anchor institution in the Boston Innovation District, which was a subject of discussion in the concept creation process. However, the further success of the Seaport area is evidence of how interconnected BID is with existing innovation clusters as well as the resources that educational institutions generate in Boston and Cambridge.

"Many people were saying to the mayor the idea that you couldn't create a new innovation district without a host institution nearby, everybody thought it would fail. So that system worked because these other clusters were getting very dense, rents were getting very high and this other location in the waterfront needed an identity as a place which companies saw as a natural way of expanding." - Mentioned Kairos Shen in the personal interview.

BPDA's strategic aim was to attract new businesses searching for favorable locations by offering city services and identifying financial resources. The 'Boston Innovation District' (BID), a development project was later described as the most critical component of the original strategy. The goal of the project was to build a complex neighborhood capable of attracting funders, capital, and talent that was inspired by the success of 22@Barcelona, which was prominent in 2010.

Primary vision

The Seaport area had several contextual elements that triggered the idea about the Innovation District to be developed due to the proximity to the airport as well as the city center, accessibility, and the possibility to build the area from scratch and allocate all the necessary components.

The primary vision for the BID had considered several features, principles, and strategies that set the framework of how the development would take shape. These elements are considerable factors for the further evaluation of the Boston Innovation District and the compliance of final outcomes with primary intentions.

The four main features were: Industry agnostic, Clusters, Experimental, and City as a host.

The idea to be industry agnostic was aiming to open the door for anyone who would consider itself “innovative” and help the district to be diversified and not dependent on a single sector.

The desire to cluster innovative entrepreneurs and firms with increased proximity and density was highlighted in the motto of BID - “Live, Work, Play” with the notion to help users spend more time, interact and innovate at a higher rate.

The experimental feature of the BID was the public sector's adoption of an experimental framework that was characterized by fast decision making and planning flexibility.

Finally, the most interesting feature was creating a "city as a host" - instead of having an anchor firm or institution like MIT in Kendall for instance, to have a city of Boston itself being transformed as a host. According to this idea, the neighborhood would be free to develop in an organic way and innovations would be allowed to be spread across the city. *"Even if networking and proximity are conceived as one of the primary preconditions for developing innovations, in this model, the "cluster" is defined more broadly and regionally, and density of innovation activities is less important. The principal benefit of this model is its flexibility."* Ariella Cohen (2015)

The primary vision was also based on the three core principles that were aiming to create an Urban Lab with Sustainable Leadership and Shared Innovation followed by key strategies to promote collaboration, provide public spaces with 24 hours functions. Moreover, besides the aim to create an open innovation system with facilities that would trigger networking, the initial vision highlighted the component of inclusiveness as well.

The key principles were:

Urban Lab: *In the culture of the Innovation District, creativity is central. Its developers plan to use the space to experiment with renewable energy, community engagement, transportation, and social infrastructure to support all communities, achievements would be scaled and translated.*

Sustainable Leadership: *The redevelopment should optimize the existing waterfront land while ensuring future generations have ample opportunities and enjoyment.*

Shared Innovation: *The shared idea economy and the goods that arise from the Innovation District should support all the Bostonians.*

The BPDA oversaw the project and provided partial funding for new public spaces to be created. In order to ensure progressive implementation and to alleviate the cost burden of the project on the city's budget, they established a network of private companies and used financial and planning instruments within a Public-Private Partnership.

The public initiative has been actively involved in attracting start-ups as well as more developed companies such as Vertex Pharmaceutical and more recently, General Electric, both of which have earned substantial tax cuts in exchange for building their new headquarters within the borders of the BID. Unique properties, such as the world's largest start-up accelerator,' MassChallenge' and 'Factory 63', a major experiment in creative housing, include private micro-apartments and public areas for working, meeting, and organizing activities, are concentrated in the dense regeneration area.

MassChallenge (in Boston Innovation District) was one of the turning points for BID where Mayor Menino encouraged real estate developer Joe Fallon to provide free office space for MassChallenge for one year rent-free lease. The presence of Accelerator in the building doubled its real estate value since it also secured the relocation of big companies (e.g Autodesk) and contributed to the regeneration of the Seaport District area since it had a crucial role in the relocation of relevant companies. District hall represents another example of Boston’s government’s intervention, which occurred by putting together a Venture Cafe and developer in order to sign a lease to operate the building. The district hall nowadays is a non-profit joint venture with the developer that owns the property and seaport square.

Finally, even though the government was actively involved in the concept creation and particularly in the first steps of BID, its role and direct intervention in the district development was minor. There are indeed companies that have moved to the South Boston Innovation District with small government grants but there were no direct investments or incentives provided from the city as the main driver at the end for BID was a market force.

District Hall (Innovation Studio)-the anchor tenant

District Hall was the outcome of a cross-sector partnership that aimed to create an anchor tenant serving as the "living room" of the BID for entrepreneurs and members of the community with similar interests. The public sector's vision for District Hall suggested an open-ended flexible framework which allowed developers and involved stakeholders to experiment with layouts and designs to create easily modifiable public spaces, open to all, that would encourage collaboration, networking and act as a catalyst for innovation.

"In 2014, District Hall hosted a total of 562 events ranging from hackathons and training sessions to startup networking meetings and brainstorming sessions. It held more than 30,000 meetings, and an estimated 25,000 people used its public meeting space. More than 70 percent of District Hall's space rental value has been donated for community use – a $1 million investment in the local startup community." Ariella Cohen, 2015. Moreover, District hall represents one of the main driving forces for the Roxbury Innovation Center (Roxbury Innovation Studio) which is operated by the same organization as District Hall. Finances and resources that are gathered in BID are partially distributed in areas like Roxbury afterward that are being dedicated to community-oriented projects.

Boston Innovation District today

Almost 10 years after the idea of the Boston Innovation District emerged, Seaport represents one of the most attractive areas for large firms and knowledge workers (who can afford rent) nowadays. More generally, there is an emerging linkage - both collaborative and competitive - between Kendall Square and Boston's Innovation District, which is seen by many in the market as the "next place Kendall companies look" as they scale up.

Boston Innovation District represents public-private cooperation with a strong role of city government and capital attraction that turned into a geographic hub of innovation as it was initially conceived. It's a high technology innovation district, extraverted, and branded at the global level. A nice urban design of public spaces, high density of firms, and opportunities for collaboration during the day as well as night create an ideal environment to work, live, and play. From the abandoned brownfield BID has transformed into an iconic waterfront, being accessible for the global dynamics (through the airport) as well as city dynamics through public transport.

Due to its crucial role at different levels, the district had been a subject of scientific and political debate, especially a few years after it was launched. Scientists, practitioners, and the city government envisioned potential threats to the district, questioning its further inclusiveness, sustainability in the long term, etc. One of these concerns had been addressing possible gentrification and displacement in lower-income neighborhoods and Roxbury represents one of the crucial aspects of the Boston Innovation District story which goes back to 2014 when discussion about Roxbury Neighborhood Innovation Center began.

5.5.2 Neighborhood Innovation Districts-Supporting neighborhoods by fostering innovation

(Roxbury Innovation Center)

In September 2014, Mayor Walsh created the Neighborhood Innovation District Committee, which includes more than 25 members from all sectors. The committee was tasked with identifying best practices for developing neighborhood innovation districts, making recommendations for an inclusive citywide innovation agenda, and designing a pilot for a neighborhood-based innovation district.

"As we work to create sustainable opportunities throughout the City of Boston, we have identified the creation of additional Neighborhood Innovation Districts as a promising strategy to empower and encourage the entrepreneurial talent that already exists in our neighborhoods," said Mayor Walsh. *"I thank the Committee for their hard work in assembling this set of recommendations and I look forward to turning their thoughtful plans into action so we can continue to spread the entrepreneurial spirit throughout the city."*

The City looked to the Dudley Square area of Roxbury, a high-poverty neighborhood, as its next potential target. While Seaport District was considered somewhat of an “empty playground” for the public sector, imagining an innovation district in the Roxbury neighborhood required a high degree of tailoring and a strong contextual understanding of the long-standing community there.

Roxbury is one of the neighborhoods in Boston with the most lower-income residents with an average household income of $52.909 (which is extremely low, compared to the $71.834 based on the 2018 Census data). The neighborhood became part of Boston in 1867. However, due to its permanent residents, strongly presented ethnic groups, and long history, Roxbury is characterized by a

significant identity at the neighborhood level and a high number of affordable housing. According to the City of Boston data (2010), owner occupancy of the housing is only 23% and over 55% of the population are African-American with a majority of 30% residents with a high school degree, 14% with a college degree, and only 11% with a Bachelor degree. Moreover, according to the recent data provided by point2homes.com, there are 0% of graduate residents present in Roxbury.

Therefore, addressing social and economic issues in Roxbury through innovation is a challenging mission, especially with the target is to have a "city as a host" (as was decided in 2010) and ongoing active dynamics in the Seaport district that has already spread to the transformation of South Boston (the area between Seaport and Roxbury).

Roxbury Innovation Center (RIC) was created through a public-private partnership in 2015 with the City of Boston and The Venture Café Foundation, where Innovation Studio (a new concept of venture cafe) activates the Roxbury Innovation Center with the mission to support economic development in Roxbury, Dorchester and Mattapan by promoting innovation and entrepreneurship as possible career options. RIC is providing different resources for small business owners, industries, and individuals through instructional workshops, networking events to link ideas with investments and mentorship programs, organizing entertainment activities for socialization, and raising awareness about the center (which is one of the most significant challenges of RIC in Roxbury). Moreover, RIC supports local businesses by helping them to reach the audience of investors and using their products or services.

Roxbury Innovation Center is located on the second floor of a historic building where Boston Public Schools' central offices and several retailers are present. Therefore it doesn't have direct communication with the street or surrounding areas to attract attention. According to the online questionnaire held in Roxbury

through this research, there is an awareness issue of Roxbury residents about the presence of RIC and the above-mentioned opportunities in their neighborhood. Besides, there are significant cognitive boundaries in place that separates Roxbury from Boston Innovation District and keeps its residents away from the Seaport area. These barriers represent a complex issue that refers to the existing socio-economic as well as ethnic segregation of different groups, as well as the presence of the privately owned public spaces in the Seaport area which are dedicated to entertainment but automatically exclude certain groups and behavior.

Roxbury Innovation Center managed to attract different investments mainly from the City of Boston, CIC, Microsoft, and the Boston Foundation. However, the center is still struggling to form links with residents as well as attract new investments.

"After almost four years' activity, however, the Roxbury Innovation Center has mainly been involved in providing vocational training programs for residents. The local administration, due to a lack of a thriving socio-economic environment, is still struggling to find entrepreneurs ready to invest in the corridor" - write G. Rissola, C. Bevilacqua, B. Monardo, C. Trillo (2019).

As a result, Roxbury is one of the gentrified neighborhoods in Boston (Mostly reflected by media during the past few years) where the debate doesn't only concern its population but the identity as well. "'It Is Erasing Our History' - New Development Blurs Boundaries" - says the headline of an article published in Wbur in 2019 where "The Alexandra Hotel on Washington St. Boston officials classified the redevelopment as a South End project, but the building is actually in Roxbury". Moreover,

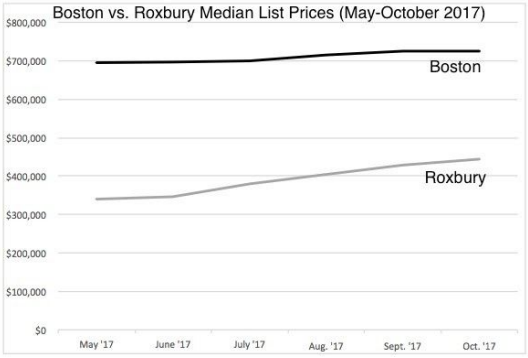


Image 5.5.2 boston VS roxbury median list prices

Source:https://huntnewsnu.com/50562/city-pulse/roxbury-residents-face-gentrification/

according to the “Imagine Boston 2030” report, housing prices in Roxbury increased by almost 70 % between 2010 and 2015, while housing prices in Boston only increased by 36 % (Image 5.5.2).

Finally, from the strategic point of view, supporting policies and initiatives are crucial to address the “side effects” of new innovative dynamics. However, while the mission of RIC is to find entrepreneurial talent in lower-income neighborhoods like Roxbury, the question is if all the Roxbury residents (in this case) want and are willing to “be upgraded” as entrepreneurs and if the presence of an innovation center is enough to address the very possible threats of displacement?

“*We have a serious problem*,” said Robert Terrell, head of the Roxbury Neighborhood Council. “*By the time we get (solutions) in place and implemented, many of us won’t be here*.” - published Boston Herald in 2018.

5.5.3 Spontaneous agglomeration of innovation - where do the small firms go?

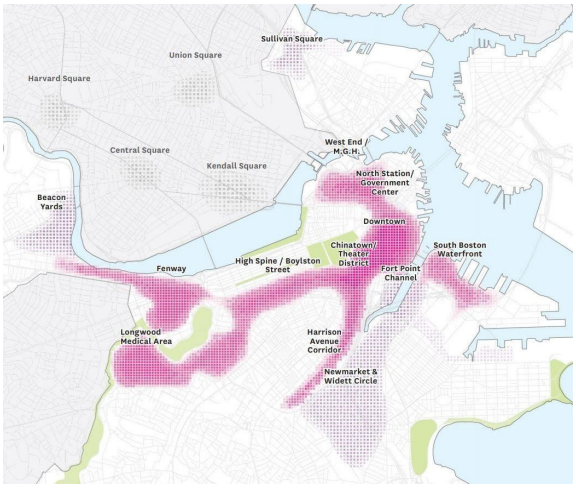
As Kendall Square in Cambridge and Boston Innovation District in Seaport are becoming more and more expensive areas for smaller firms and startups, the challenge for the city of Boston (as well as for Cambridge) is to understand where small and “poor” startups are going. It’s challenging to track the exact movements of small firms and early stage startups through this research. However, there is evidence of spontaneously emerging new agglomerations of innovation in the areas close to the downtown where small firms, startups, and coworking spaces are able to find affordable rent prices (so far).

The truth is that startups are going to class B office locations in the downtown that are Back Bay and South Station areas. *“The city of Boston has many startup clusters. The Seaport District is where the Innovation & Design Building hosts MassChallenge, a program hundreds of startups participate in each year. South*

Station is home to popular coworking facilities WeWork and Workbar, and the Back Bay / South End has many startup offices between and above trendy storefronts." - writes Boston Startup Guide.

"What we found is that the city is developing class A office spaces in new districts and some of the older mid-20th century and even early office buildings are becoming less competitive for the class A office tenants. So cheaper rents that all startup companies can afford is happening in the location that used to be shopping areas. Just as innovation district prices and rents have gone up, companies similar to the ones that 10 years ago were looking for warehouse districts in the South Boston waterfront are moving to different parts of a town. So it's a natural migration. " - Added Kairos Shen in the personal interview.

If we look at the innovation district in Seaport now it's clear that it's no longer an innovation district for small companies. In fact, the innovation district 10 years ago that was in South Boston now has moved. Seaport District has innovation companies but they tend to be mature and well beyond the startup phase because



startups can no longer afford to be in the innovation district. Much of this process was market-driven and strongly enabled by the government support but there were no policies put in place to maintain the affordability of innovation districts. The government didn't intervene to regulate and control rents either.

Image 5.5.3 Boston Mixed Use Centers Identification

Source: "Imagine Boston 2030

However, what the city was able to do was to deliver the required affordable housing units. As there was no mechanism to control commercial rents there were

opportunities to control residential rents to help young people who can't afford expensive housing to live closer to the innovation district. But the numbers show that the percentage of affordable units is somewhere around 12-13% which is what's required but not sufficient.

If we look at the map, indeed, Back Bay and South Station areas are the ones with the major flexible workplaces and coworking spaces with several universities in it as well. The downtown crossing is at the edge of what might be called a central business district in Boston and both areas are well accessible with relatively affordable rents.

However, this dynamic is also recognized by the city, which is reflected in the Imagine Boston 2030 report, which emphasizes the role of mixed-use cores that needs to be encouraged. The strategic vision to address these areas (including mentioned spontaneous innovation agglomerations in Back Bay and South Station areas) is to *"Continue to encourage dense, walkable, mixed-use development and public realm improvements to foster a core where more people live, work, and gather"* by new developments, open spaces, job centers, and housing.

Finally, existing agglomerations, which apparently are strategic for further city growth as well, will soon attract new investments and go through a redevelopment that will fairly impact the rent prices. Boston's more than 40,000 small businesses generate about $15 billion in annual revenue and approximately 170,000 jobs. (Imagine Boston 2030 Report). Therefore, it's fair to say that small firms have a significant contribution to the city's economy. The question here is what will be the next destination for these firms, startups, and coworking spaces once they won't be anymore able to afford expensive rents in their existing locations, and will there be room for small firms in the city of Boston at the end?

5.6 Success and The Other Side Of A Success Story

Primary vision and the Boston Innovation District today

Seaport district represents one of the most vibrant areas today in Boston with stunning public spaces and diverse activities. It managed to attract large firms and investments and transformed into a powerful destination for entrepreneurial activities. On the other hand, the city of Boston primarily promoted the organic market-driven development concept of the Boston Innovation District, where except for several cases where the government got involved as a mediator and enabler, direct public sector intervention was minor as the main driver of the process was still the private sector. Looking back at the planning decisions that were made, there were not much contingent arrangements made that could have been able to give requirements to the developers to set aside part of residential and commercial units for example for innovation-related uses, or to create a fund to ensure further resilience of a project and presence of smaller-scale firms and startups. However, it also considers that the larger involvement of the government in this process would interrupt the idea of organic development as it was intended.

As there were key strategies promoted by the city government, one of the primary intentions towards BID was to transform the area into a district with community engagement and social infrastructure to support all communities by replicating and scaling achievements. However, while it seems like the intention for inclusion, the emerging dynamics in the Boston Innovation District created a work, live, play environment for certain groups only who automatically excluded social groups different from them. As a result, Innovation District couldn't' manage to deliver benefits equally for everyone directly (at least the component to

"play" in public spaces which are privately owned and managed) but resulted in different unintended consequences indirectly such as gentrification and displacement.

The role of Boston Innovation District in the city transformation

Mayor Manino's original vision towards the Innovation District was based on the benefits of a strongly clustered innovation ecosystem one hand which is directly reflected on the "work, live, play" motto of the BID. Proximity is indeed one of the most important elements for networking, knowledge exchange, and developing relationships. On the other hand, the concept of the "city as a host" means creating a larger regional innovation ecosystem where "cluster" is perceived not at the district level but with a broader understanding, at the regional level. In this case, density and actual proximity are less significant as the main focus of this model is flexibility. Therefore, the Boston Innovation District in this case represents a catalyst for a larger transformation of the city while the program of Neighborhood Innovation Districts plays a role of supporting element for a radical change.

Secondly, *"identification of the District with the city meant that the neighborhood would be free to develop organically, create momentum, and allow innovation to disperse across the city."* (H.Rodriguez, 2015). It resulted in new developments and large companies to start crowding out early-stage entrepreneurial activities. This process has impacts on all the social-economic groups in different ways.

Boston added 275000 new jobs in the past decade which is more than 2.5 times more than the number of new homes that were built up. (A. Campbell, 2020). Shortage of housing coupled with an increasing number of population, and other factors (such as relocation of some manufacturing companies further from a city center, etc) resulted in increased traffic, commuting time, rising prices, and congestion. As a result, many of the "talents" -white-collar workers who are

perceived as a major driving force of the Boston innovation ecosystem consider moving out elsewhere to receive the quality of life relevant to their income. One of the most considerable things is the lifestyle of the (mostly) millennial workforce which is flexible and on the other hand, United States' federal immigration policy and increased competitiveness of universities in developed countries such as Canada, the United Kingdom, Russia, and Australia pose a threat to the Commonwealth's international talent pool. (Fernandes, 2019).

The number of school-age kids living in Boston decreased by 10,000 compared to the numbers in 2000 and households with incomes of $1 million and up, increased by almost 1,000 more than in 2015. In addition, Boston has the seventh-highest income inequality among major U.S. cities, according to a recent Brookings Institution analysis. In other words, "Boston's Middle Class Is Doomed", especially the middle-income families with kids.

"Don't get me wrong, I realize that the things one loves about a city are often suddenly replaced by new things you may hate. It's a story as old as time. But here in Boston, the middle class has always been part of our identity and soul. Plus, says Schuster, when a city loses its middle-class, it also loses "some of the basic fabric of what it means to be a community. There are many ways in which Boston's gotten a lot better in recent years, but I think one way in which we're moving in the wrong direction is that Boston used to be a city of neighborhoods—the sort with middle-class families. And I think that that hollowing out is a troubling trend." [...] I do, however, believe that [the Middle class won't come back in Boston] unless we face facts about just how bleak our city's future appears to be without them. And if you want to live in a city where every last neighborhood feels like the Seaport, well, what can I say? You can have it." -wrote Thomas Stackpole (2020) in Boston Magazine which summarizes the tension of the middle class about the city transformation.

Due to the mentioned dynamics, neighborhoods like Roxbury are being actively

gentrified and threats of displacement of its lower-income residents are part of a recent debate more than ever. On the other hand, continuous initiatives like Roxbury Innovation Center coupled with relevant supporting policies such as affordable housing, investments in education at different levels, etc. are probably the only things that could ease the process. From the regional ecosystem or from an employment and tax revenue perspective, the idea of a geographic hub might turn out positive for the city in the end as well. Meanwhile, there are choices that still need to be made concerning who the city is ultimately for and who will be the residents of Boston by the time when the city will be transformed into a "host"?

As a result, the Boston area is becoming highly competitive where the coexistence of competition and inclusion represents a political dilemma. However, becoming a host city is a decision made almost one decade ago. Considering the course of Boston towards global competition raises another concern, which doesn't only relate to the inclusion of disadvantaged groups or the middle class but the benefits that the city is struggling to deliver even for its white-collar highly paid workers (due to the traffic, increased prices, etc). Therefore, if a competitive market is unable to take urban issues into consideration, there is a question of where is the red line between livability and economic well-being which Boston is close to crossing?

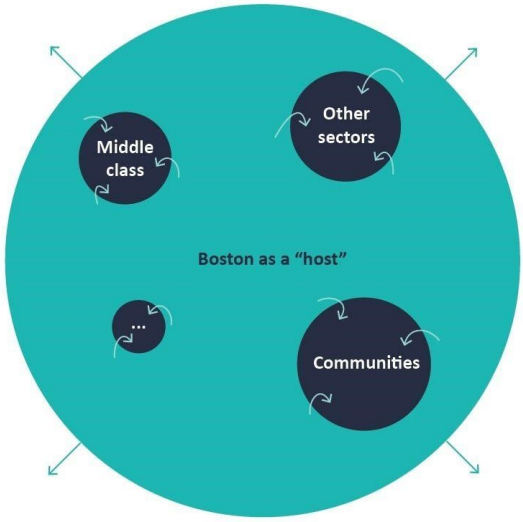


Image 6.5 "Boston As A Host"
Source: Author

CHAPTER 6. MILAN - THE CITY IN BETWEEN

6.1 North Italy In Context

How many Italies?

Compared to other Western European countries, Italy's industrialization began late around the 1880s. It lasted for about a century before industrial bases started to shrink in the 1970s-1980s.

Due to the different historic events, the economic and cultural distance between the North and the South has widened through the time that led to the emergence of “Questione Meridionale”- Southern problem. As a result, orthodox North/South division is a prevalent concept in political discourse. However, Literature and later on policies have been able to contrast traditional debate with a more complex vision which is based on the understanding of the emerging role of so-called Third Italy.

The term “Third Italy” was coined by Arnaldo Bagnasco(1977) to refer to the areas of North-Eastern and central Italy, characterized by the strong presence of crafts-based small firms clustered in a constellation of specialized industrial districts. In order to differentiate these geographical regions, Bagnasco gave a definition to the Third Italy, different from both the underdeveloped south of the country (the Mezzogiorno) and the traditional triangle of heavy industry in the north-west. The North-West's prosperity was founded on the growth of large-scale manufacturing plants, such as the Fiat plants in Turin that employed Fordist production methods (mass production). This regime underpinned the economic miracle of Italy in the 1960s and was correlated with the growing concentration in

the North-West of productive capacity. Milan became the commercial and business center of the Industrial Triangle, where Turin became an industrial city and home to the largest companies in the world, while Genoa became the Mediterranean's main port and an export outlet for foreign countries. As a result, the industrial triangle, composed of Milan, Turin, and Genoa, had become one of the most successful regions.

Industrial districts

Rising diseconomies of agglomeration in the late 1960s. A major process of industrial restructuring was precipitated by market saturation and stiffer foreign competition. One of the most significant elements of industrial transformation in Italy was Italian industrial districts that became a popular subject of debate in different fields at the end of the 20th century. The scenario, reminiscent of the Industrial Revolution, amazed everyone in the '70s when the phenomenon emerged, and at the same time became conspicuous. Interest was raised not only in Italy but also in other places because it challenged existing economic thought and opened up new horizons for economic policy. Therefore, the topic of industrial districts has generated a flood of literature since then.

The concept of Marshallian industrial district, as studied by Becattini over the years, with specialized manufacturing or services mostly covered a specific area within one or more provinces. These districts were highly creative and situated primarily in the country's more developed - Northern part (Biggiero, 1998). The industrial district is identified by Becattini as a socio-territorial entity that is characterized by the active presence in one region of both a group of individuals and a population of companies. Unlike other areas such as industrial cities, culture and businesses tend to combine in the district (Becattini, 1990).

The demand for durable goods, particularly products for the individual (textiles, clothing, footwear, jewelry) and for the home (furniture, tiles)-which were the

type of goods specialized in the Italian districts-was increasingly fragmented and variable. As summarized by Gabi Dei Ottati (2018), the new consumption pattern, shown by customers, favored the growth of districts, not only because of the versatility of their organization but also because of the widespread availability of craftsmanship that was still present in the local communities where Fordist industrialization had not penetrated. This favored the success of exports of goods produced in Italy for the individual and the home (Becattini and Menghinello, 1998) and the emergence of the concept "made in Italy".

According to L.Leydesdorff and I.Cucco (2019), using 2011 census data, 141 industrial districts, and 611 so-called local labor systems were differentiated by Statistics Italy (Istat) based on commuting patterns. However, industrial districts do not constitute a distinct level of administration and are thus not included in national statistics. According to Becattini (1998), given the complexity and continuous change that characterized the industrial district, the study of the districts should be broken down into the analysis of a number of different processes that allow reproduction to adapt over time to the changes affecting the district. Indeed, a few decades after the given discussion, industrial districts in Italy, and in particular in the Milan area represent a subject of significant transformation.

Bananas, European bunch of grapes and Northern Italy

There have been several attempts in the past decades to identify European regional-economic and urban development through various patterns and interpretations, especially after the 80s when regions started to gain importance and North Italy has always been a significant part of these debates due to its economic success. "Blue Banana" was one of the first metaphors proposed by a group of French geographers led by Roger Brunet (1989), representing trade routes and an accumulation of industrial capital in Europe through the identification of the core and a periphery. Despite criticism of the model

(summarized by Faludi, 2015), the urbanization corridor which was described through the concept of "European Backbone" was stretched from North Wales to Northern Italy, with the consideration of Milan as an important element of the corridor.

On the other hand, Klaus Kunzmann and Michael Wagener proposed an alternative concept of sustainable and democratic, even development of Europe in 1991 by suggesting the model of "European Bunch of Grapes". The idea was a polycentric development where again, Northern Italy represents one of the significant centralities in Europe.

It would be reasonable to assume that the Blue Banana and its counter concepts opened a debate that led to understanding further steps Europe should have taken towards better living conditions and equal opportunities. Positioning Northern Italy and particularly Milan into this debate of a larger regional context gives sense to its further study at the local scale when it comes to the innovation at the city level. Despite the contradictory visions evolved through the way of discussion, Northern Italy has evolved as a significant element of European urbanization, holding a leading role in various regional or national contexts.

A new hi-tech Triangle

Contemporary economic dynamics have pushed hi-tech services, the knowledge economy, and competitive mechatronics, chemicals, furnishing industries into the foreground under the sign of "industry 4.0". As a result, the Traditional industrial triangle doesn't exist anymore as Turin has undergone strong deindustrialization, Genoa represents a shrinking city with numerous demographic issues and the production model is becoming more fragmented.

Milan remains a relevant role but development moves eastwards towards Veneto and Emilia as Fondazione Pirelli (2018) published: "*The vertices of the new*

Image 6.1 Division of Italy Source: Stannard K. (1999) Elaborated By the Author

Italian Industrial Triangle are in Milan, in the small and medium-sized enterprises of Veneto and the pocket-sized multinationals of Emilia. [...] According to the figures, the GDP of this modern industrial triangle as a whole is higher than that of the Netherlands, Sweden, and Poland, combined with a higher output value-added than that of Spain." It is an open economy, export-oriented, well-integrated with the German and French industries, and resilient to competitive business activity. As it was mentioned before, North Italy is privileged for the investments and attracting expertise, skills, and talents that are marked by high levels of innovation.

The new hi-tech triangle proposed by Fondazione Pirelli doesn't represent an administrative unit but an interpretative figure pointing out that the development is moving East compared to the industrial boom in the 60-70s.

In the words of the president of Assolombarda -Carlo Bonomi, (which itself is not a scientific source but a reliable and remarkable quotation provided by Fondazione Pirelli in the above-mentioned article): *"We shall not compromise, we shall not embrace ideological biases that impede the construction of the works required to improve our regions."In short, the new industrial triangle is an original geometric and geographic figure – fast and dynamic. And open"* where Milan remains the leading position.

6.2 Milan And Its Innovation Ecosystem

6.2.1 What do we mean by the Italian Innovation System?

According to Loet Leydesdorff and Ivan Cucco (2019), regions have gained significant importance as innovation-policy units since 2001, when the Italian constitution (Riforma del Titolo Quinto) was modified. Regional governments were granted greater influence over policy areas such as health, education, and economic and industrial growth through a number of devolution initiatives, including innovation policy (Rolfo; Calabrese, 2006) and later S3 that gave the power to the intentional development by a constellation of actors that are aiming to create innovation systems. This change has led to a sharp reduction in the national budget to support industrial and research and development activities, especially in the South. Brancati (2015) reports that state assistance dropped by 72 percent between 2002 and 2013; central and northern Italy was privileged by the remaining state interventions, while industrial policies in favor of the southern regions were practically abandoned after 2000 (Prota; Viesti, 2013).

Despite the growing role played by regional governments in innovation policy, the question of whether the regional level is most suitable for the design and implementation of such policies has remained the subject of debate. In contrast to its principal competitors, Nuvolari & Vasta (2015) described Italy as a structurally poor national innovation structure. In addition, a number of studies in different sectors of the Italian economy (e.g., Antonioli et al . , 2014; Belussi et al . , 2010; De-Marchi; Grandinetti, 2017; Lew et al . , 2018) have argued that the international orientation of partnerships in research means that it is difficult to regard Italian regions as structures of innovation. As "glocal" structures, these creative regions are best defined. At the local level, they combine a relatively low connection with strong knowledge-intensive ties at the international level. On the manufacturing side, this foreign focus poses a risk of creative districts and regions being de-industrialized because multinational companies can quickly purchase

and move new alternatives elsewhere (Cooke; Leydesdorff, 2006; Dei-Ottati, 2003).

Malerba (1993) argued that "not one, but two innovation systems are present in Italy:"

- The first one is a "core R&D system" that operates at the national level through systematic cooperation between large firms with industrial laboratories, small high-tech firms, universities, public research institutes, and the national government.
- The second innovation system would be a "small-firms network" composed of a plurality of small and medium-sized firms that cooperate intensively at the local level, often within industrial districts, and generate incremental innovation through learning-by-doing

Almost three decades later, the multiscale nature of the Italian innovation system remains its glocal nature, especially speaking of the developed North, more, in particular, the Lombardy Region and the Metropolitan City of Milan. While the subject of fragmentation between the two levels and the gap in the institutional framework remains an open issue, the outcome of the debate is having a city as a place or the city as a node of a global network.

Milan in context

Milan has clearly positioned itself as a center to the Italian economic system in the global discussion recently with the help of relevant policies, institutions, and the desire of creating an innovation ecosystem. Moreover, it has been representing a bridge between Italy, Europe, and the world. The Metropolitan area of Milan hosts 3.200.000 inhabitants nowadays that makes it one of the most densely populated areas in Europe. According to the data provided by Commune di Milano (Migration Policies Milan IC, 2018), "*Today, around 19% of Milan's total*

population of 1,380,873 people have a migration background: this share (which is twice the Italian national average) is an indicator of richness and attractiveness – the more magnetic the metropolis, the higher the number of immigrants".

International students represent almost 7% of students in Milan according to the 2018 data and by share of non-Italian citizens in Milan is expected to rise by 2030. *"The Municipality is committed to making Milan more attractive, by balancing increasing internationalization with integration processes and by promoting the new citizens' positive contribution to the urban social fabric."* - notes the above-mentioned report.

When we see Milan with a closer look there are many dichotomies as highly developed life-science sectors, engineering, and STEM coexist with agriculture, fashion, and tourism coupled with a pool of talent and international students with lower income immigrants and deprived polarized social groups. All together these and many other contrasting elements make the city unique.

It's challenging to fully summarise specialization niches of Milan, since existing numbers and statistics, identified clusters, and reports provided by different organizations/firms usually overlap but don't always match. According to Lexia Avvocati, based on the Chamber of Commerce source, key sectors in Milan are ICT and Media (with 1200 companies active in the industry), Creative industry (with 13000 companies and 84000 professionals), Finance and consultancy (10000 financial services companies), Chemicals and Pharma (2nd region in Europe with its employees), Research & Development (2nd region in Europe with the number of companies that support innovation with 22% of R&D expenditures that are generated in Lombardy).

While looking at the GDP and numbers, the city has 300.000 companies (50% services, 25% trade) vocations in Agri-food, finance, manufacturing, life sciences,

cultural and creative industries that together produce about 10% of the national GDP coupled with tourism and international students that create a local added value of 13% each. However, even though agriculture or tourism has very little to do with innovation, life-science remains the most promising niche coupled with other innovative clusters identified by S3, ex: aerospace or green chemistry. Milan boasts some of the most advanced research centers of the Life Sciences and Biotechnology in Europe, specialized in various sectors. 26% of Italian companies in the Biotechnology industry are located here, with a turnover of € 3.4 million, representing 70% of the regional and 45% of the overall national turnover. In addition, 32% of Italian patent applications to the EU patent office come from Lombardy and €47Bln spent on R&D in Lombardy every year. 22% of registered patents are from the Milan area.

On the other hand, creative enterprises located in Milano make up more than 10% of the overall Italian national number. The Milan Metropolitan area produces 61% of the Italian turnover for design and the fashion industry. The Milanese trade fair system creates a value of € 2.1 billion, of which 50% are exhibition services. The value of the fashion industry, including trade, is approximately € 2.4 billion, of which approximately 60% is an industry. Milan is one of the five world capitals of shopping.

There are 2100 innovative startups registered in Milan which makes it the 1 st city in Italy, however, none of these companies have made unicorns so far. Moreover, Italy is one of the surprising examples with no unicorn companies at all as scaling-up, scarcity of venture capital, and market limits remain one of the main challenges for startups in Italy nowadays.

On the other hand, Milan has a clear direction towards the quadruple helix model of innovation policy and strong intention to address social challenges as social innovation coupled with urban innovation remain the silver lining in most of the actions or fundings coming as the city initiative. A series of activities, since 2011

aims to combine the development of innovation and new urban economies and the social inclusion of the most fragile segments of the city.

In 2017 the Municipality of Milan launched the "Manifattura Milano" Action Plan for the development of new crafts and digital manufacturing in the city. The new measures support investments of manufacturing enterprises in the suburbs. 5M EUR investments from the city municipality are considered to be spent during 2018-21 to support new manufacturing companies that are located in the suburbs as well as 340.000 EUR sponsorship during the same period of time for the startups with social impacts that are located in the periphery.

Smart city and smart people is another leading pillar of Milan's vision where the Smart City paradigm has changed in being not only technology for efficiency but also people-centered supporting innovative smart tools in the city center as well as with a major focus on suburbs.

When it comes to the R&D funding, Italy lags behind the 2.4% average of other developed countries with R&D spending of about 1.3% of its gross domestic product. Around one-third of the spending, (which was €23.8 billion in 2017), according to the Italian National Institute of Statistics, came from public sources such as the Ministry of the Environment, Ministry of Health, and the Ministry of Education, University, and Research (MIUR). As the partnership between universities located in Milan and private companies and industries are fairly strong, there are numerous research funding and initiatives coming from the private sector as well. However, apparently not enough to impact the statistics.

Milan has become a city that is "over-described." Over the last few decades, a number of people with different viewpoints have provided a broad range of descriptions of the capital of the Lombard Region, mostly sectoral and partial descriptions based on particular goals, needs, or interests. They are powerful and efficient images (Milan, the economic and moral capital, Milan, the European

city, etc.), always preferred by urban marketing (Milan, the city of fashion, Milan, the city of architecture, etc.), almost always specific and important, almost all focused on a single characteristic: excellence. Such descriptions have fed the inhabitants' collective and individual views and can be found at the base of much of the prevailing discourse in the Milan political and social debate.

In the recent public discourse on the Milan area, explanations of the opposite kind have been enriched, focusing on the essential aspects of the city (and the surrounding region) that its inhabitants most note, such as atmospheric pollution, road traffic, and living costs. Although the evocative force characteristic of schematic facilitating images seen in the edifying descriptions has not yet been acquired by these portrayals, they are now very common in some particular contact contexts (e.g. online discussion platforms of major daily newspapers in Milan).

However, none of these images seem to be effective in portraying the great variety, interdependence, complementarity, and conictuality of the phenomena that affect Milan as an actively inhabited place and that could have a major impact on its prospects for growth.

6.2.2 Territorial interpretations of Milan

Over the past three decades, two separate ways of understanding urban phenomena have been emerging in Italy. The first involves attempts to "regionalize" Italian territory and is based on the Functional Urban Area (FUR) definition. The term "metropolitan area" was adopted by this scientific model, named "functional" (BBSR, 2011; OECD, 2012) and begins from a general definition, and continues to empirically classify geographical entities that can be identified as "urban" in order to evaluate urban areas. This technique supports a quantitative approach. The second paradigm, called "spatial," introduced the word "urban region" and emphasized the various social, economic, and morphological

characteristics that characterize contemporary urban areas (Soja, 2000). The second paradigm was called "spatial." On the contrary, this territorial interpretation begins from localized observations and progresses to the identification of relatively homogeneous settlements. Qualitative methodology favors this technique.

In the past decades, as the functional paradigm peaked in Italy, alternative approaches to the urban phenomenon were being put forward. Two main sources can be identified to trace back these new approaches: on the one hand, the theoretical stance that conceived the city as a “network” rather than as an “area”; on the other hand, the methodological practice to start from the observation and description of actual urban forms rather than from a general and abstract definition. This research line was first applied to Milan as early as 1987, in two monographic issues of the magazine Urbanistica, collecting contributions by renowned architecture professors and professionals. The opening text stated that the peculiar gaze of architects and urban planners allowed them to “read into what is not visible beyond the urban form” (Boeri, 1987: 46). Indeed, the research subject was not conceived as the urban morphology per se, but as the relationship between urban forms and “social demands, their potential expression, and their political recognition” (Secchi, 1988: 93).

Milan as complex geography has been interpreted in several ways and these images operationalize different approaches and representations. Moreover, Milan is strongly embedded in its regional context that opens up a number of alternative ways to look at the city. As summarized by Matteo Del Fabbro (2015),There is a significant difference in the interpretations and the terms used as well as they refer to different spatial categories - the “Metropolitan area”, “Urban system”, “Network of cities”, “Urban Region”..

While the approach of Milan as a metropolitan area, and Milan as an Urban System images derived from the functional paradigm represent the urban area as a

fundamentally monocentric system (in some cases, with polycentrism strongly dominated by one center), Milan as a Network of towns, and Milan as an urban region illustrate the conceptualizations of the spatial paradigm, the point at the fragmentation of Milan urban area - both in-network and “settlement” vision, sharing the idea of a polycentric system with increasing transversal connections, contrasting with the traditional radio-centric structure of the city.

The monographic issue of the journal Territorio, published in 1999, entitled 'New pictures of Milan's territory,' can be seen as a turning point in the scientific debate on the spatial paradigm concerning the Milan case. The limitation of the territorial paradigm, as it has been described, was that it technically stopped evolving "(Calafati, 2009)." Different research methods were, however, successively followed: from a strong and articulated systematization of the previously elaborated theoretical and methodological perspectives (Lanzani, 2005); to a more realistic approach, less focused on outlining a picture of the urban area of Milan and more willing to set a political design context (Balducci, 2004). (Matteo Del Fabbro, 2015).

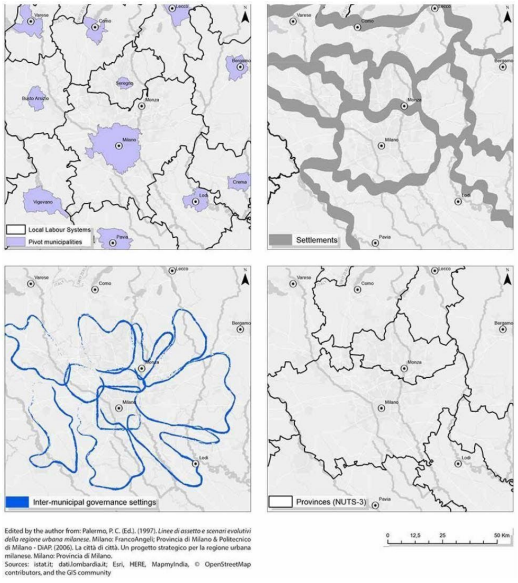


Image 6.2.2 Territorial Interpretations of Milan

Source:Matteo Del Fabro, 2015

Finally, the Politecnico di Milano research group, which collaborated with the provincial government to propose the strategic project 'La Citta di Citta' (City of Cities), contributed to the conclusion of the conceptualization of the territory of Milan by providing 11 subdivisions of “cities”, however, the concept never got to the further stage either.

Finally, none of these interpretations are fully able to capture the complexity of Milan or address the emerging challenges as the city represents the constantly transforming center of many different powers and overlapping layers. Nor these visions tackle directly the questions of innovation but they contribute to widening the debate about what we speak about when we speak about Milan since Milan doesn't only represent a city, or only the metropolitan area but a more complex and multiscale phenomenon.

6.2.3 Smart Specialisation Strategy (S3), Milan metropolitan strategic documents and innovation system

S3 is one of the most significant strategies developed by the European Commission that represents integrated, place-based economic transformation agendas focusing on policy support and investment on key national/regional priorities, challenges, and needs for knowledge-based growth, including ICT-related measures, building policies and investments. The framework at the same time is open for interpretation in order to be adapted to the local context. S3 was implemented in the Lombardy region (where the regional government was in charge of implementing it) in 2014 when macro-areas called "competence systems" were identified (referring to nine pre-existing clusters, which are: *aerospace, agro-food, green chemistry, energy, and the environment, smart plant, mobility, life sciences, living environments, and smart communities*) with a bottom-up entrepreneurial process of discovery involving different stakeholders in the consultation (i.e. firms, higher education institutions, and research centers as well as independent inventors and innovative startuppers).

The S3 approach is thus well suited in this context as it stimulates entrepreneurial discoveries within clusters and allows for the concentration of resources in selected industrial domains, some of which have a significant presence in the Milan area. However, the Milan municipality wasn't much involved in the process as the main stakeholder.

Even though S3 was implemented at the regional level in Lombardy, cities were the obvious candidates to be the 'engines of S3' for a vast majority of European regions because they can better identify the most suitable areas for specialization, capitalize on their unique ecosystems, mobilize their assets, resources, and individuals to target their efforts. Besides, cities can create their own networks and partnerships for innovation regardless of the region in which they are located. However, In the case of Milan, it is the regional authority of Lombardy responsible for the Smart Specialisation Strategy development since 2014, and not the municipality, and within this strategy, the regional government did not include any meaningful differentiation for the different regional territories, from Milan to medium-sized cities in the region or peripheral mountain areas which could be seen the strength of the region but at the same time relate to the ambiguity of the spatial boundaries of Milan.

According to the interview with Lucia Scopelliti (Head of Unit, Economic Development, Municipality of Milan),

"The local authority was not in their mind as the first layer of stakeholders. In fact, the interaction happened to be among us and clusters, not the regional authority. We were involved in meetings, congresses, and talks in order to express a few of our priorities and main projects but we didn't work with them. What was missed is the opportunity possibly offered at the local level was not easy to intersect for the companies belonging to the clusters." - says in a personal interview.

On the other hand, the Metropolitan City of Milan has expressed its strength to position back itself on a world map again recently, and the event that triggered it was the International Expo of 2015. According to N. Dotti, G.Lazzeri, A.Bramanti (2018), this success was related to a new economic model able to mix

an improbable combination of factors supporting the local productive system and leading to innovation.

The combination of both traditional economic factors and soft cultural assets leading to a growing number of start-ups is combined with a new frame for industrial policy, which are less about market interactions while focusing more on systems, networks, institutions, and capabilities through a Quadruple Helix perspective. Referring to the S3 frame, the success of Milan is particularly enlightening because it is a large, international city acting as the gateway of a broader region, Lombardy.

When it comes to the Innovation ecosystem of Milan, it is a complex phenomenon to be described due to its multiscalar nature and diffusion. According to Prof. Gabriele Pasqui, *"Milan is many different things. It is a stratified innovation system that works on the international level as well as the city and regional levels. And I think it's an advantage"*

However, the overrepresentation of different local and international actors (that operate at various levels) makes the coordination of the initiatives challenging as there are many different strategic documents and projects provided nowadays from various sources.

One of these documents is the smart city plan, consistent with the fundamental principles of the Europe 2020 strategy, according to which a smart city not only develops its technical aspect but is also capable of integrating economic growth and social innovation, innovation, and training, as well as study and participation. With the introduction of a public initiative named 'Public Hearing: Towards Milan as a Smart City' in April 2014, the identification of strategic priorities for Milan as a smart city began. This initiative aimed at involving the main actors of urban development in the creation of a system, thus making them the active protagonists of a process consisting of not only consultations and governance.

Milan proved to succeed in terms of the Social innovation (according to the rising numbers of socially-driven start-ups, projects, and engagement) yet the city does not have a general framework available giving a clear strategy that would operate at different levels and could be able to cover all the initiatives or to give a direction to academia.

"This is an example of a complex program in which there is a national government, the region, and a municipality presented with strong links to the EU level and there is a problem of coordination between different parts of public administration and engaged actors."
Prof. Gabriele Pasqui

Milan remains a knowledge-based economic city among the Italian urban structures, with a high degree of innovation in manufacturing activities and new workplaces. Nevertheless, in the midst of the areas of greatest abundance, Milan shows a contradictory urban transition, including a systemic phase of spatial shrinkage, social isolation, marginalization, and conflict, along with complete desolation (Andreotti, 2006). Instead of a cohesive whole, the city appears more as a place of contradiction and a site of rivalry. Paradoxically, this latter situation has been assumed by the Municipality of Milan as an asset rather than a weakness, using it to create a modern public policy style. In Milan, after the election of former Mayor Giuliano Pisapia, the advent of a more pluralistic urban governance system has led to the redefinition of the positions played by local authorities and economic and social actors (S. Armondi, A. Bruzzese, 2017).

6.3 Key Actors And Their Interrelation

The entrepreneurial dynamism is a feature of Milan that together with the other factors here discussed, confirms this city as a Cluster of Innovation. Here, economic and social stakeholders are willing to engage with public administrations. On the other side, the city administrators understand that their role is to be facilitators and catalysts. The success of Milan is due not to individual actors or decisions, but to the urban ecosystem collectively developed over the last half-century.

However, if we look at the engaged actors more closely, there is a high presence of universities, firms, industries, organizations, and state authorities in Milan, coupled with different communities and social groups with various needs. On the other hand, representatives from the regional, national, and EU levels are actively involved in the process of creating the innovation ecosystem of Milan by supporting various initiatives. Instead of having "engines", a network of a high number of actors and stakeholders intersect in many ways in Milan, with a significant connection between Academia, firms, and local authorities with a high focus on urban and social-driven innovation through the Quadruple Helix perspective.

Network of academia

Milan is ranked 15th in the best student cities ranking (2020) for the employer activity quality. Eighty research centers and sixteen universities are presented in Milan where the majority are the top higher education institutions that compete in the worldwide ranking. Milan is the 3rd most highly sought among graduate employers city in the EU (after London and Paris) and the 16th in the world (QS Best City for students 2016 ranking).

Image 6.3 Universities in Milan

Source:Author

When it comes to creating the innovative ecosystem of the city, the whole university system (with a strong engagement of Bocconi University, IULM, Politecnico di Milano, University of Milan, Università Cattolica del Sacro Cuore, University of Milano - Bicocca) is deeply involved by direct cooperation with companies, industries, and research for promoting innovation in different study areas. Therefore, there are numerous direct research and Ph.D. programs available funded by companies.

As an example of Politecnico di Milano, academia in Milan operates on three main levels when it comes to the creation of an innovation ecosystem and supporting related activities and initiatives:

-direct cooperation with companies in the definition of innovation programs and tech innovation (through agreements and different collaboration)

Ex: Agreement between Politecnico di Milano and Telecom for using ICT for innovative urban technologies.

-the use of physical spaces (Regeneration through innovation)

Physical spaces that are promoted by universities. For example in Bovisa, where Politecnico di Milano uses spaces (especially deprived areas) for innovative activities for urban regeneration.

-Direct involvement in urban innovation and social innovation

Direct involvement of universities in urban regeneration - for instance, political - social responsibility program of Politecnico di Milano where Polimi is directly

involved with different actors, social groups, public administration, identifying spaces for urban innovation, and funding different initiatives.

Public sector and multiscale organizations

Milan reveals strong bonds on different levels, from the direct and direct relation with the EU (spatially, politically, or economically) and its member countries, as well as the National level of Italy and Lombardy region authority. While Comune di Milano operates at the Metropolitan city level, there are a number of associations and organizations represented at the local scale and all these actors intersect in many ways (by funding, mobilization of resources, or community representations).

As Milan is closely linked to the European goals, there are several EU initiatives, policies, and programs, as well as the objectives set out in the 'Europe 2020' strategy, and the programs are being implemented at various levels in Milan within the context of the strategy. The Regional Authority of Lombardy is responsible for implementing the S3 and the 2014-2020 Regional Operational Programme (ROP) of the Lombardy Region under the European Regional Development Fund (ERDF), which provides investment funds of almost EUR 1 billion (EUR 970,474,516) with priority objectives for the region's economic growth and social development, as well as for improving its productive potential. The ERDF ROP promotes a smart, sustainable and inclusive growth model in line with the objectives identified in the “Europe 2020” strategy and with the regional government’s development policies promoting the productivity and competitiveness of its businesses and the entire economy of the Region.

On the other hand, a number of H2020 programs are being implemented directly at the city level as well such as Smart cities, Clever cities, Sharing cities, or Urbach, etc. These initiatives are being managed through the local authority and involvement of academia, stakeholders from the private sector, and industries.

However, there is an absence of strong coordination between the city-regional-national and EU level, and there is no common strategic plan of Milan available that would work as an umbrella vision of all the different initiatives and programs that come from numerous multiscale sources.
The municipality of Milan is the local authority mostly in charge of management and coordination but not strong enough to take the lead in terms of the city strategy. It collaborates with universities, entrepreneurs' organizations, and the Chamber of Commerce in supporting innovative start-ups acting as a mediator and enabler (On the one hand, providing tools and programs for the different audiences and on the other, helping for networking and scaling up). Moreover, the authority attracts finances for startups to get funded and scale-up and launches various supporting policies to attract entrepreneurs with the strong engagement of AMCHAM Italy, Camera di Commercio di Milano Monza Brianza Lodi, Invest in Lombardy, Invest in Milano. Commune di Milano has launched a number of activities in order to promote the Milan ecosystem abroad, facilitate the international companies and help the ones based in Italy to get linked with other cities and broader audiences in Europe.

The local authority in Milan adopts a needs-driven approach, which was clearly shown during the Covid19 lockdown when in the absence of international dynamics, the focus of the municipality was shifted on people through the new campaign dedicated to the citizens in order to address growing neighborhoods in Milan.

Between the social and the spatial "(De Boise et al . , 2016) is the vision of the Milanese public policy approach and understanding of smartness, as it is focused on the use of emerging technology, while also balancing economic growth with social inclusion, infrastructure and human resources, creativity and training and study and participation." It, therefore, promotes smart initiatives aimed not only at the potential of ICTs but also at the vulnerable targets of the population (the elderly, girls, young people, people with disabilities, migrants), with a view to

growing equal opportunity and addressing discrimination. At the same time, by putting together numerous actors, along with public and private capital, the municipality explores all the policy instruments required to provide the structure and internal cooperation (S.Armondi, A.Bruzzese 2017).

Firms and startups

In order to understand how firms, startups, and the private sector, in general, contribute to creating the innovation ecosystem of Milan, first, it's important to know what kind of companies are located in the city and what challenges they are facing. The Milan Metropolitan area accounts for nearly one-third of all foreign-invested firms in Italy, more than 30% of their employees and 34% of their turnover. Milan is home to 123 large companies (companies with turnover greater than € 1 billion). 52% of these investments come to manufacturing and energy, followed by 18% in trade and transport, and information and communication with 11% of investments (Invest in Milano 2020).

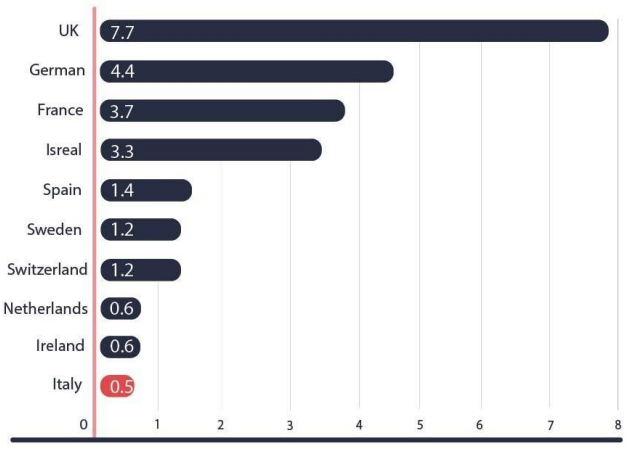


Image 6.3 (2) Investments in 2018 Bn EUR

Source: https://ec.europa.eu/eurostat

The financing of venture capital in Milan and Italy is rising, but not enough; start-ups in the country raised EUR 522 million in funding last year, compared to just EUR 140 million in 2017. The country, however, lags far behind the UK, France, and Germany. According to Sifted, 2019 *"instead of avoiding brain drain, Italy appears to be actively exporting its founders. "The idea is not to go back to Italy but to have the companies stay in London and find customers here," says Grasso. The path between Italy and the UK is already a pretty well-trodden one. With an estimated 100,000 Italians living in London."*

"Italy is a great place to start a company and to prove something, but it doesn't have enough funding and exit possibilities," says Andrea Severino, the founder of Healthy Virtuoso.

Companies in Italy are indeed usually small, and when it comes to Milan, there are a growing number of scale-ups (2100 innovative startups registered in Milan by 2020 and around 100 scale-ups). In order to have scale-ups, a number of programs and initiatives are funded, for instance, programs run by Startupbootcamp and bankrolled by the Italian Ministry of Economic Development and the Italian Trade & Investment Agency in London in order to assist Italian startups in growing into unicorns. There are different fundings available for early-stage or growth-stage startups in Milan such as Seed Accelerators that usually accept teams with products and some form of traction. Investments range from $15k to $150k in exchange for equity (6-10%). Around 30 notable seed accelerators are registered in Milan (Founder Institute, 2019). Angel investors are another notable type of investments that are available in Milan, these are the people that usually invest (one-time investment) their personal capital in early-stage startups or entrepreneurs and are focused on helping startups build a product instead of generating a profit. More than 30 notable angel investors and angel investor groups are present in Milan and they are known by other names as well, including informal investors, private investors, or business angels.

When it comes to the growth stage, the situation is trickier. Venture capital firms invest in companies that have long-term growth potential of at least x10 their investment and that already have considerable traction, team, and product/service. As the standards of VC investments are high, usually less than 1% of businesses are funded by venture capital. However, besides the high standards, keeping startups at the scale-up stage is a challenge for Milan as they relocate usually to the US or UK to grow.

While growing startups are not in the best position in Milan, there are indeed a high number of large companies and industries presented that significantly contribute to R&D, support universities, research activities, and program funding (ex: Ph.D. programs sponsorship). Universities indeed collaborate with firms, get funding for the research, and different grants. However, there is an unusual synergy between these two actors in Milan where the private sector (big firms and industries usually) clearly dominates. One of the examples of it is the Bicocca project where Fondazione Pirelli invested in creating a science park through which the creation of the university was highly supported in order to create innovative dynamics. The case of Bicocca will be discussed later, as a development project that never ended up becoming a science park of an innovation district but it represents a good lesson for the city.

Another example of Milan where the private sector tends to contribute to R&D is the MIND innovation district which faced numerous difficulties and obstacles to relocating the State University of Milan campus in the area. Locating Human Technopole that received 1.5 Billion in governmental funding for the research raised a debate as well. *"Italian research is becoming a desert," says Massimo Dominici, an oncologist and hematologist at the University of Modena and Reggio Emilia, "but that doesn't mean water should be poured in without following international standards." - wrote Laura Margottini in 2016.*

6.4 Enabling Factors

1. Contextual factors

Milan has positioned itself globally as an Alpha city, becoming open for innovation and there are some contextual factors thanks to which the city had the opportunity to succeed thanks to the geographic location, industrial past, political and policy support, and other relevant factors.

First of all, due to the beneficial geographic location and characteristics that were the closeness to North and direct access to Europe as well as good road and rail links across the flat North Italian Plain. Milan has been acting a leading role in the Industrial triangle of Italy thanks to the plenty of flat lands available for the large factories to be built which acted as a trigger for the industrial shift. Alpine rivers provide a source of cheap hydro-electric power and nearby natural gas provides cheap energy that results in high economic production and a strong diversification of business in the manufacturing and service industries at the end particularly in the traditional and modern manufacturing and service fields.

Leisure opportunities are one of the elements that make Milan attractive, Alps to the North and the Mediterranean to the South create excellent leisure locations coupled with the presence of high-quality advanced education and of the private and public research system which bring international students and talent into the city.

Due to the active and diversified industries and active labor market, a population of over 10 million in the region provides a large local labor force. The car industry employs over 140,000 people in the Lombardy region while large-scale agriculture provides many jobs. Moreover, The creative sector of the Lombardy economy is one of the largest in Europe and in the world. With unique strengths in visual arts and architecture, it is a major regional asset. The educational and

creative arts institutions of Lombardy draw talent from around the globe and should be regarded as a major industry (OECD, 2011).

2. Regulatory & Institutional factors

Milan has a long history of being a" self-governing city, "a city where the role of private actors (both profit and non-profit), as well as higher education and cultural institutions, has always been as important in setting the urban agenda and implementing urban projects like that of local authorities.. It is, however, part of a broader area and a variety of diverse geographical structures that affect the institutional structure.

A high number of policies have been launched during the past decade, and institutional support became available for innovation development in the city as well as the integration of smart city objectives as for example Comune di Milano's approach towards new developments through "trading" mandatory taxes that are usually paid in cash, by offering developers to implement smart technologies (cameras, digital tools, sensors, etc) according to certain standards in order to get further data, provide connection, etc.

On the other hand, the existence of representative organizations in Milan, deeply entrenched in the manufacturing and industrial sectors, as well as the presence of larger corporations and major multinational groups, is widespread. The organizational complexity is manifested by the widespread presence of the vast tertiarization of capital firms, with a solid specialization in professional services.

The Milanese entrepreneurial system has substantial features that explain its higher performance compared to the rest of the country (Camera di Commercio di Milano, 2013) including the location of many larger firms and important multinational groups; Reduced manufacturing sector, but which claims

productions of excellence in some leading sectors and a high capacity to create jobs and the intensity of openness to foreign countries.

Overall, existing regulatory and institutional factors work both at the local as well as international level with the leading part of social innovation, finally shaping some resilient forms of new entrepreneurship, such as foreign, one-person companies, which grow in general and through innovative start-ups.

3. Innovation Policy Framework and spontaneous change

Milan shows an increasing trend in the demand and supply of economic and social innovation (Comune di Milano, Fondazione Brodolini, 2016). Quadruple Helix's perspective was identified as the leading pillar of developing innovations in Lombardy in 2015, suggesting the open innovation environment, the process of gathering from the community comments, observations, ideas for improvements, and modification, all to be considered in the review process. Innovations in Milan are directed towards improvements in the quality of citizens' life, favoring the development of shared solutions, focusing on communities, and being driven by needs rather than certain goals.

"Milan plays therefore a leading role in the context of social innovation: not only in terms of figures but also (and mostly) in the willingness to experiment. The city, in fact, is trying to promote social innovation as one of the fundamental aspects of the concept of a smart city, striving to go beyond the technological dimension and to turn it into a tool capable of contributing to the development of new methods to tackle socially relevant problems. In doing so, it involves a large number of stakeholders and uses digital technologies to support collaborative processes".

Milan White Paper on Social Innovation. Accelerating Milan's local ecosystem for social innovation (2016)

Therefore, the Innovation policy framework in Milan works in a more experimental way rather than the traditional technocratic model, creating an open-ended process that allows experimentation and flexibility. By leveraging its conventional economic and social strengths (such as its high levels of entrepreneurial activity and social cooperation) and combining them with both ICT technologies and the associated development of the shared economy and society (Centro Studi PIM, 2016), Milan has strongly reacted to the current economic downturn. This has been achieved by the (mainly spontaneous) growth of collaborative organizational alternatives to conventional workplaces (Colleoni and Arvidsson, 2014), where new practices are facilitated by sharing rooms, exchanging knowledge, and thereby reducing costs.

The spontaneity of innovation dynamics in Milan is partially impacted by the fragmented governance and absence of a shared vision which is reflected spatially as well when it comes to the innovation districts, science parks, their development and distribution in the city.

6.5 Challenge For Becoming An Innovative Global Node Or A Room For Inclusion

Before discussing the challenges that Milan is facing on its way to creating a strong innovative ecosystem, it's significant to keep in mind the dichotomy that exists in the city on almost every level. Milan is an area that operates at many different scales, where agriculture develops next to STEM, and where numerous organizations and initiatives emerge with weak coordination, etc. Overall these conditions create a perfect living lab for different initiatives to be tested and be implemented through an open-ended process; to address social issues and deliver environmental and social value, but does it make Milan an innovative global hub as the city is aiming? However, the scale is important in urban systems, and

despite its prominent position in Italy, Milan is quite small on a global stage, therefore it needs to remain proactive to keep its position.

It's difficult to say what are the anchor elements that create an innovation ecosystem in Milan. It faces fragmentation of politics and public initiatives, including the new Metropolitan City body that still has to find its place between the rock of the Region and the hard place of the Municipality. Milan is Italy's top metropolitan area and one of the best in Europe for creating and selling new goods and services locally and internationally. In the region, the blend of entrepreneurial dynamism, the availability of resources, old and new businesses, academic and research institutions is unmatched. Local governments have acknowledged the importance of investors and companies in fostering innovation and economic development, as well as the value of social innovation and placemaking. The heterogeneity of constituents imposes conflicting goals and trade-offs between citizens and businesses, although the local government is in charge of managing the ecosystem. For this purpose, public administrators should be able to work with each other to sustain the success of the region, bringing together very different players and forging or favoring emerging trans-boundary partnerships. Increasingly, the governance of a complex society like Milan is a joint effort, but the city has the resources to keep up with its citizens' demands.

According to the OECD, Higher Education in Regional and City Development report of Lombardy, Italy (2011), *"Italy has been slow to move to a "knowledge economy" model. In Lombardy, the regional labor market has traditionally had many jobs with low skills, and limited opportunities for productivity increases. To maintain its distinct global position over the long term, Lombardy needs to develop a highly-skilled workforce and a knowledge-based economy that can absorb it." Moreover,* the biggest need that we see in companies is not really to be disruptive in the market but to sell their product. Innovations in Milan nowadays (especially the ones triggered through the policies) are more process-oriented than the product as well as technological than organizational as

the major focus and subsidies go towards social innovation and the smart city strategy is being actively implemented on different levels. When it comes to the firms, market limits are another challenge. Without a larger market, there's very little chance for growth as the Italian market is too small.

The recent huge flow of immigrants, many of them children, pose a challenge to linguistic and cultural integration where new citizens need to be included also socially and economically. Older problems remain, Lombardy has a rapidly aging population, low labor market participation, and one of the most negative elderly dependency rates in Europe. There is a need to strengthen the policy focus on lifelong learning in order to extend the productive lives of the workforce and to make its education and labor market systems more inclusive (OECD, 2011), especially while the focus on smart cities and new technologies are high.
Due to existing flows and increasing prices, there is a threat of desertification of the city center where most spaces are for commercial and office use, with little presence of residents; Milan faces high polarization and social vulnerability, public housing and large areas belonging to the government which has got abandoned after deindustrialization and represents a great challenge as well as a potential for the city.

6.6 Science Parks VS Informal Innovation Clusters -Where Innovations Cluster Anyway?

"The entrepreneurial dynamism is a feature of Milan that together with the other factors discussed, confirm this city as a Cluster of Innovation." - writes Michele Coletti. However, there is no certain footprint of Milan available showing what are the locations where innovations gather.

Milan represents an unusual case of a diffused innovation system where despite a strong entrepreneurial climate, innovations are scattered and unlinked in space.

While entrepreneurial activities got distributed through small scale spaces within the city (historic inner ring), deindustrialization gifted a large number of vacant areas to Milan close to the second ring which became an opportunity due to their strategic location as well as a challenge for their high number and interest at the same time.

There are a number of large areas in Milan that were attempted to be transformed, are being transformed, or will be transformed into innovation districts. *"There is a problem of overproduction of transformation areas that should host these kinds of innovation districts"* mentioned Gabriele Pasqui during the interview. On the other hand, primary intentions do not always match the final outcomes. Not all the previously intended science parks/innovation districts got recognized and were realized as Innovation Districts in Milan as it's shown below. In fact, while the city of Milan has attempted several times to build an innovative environment for catalyzing science, innovations, investments, and startups, there is an unrecognized dimension of spontaneous agglomerations of innovation in the city. As we've seen before (ex: in the case of Boston), entrepreneurial dynamics often cluster within the city through flexible workspaces and coworking spaces. It's true that what are the elements that create spontaneous innovation agglomeration in the city are uncertain, however, coworking spaces and startup locations are some of the considerable elements that might help in understanding spatial patterns of unrecognized clusters of innovation in Milan.

In the following subchapters I overview cases of Bicocca and Bovisa (as one of the first attempts of Milan to build science parks), Spontaneous innovation agglomeration will be discussed afterward that emerge mostly in-between "innovation districts". Finally, I will focus in-depth on the MIND innovation district as one of the influential and large scale ongoing projects in the post expo area and its role on different scales.

6.6.1 What could be learned from the cases of Bicocca and Bovisa?

Redevelopment of large industrial areas that were being left close to the city center without certain uses was a significant part of a debate starting after the 1970s in Milan. Various studies began to rethink these industrial spaces. In this debate, Bicocca and soon after Bovisa represent significant attempts of developments once imagined as “science parks”.

The industrial area of the Bicocca project was owned by The Pirelli Group. The primary vision of the area was creating a scientific park that would contribute to different levels to promote the idea of a knowledge city. The municipality had a significant impact on giving the developer the mechanisms and collaboration to kick start the project in the initial phases by permitting higher land occupations or assisting that allowed investments and assisting to establish the University Of Milano-Bicocca. On the other hand, the location of the university has helped significantly to promote the real estate and housing market for the project as well.

From the perspective of 2020, when the project has been released, there is a gap between the initial image of the project, its objectives, and the final outcome. While the original vision was for the development of most new technical and creative industries as well as research facilities, mixed-use projects, including residential and commercial ones, also had some scope. The University, CNR, and the Pirelli research center itself were the only remnants of research and creativity left inside the final Gregotti program. The final design, however, revealed a different vision with a much higher percentage of residential construction than indicated by the initial project. Ultimately, the project had no choice but to be determined by the real estate sector because of the combination of high yields offered by the housing and office market and strong private investment interests, and so Gregotti 's final strategy was based on the viability of the scheme, rather than the construction of a techno-pole.

As a result, the Bicocca project can not be regarded as a strategic development project for the City of Milan if we compare the effects that the project has had on those that similar projects are supposed to produce. It gave the area new dynamics, but this transformation has usually been sustained within the project's limits. There are poor links with Bicocca and other universities in Milan and nowadays it represents more of an island for the city rather than an organic element. Looking back at the Bicocca project from 2020, it is clear that some of the project's biggest failures were due to the inability to establish consistency in the connections to the surrounding areas and beyond.

While Bicocca managed to be released (even if not as a science park), Bovisa - another strategic project for the city represents a site of conflicting potential nowadays. The main actor here was Politecnico di Milano who suggested transferring part of the university campus in Bovisa. The idea was related to the polycentric territorial city (similar to Bicocca's initial concept) - More specifically, the new functions were promoted for the area to set a new centrality in order to regenerate peripheral conditions. The main reason was the availability of abandoned industrial areas and the great rail accessibility.

The intention (which never fully released) was to bring regional-scale public activities, services, residences, public places, and green spaces to it: a new centrality, therefore was able to organize all those activities that are typical of the urban settlements around it which highlight the opportunities of the area to redesign this part of town, give it a new identity and corresponding shape - create places for study, research, living, community life, leisure, entertainment, sports, etc. The redesign of the large area covered by the Bovisa University of Technology (UTA) and the possibility of planning the vast area of the Drop, the original settlement site for the Politecnico, provides the opportunity to redefine the locations in this part of the city, which has as its core of importance the scientific and technical faculties of the Politecnico di Milano campus.

Over the past decade, the area has gained popularity as a "melting pot" of architecture and art. This pattern was confirmed in 2006 when a new headquarters was set up in this area for the Triennale Architecture and Art Museum, dedicated to modern art. Numerous master plans and attempts to redesign the site have been proposed with no success in recent years. Unable to solve the many constraints of the site, Bovisa has languished undeveloped, a hole in the urban structure of Milan, isolated from the flourishing areas surrounding it. In 2007, OMA worked on the master plan project for part of Bovisa, but it has not yet been launched.

There are several reasons why Bovisa never managed to get finalized, which, first of all, is the issue of pollution that represents one of the main unsolved problems of the area. Secondly, the ownership belonged not only to Politecnico di Milano but the two other public actors. Finally, and most importantly, Bovisa is a significant part of Milan but doesn't represent the top priority of the city. Due to the absence of private owner /developer development of the Bovisa area requires a huge amount of public finance which is absent at the moment. Moreover, locals are not in favor of large developments and new interventions in Bovisa which is a threat for a possible conflict that the government tries to avoid.

It'd be fair to say that Bovisa indeed represents a site of conflictual potential. One of the most interesting points here is that the main anchor is the university which naturally happened to appear in Bovisa with a great wheel to transform the site. However, in this case, the main obstacle was the absence of relevant funding and support not only at the city level but at the national level or private investments.

There are several conclusions and lessons that could be learned from these two cases where actors were different but the location and physical features were alike. The main anchor in Bicocca was a private developer while the rest of the elements (including the university) were artificially articulated but the project ended up as a regular urban development island. On the other hand, Bovisa seems part of a more natural process but here the problem of funding and finding

investments is the main challenge. The most exciting thing about these two projects is that they started to be developed in the same period of time and left significant marks on Milan. The question here is what are the lessons that the city learned from the past and how will it be able to match the different interests and needs in further attempts?

6.6.2 Spontaneous agglomeration of innovation in Milan

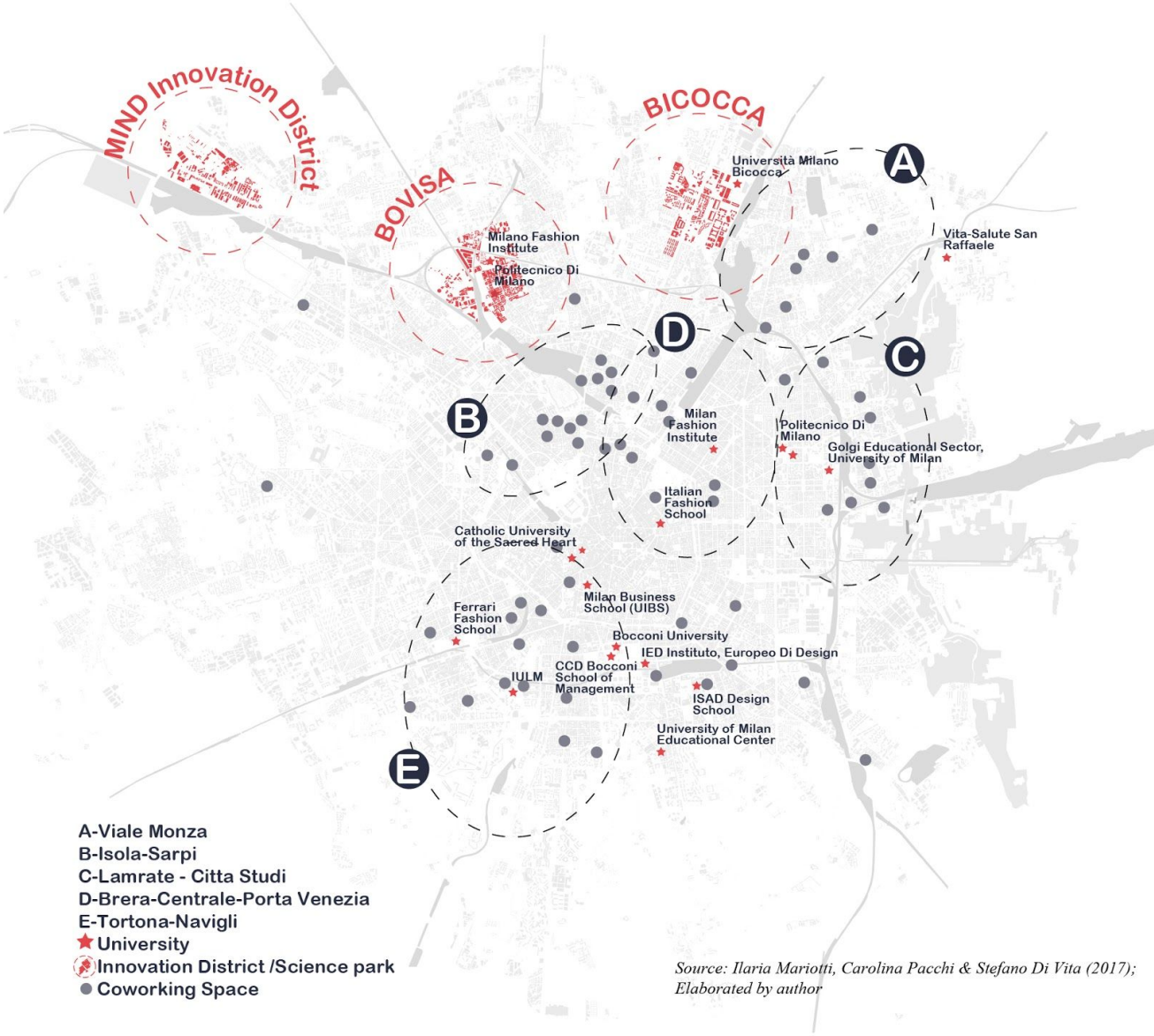


Image 6.6.2 Place-Based Innovation Ecosystems in Milan
Source: Ilaria Mariotti, Carolina Pacchi & Stefano Di Vita (2017)
Elaborated by author

While there are yet no established innovation district in Milan yet but an increasing number of innovative activities and knowledge workers, looking at the innovative dynamics and spaces in the city can lead to understanding where the existing innovative resources are located. On the other hand, spontaneous dynamics of entrepreneurial activities is a not yet fully observed complex phenomena which doesn't have a certain "matrix" (or at least based on the information gathered through this research). I will try to look at the spatial patterns of "innovative activities" located in Milan through the spatial patterns of coworking spaces.

The fist coworking space in Milan was first opened in 2006 and was followed by the rapid growth of similar spaces which reached almost 70 by 2015. These spatial trends and the effects of CSs in Milan were studied in 2017, by Ilaria Mariotti, Carolina Pacchi & Stefano Di Vita. As summarized in the research, there are five major agglomerations of Coworking Spaces in Milan which are characterized by strong connectivity to local public transport, high urban density, and functional mix. One of the major elements of these agglomerations is that they are mainly located in the Northern part of the city followed by central districts and are characterized by proximity to universities and research centers for Lambrate-Citta Studi, Brera-Centrale-Pta. Venezia and Tortona-Navigli areas. Moreover, the majority of the activities in some of the clusters tend to be related to media, architecture, or design.

Another interesting thing about observing spontaneous innovative spatial trends in the city is that agglomeration of CSs and diffused entrepreneurial activities in the city do not interact with Bicocca or Bovisa (nor MIND area) - "science parks" that exist in Milan for over 20 years but create a separate networks across more livable and accessible parts of the city.

While the city has committed tremendous financial resources and many other resources to regenerate peripheries through structured science parks,

innovative/creative activities have already found a way to emerge and spread within the city with scattered interconnected networks shaped without certain coordination through coworking spaces, startups (which are challenging to track due to the lack of relevant data), research centers, labs, accelerators, etc. In this case, the challenge is to recognize and address these dynamics with appropriate resources as the existing place-based innovation ecosystem in Milan is one of the key elements that contribute to the livability and attractiveness of the city as a global node after all.

It's also true that coworking spaces might not be the only criteria to identify spatial patterns of innovation, especially speaking about some specialization niches like life science, engineering, etc. require special environments, laboratories, and different synergies that do not necessarily interact with regular coworking spaces which are particularly smaller scale in Milan. Moreover, another notable element between existing scattered innovative activities in Milan and high-tech industries is that the latter niche requires not only a certain physical environment but intensity and concentration of investments which is not feasible to happen in such a diffused system. Probably, this is why Innovation Districts are often perfect triggers for high tech sectors. On the other hand, looking at Milan it's challenging to say which are the causes and effects while looking at the development of present place-based innovation systems in a certain way. Did the absence of investments and strong physical cluster provoke diffusion of "less technology intensive" dynamics spontaneously, or was it the capacity of the city (as a combination of various elements) and embedded local dynamics which limit the organic formation of hi-tech clusters (for instance in Bicocca)?.. While these elements are strongly interconnected with each other as well as the complexity of the city, there might not be clear answers to these concerns.

However, while speaking about what creates the place-based innovation system in Milan today, it'd be fair to consider the dynamics around CSs and their specializations discussed above which are architecture and design, digital careers,

communication, and information technology and social innovation which are embedded in the existing identity of Milan. As noted previously, these sectors can hardly be disruptive or compete with high-technology industries with the profit, but at the same time they represent notable elements of the city.

Finally, looking at the map showing the independent presence of spontaneous innovation agglomerations in the city and formal innovation clusters in the peripheries, the question raises if these different place-based innovation systems compete (or will compete after MIND and Bovisa will be finalized) for the same system or are these two layers separate from each other and represent the above-mentioned dichotomy of the city which is constructed with the strongly embedded local city identity (shaped by clusters of universities, small firms & startups, knowledge workers and Coworking Spaces) mixed with the global dynamics?

6.7 MIND - Threat Or The Opportunity?

"There are all the ingredients presented in Milan for creating a successful innovation district - scientific environment, talent and international aspirations, creative community, a good mix of large companies and startups and all the finance you need to get." - mentioned Fiorenza Lipparini (the Founding partner and director of research at Plusvalue) during an interview regarding MIND district. Therefore, it's not surprising to see a number of attempts for creating an innovation cluster in Milan, and MIND is the most recent example which is coming soon.

Image 6.7 Milano Innovation District Conceptual Diagram

Source: MIND presentation 2020

MIND (Milan Innovation District) is being developed by a private developer - Landlease (which operates at the international market and one of the areas of its expertise is innovation districts) in the post expo area (North-West part of Milan) which already has a strong identity thanks to the worldwide events and numerous activities that have been held on the site, especially Expo 2015 which was marked as a significant event for Milan. The owner of the land is Arexpo (with the involvement of main shareholders of the Ministry of Economy and Finance (39.28%), Region of Lombardy (21.05%), and City of Milan (21.05%),(www.Arexpo.it)) which announced a tender of the redevelopment of the area with a primary intention to create a science park. Arexpo, an agency established in 2011 to acquire land for the Expo and develop it, has chosen Lendlease for the post-Expo process to assist in transforming the site with a commitment to construct and run the project for the next 100 years which aligned the interests of both sides to build a striving as well as profitable place. In November 2017, Lendlease announced a first stage Consultancy Agreement, which included the development of the masterplan design and business plan for the public-private partnership (PPP) project.

Primary research and concept creation

Plusvalue is one of the main actors involved in MIND based in London (however, due to the project needs, involved staff spent more than a year in Milan), involved from the very beginning of MIND project as a consultant of Landlease who also worked with Julie Wagner (President of the global institute of Innovation districts) particularly at the first phase of concept creation and finding the specialization of the area at different levels. As for the involvement of the public authorities from Italy, the public sector didn't really participate in the setup of the innovation model (which is federated innovation) and the concept creation process, however, tender procedure, public-private partnership, further obligations, and commitments were actively discussed and coordinated in order to align interests of the city and the developer.

The very first step of the project was to rethink its concept. The scenario changed after comprehensive research, the idea of a science park (as it was primarily suggested by Arexpo) was turned into a concept of a specialized innovation district due to the two key factors: On one hand, the need to overcome geographical barriers (as well as conceptual barriers of the science park concept) and become part of the city and the broader region and on the other hand, expertise of the private developer and knowledge of consultants. *"The idea was to work on the idea of innovation district instead of the scientific park in order not to create a separated park but to build on the legacy of the expo which people visit and have an identity, moreover has an emotional link with the city of Milan even though the area has been neglected for a while."* - explained Fiorenza Lipparini.

Brookings institution was involved from the first stage of the research with Plusvalue in order to identify further specialization of the area at different levels, given local, national and global environment by mapping and interviewing different actors and stakeholders. 6 months were spent for desk research and

interviews with different stakeholders in Lombardy region. The conclusion of the research was to specialize in Life Science (which is also one of the sectors identified by Smart Specialisation Strategy and Chamber of Commerce report). Life Science in Lombardy includes several sub-specializations of the sectors that exist in the area, as well as industries and scientific resources, hospitals, and different institutions.

Anchor tenants, stakeholders, and governance model.

Three key anchor tenants from the very beginning of the project were Human Techopole, Research Hospital Galeazzi, and the University of Milan. These actors represent bodies from Academia, the life science industry, and Research that usually create a good mix for achieving high results and transforming scientific and research discoveries into practice.

The fourth key body presented in MIND is Cascina Triulza which represents a social innovation hub, - *"a place of work and interaction which fosters collaboration and the circular relation between scientific-technological research and civil society associations. The Cascina Triulza Social Innovation Lab Hub was promoted by Fondazione Triulza and its founder network after the end of Expo Milano. The goal is to mark out the future of Arexpo's science, knowledge, and Innovation park with the values, the companies, and the planning skills of the Third Sector and the Civil Economy." Arexpo, 2020 (*www.arexpo.it*)*.

Human Technopole will contribute to promoting human health and well-being through biomedical research in the field of life science. It is envisioned as a large-scale research infrastructure, setting up and operating scientific facilities and services to be made available to external scientists that will respond to the needs of the national and international life sciences research community. It aims to promote technology transfer and engage in relations with industry to foster translation of scientific discoveries into tangible applications for larger benefits.

The initial focus is on five research areas: genomics, neurogenomics, structural biology, computational biology, and data analysis. an important element to HT's mission will be the dissemination of scientific activities and achievements to reinforce the message that science is a public good

University of Milan scientific campus will be open by 2025 in MIND which will bring 20.000 students and 2000 staff and facilities. Due to the presence of the medical school campus, most hospitals of the Lombardy region will arrive. Unimi is among the 30 best universities in the world from the life science perspective with a high number of competitive grants and in depth scientific resources in terms of research.

Finally, Research Hospital Galeazzi represents excellence in two areas, in particular: cardiovascular and diagnosis and multidisciplinary treatment of obesity (INCO). With more than 500 heart surgeries per year and 1,500 interventional cardiology procedures, the Sant'Ambrogio Clinical Institute is one of Italy's leading centers for the treatment of cardiovascular diseases. "The presence of IRCCS Galeazzi is a fundamental cornerstone of the Science Park project that Arexpo is already implementing in the area that hosted the World Exposition Milan 2015," says Giuseppe Bonomi, CEO of Arexpo. "In fact, it will be a great innovative structure dedicated to care and research that will integrate perfectly with the other scientific functions already present, such as Human Technopole, and with the academic ones that will come in the next few years, in addition to international private companies that have already expressed their interest in establishing themselves in the area".

After understanding the ecosystem from the research perspective, a tenant attraction strategy was put in place which was based on the willingness of the companies to work with the anchor institutions in the innovation projects. As a result, most of the spaces are already allocated and there are more than 100 companies interested in relocating to MIND.

MIND employs a federated innovation model which provides the platform to facilitate innovation across the Innovation District. The mentioned model was chosen to facilitate relationships among industries, and between industries and anchors. There are 40 large companies in MIND, almost half of them are operating in life science and the second half are operating in the smart city domain. 50.000 Euros per year are being paid by these companies as a fee in order to maintain a "catalyst" organization which is staffed with supporting companies in the relationship with anchor institutions interested in social innovation projects as well as funding for implementing these initiatives.

The full development of MIND represents a 10 years timeline of the construction (2020-2030), through which a temporary site (village) will be finished where different representatives and offices will be allocated by 2021 hosting 1000 workers. By the same time period, New Galeazzi will be finished and Human technopoly will grow. The first private development site will open by 2023, having an average of 15.000 people per day with finished Human Technopole on site. The State University of Milan will arrive by 2025 which will grow daily users to 40.000 users per day. All the private functions will be developed by 2029 when the project will be finished and will reach 70.000 daily users.

Planning and strategic connections

Even if, innovation district idea which is adopted in MIND is a more integrated approach as a concept than a science park, the Arexpo area is a physically secluded place nowadays due to the highways and railways that surround the space making it isolated from the rest of the city. Even though the territory is well connected to the city center due to the existing infrastructure, there are strong barriers in place, especially for the pedestrian connection with neighborhoods nearby or absent links with existing likewise facilities that are located in the Northern part of Milan, at the same axes to MIND.

One of the strategic large developments that are emerging right next to MIND is Cascina Merlata. "*The project of Mario Cucinella Architects includes the construction of three of the seven residential towers inside the Expo Village, designed by Euromilano, within the redevelopment of the Masterplan Cascina Merlata in Milan. The three buildings are located in the area north of the Masterplan and they will be used as Expo Village in a first phase, then to be converted into apartments of social housing."*- wrote Archdaily.

Even though the portion of residential units within the MIND project is minor, Cascina Merlata appears as a strategic "neighbor" of the innovation district. However, these two projects are being planned and developed independently without a common planning vision while the communication happens at the informal level only.

Target publics of MIND are tenants, creative communities who might be interested in coming to MIND because of the programming calendar, events, workshops, and conferences. Surrounding communities and families are another target group of the project as well as the retired people who will be able to enjoy the open spaces and green areas. However, as the project is just taking place, the key target audience, for now, remains the creative community of Milan.

There are planning and design solutions that are considered in the MIND project in terms of its connectivity, such as The second station which will be located near the human technopole, paths, and bridges joining the development with Cascina Merlata. Moreover, MIND will become one of the biggest green places in Milan with a 1M Sqm area dedicated to softscape which will make the district open for leisure activities for different social groups. Urban design solutions are one of the considerable aspects of the project as well since the division between indoor and outdoor spaces will be minor and ground floors will be designed as open as

possible to be integrated into the outdoor dynamics and allow “permeability” of space which is another requirement from the city government.

Besides excellent planning decisions at the neighborhood level of the project, there is still a big concern of what will be the main driver for the inhabitants of Milan to go to MIND and what the project can offer (besides entrepreneurial activities) that can create the identity of a new district.

When it comes to the bigger scale connection with existing science parks and innovative resources, it seems to be more challenging. The existing approach of MIND is to build a platform and network with different innovation districts and clusters of innovation not only in Milan but at the national and international level as well. However, as the mentioned platform described by Fiorenza Lipparini doesn’t represent physical links, proximity with Bovisa and Bicocca remains an open challenge and at the same time the opportunity.

Social and environmental commitments

Social innovation appears to be a hot topic for Milan nowadays. Environmental issues are another important pillar for the city as well. One of the main sources of these highlights is the larger debates at the EU level and funds allocated for different projects focused on the above-mentioned issues. The land lease was committed to including social and environmental consciousness in the project by being obliged to have half of the area kept green, remain Carbon 0, as well as deliver a Social value of 300M Euro. Therefore, the project employs a living lab approach, testing environmental tools such as waste collecting, renewable energy, etc as well as social impact hab in order to support different initiatives. However, how these benefits will be delivered (and to whom) is still unclear as the process remains open-ended, not limiting its impacts on the urban or the city scale.

One of the examples of the MIND's contribution in creating social value is the case of a prison, located close to the construction site that raised discussion about what could be done about it. On the one hand, existing prisons represent a modern area where there are lots of social innovation activities, cantine, and training. Therefore, it wasn't hard to collaborate. Moreover, there is a regulation in Italy that allows convicts to work outside the prison. On the other hand, it's related to stereotypes and trust issues of the other staff. Therefore, in order to avoid possible conflict and encourage contractors, the ones who'd be willing to hire convicts were paid higher ranking than usual. The idea was to use construction work to train prisoners, provide internships that could be renewed and turn into a regular contract once they would go out from the prison. Finally, the initiative is being discussed to be scaled up, quantified, and distributed in other areas as well.

MIND managed to attract large companies (who would otherwise not consider establishing a branch in Italy as Fiorenza Lipparini mentioned) just because they were offered a credible research environment and assistance which has an impact in terms of valorization of scientific input in the city of Milan, particularly in the life science sector. On the other hand, having large enterprises and startups at the same time (which are very different groups) represents a common issue in Innovation Districts since smaller companies are usually being left out due to the high rent prices. MIND has a promising strategy to create a financial model that would make the area affordable for smaller firms as well as offering sponsorships, dedicated spaces, shared labs, and training for them. Moreover, as the project follows the federal innovation model, it creates opportunities to raise funds and make financial resources available for various initiatives.

What kind of Innovation District is MIND?

From the functional point of view, MIND is structured as a High-technology intensive activity district. As mentioned before, these kinds of IDs are usually highly extraverted, focused on the global scale, and are directed towards the district-branding at the international level. In this case, (especially when the

district specialization is life-science, with no major residential units) there might be a risk of creating an overpriced “innovation enclave” that might exclude certain groups of people. These threats in MIND (from an urban planning perspective) are addressed by dedicating huge areas for public use and leisure, however, those areas will still be privately owned planned public spaces that often struggle to construct a sense of belonging and a local identity.

There are different elements presented in MIND where economic, social, and physical features are constructed by a high number of firms, organizations with public indoor and outdoor spaces for interaction, coordinated by federated innovation models.

When it comes to space use, the location choice of the MIND district seems a bit tricky. It’s not a walking distance from the city center, however, it’s not too far either. Its relationship with surrounding areas is unclear as, besides highways and railway, the area is surrounded by industrial clusters and several functions that can hardly create bonds with MIND during the day but also act as dead islands at night.

Counter ideas and equilibrium for mutual benefits

It’s yet early to discuss outcomes and impacts of the MIND innovation district as the project will be finalized by 2029. Increasing tension around the new innovation district in Milan has already triggered debate concerning different topics that are worth being brought up.

The Relationship between MIND and academic circles in Milan and in Italy was followed by tension from the beginning which could be discussed at three major

scales - MIND at the national and the regional level, city level, and the urban level.

Firstly, according to the article published by Laura Margottini in 2016 shows that "*many Italian scientists aren't happy with the new €1.5 billion research hub*" which referred to the national funding allocated to the Human Technopole which in the opinion of many researchers would contribute in increasing gaps between already relatively developed Milan and the rest of the Italian research which *"is becoming a desert"* as Massimo Dominici notes in the article.

Secondly, the idea of relocating the University of Milan campus into MIND hasn't gone smoothly. In fact, it was followed by a campaign of a Chancellor against moving into a new Innovation District. *"As always, when you change things, people always complain and there are ones who are not happy about changing their workplace, but it settled. This is changing because people are coming to appreciate the ecosystem. And it took time because there was no ecosystem before. It takes time to take value."* - Commented Fiorenza Lipparini.

Finally, MIND represents one of the possible complementary factors for the further development of the Milanese macro place-based innovation ecosystem, but at the same time, it's perceived as a competitor for existing place-based innovative dynamics such as Bovisa which is yet struggling to take off. On the other hand, is it really a competitor or a possible partner for the long term vision?

From the spatial perspective, especially from the point of view of placemaking MIND is putting much effort into creating a vibrant destination focused on pedestrian mobility, leisure activities, and flexibility of space. The thing is that art exhibitions, leisure, green spaces, and Aperitivo spots are not new things for Milan, in fact, this is what makes the buzz of the city so special. The approach of MIND is to create new functions or activities different from existing dynamics in Milan that would bring users in the district which are the active calendar of

various activities, dynamic and transforming spaces, and a well-designed environment with special consideration on placemaking. However, how will the overall scenario work for individuals not interested in entrepreneurship is unclear and what will be the new dynamic through which MIND will complement the city.

At the urban scale, MIND is surrounded by linear barriers as well as industrial islands which not only work as obstacles but also create dead spots at night. Masterplan of the district envisions several pedestrian connections to overcome these boundaries but it's also true that bridges and additional transport connections can not guarantee organic integration of the new development into an existing urban network. There are many "activators" planned within MIND but what happens on the other side of the bridges is vague as there are no initiatives or projects present to address surrounding neighborhoods which are problematic enough to deal with radical changes (ex: Gallaratese - the aging neighborhood nearby). It's also true that there are numerous initiatives and social commitments that the Innovation District is taking over responsibility for, but the priorities of these deliverables or targets are unclear. Moreover, social innovation is a concept understood differently by every involved actor. This phenomenon is deeply embedded in the urban context of Milan but at the same time is influenced and branded as a part of the image of Milan due to the huge investments and fundings coming from the EU which since 2010 with the help of large organizations defined society and environment as top priorities for the development.

While Milan is facing weak coordination and diffusion of numerous initiatives, MIND can be seen as a great occasion to naturally mobilize existing actors and resources and to act as a "glue" and mediator between all the scattered parties. *"An investment of this magnitude should involve the scientific community, not just a small number of people,*" Parisi says in the article published by Laura Margottini (2016). However, this tension does not only refer to the absence of scientific communities in the process but to a broader audience as well. MIND is

weakly connected with many strategic elements, including Cascina Merlata at the neighborhood scale and universities, existing entrepreneurial spots scattered in the city. Even anchor tenants of MIND have weak communication with each other but are linked at the MIND directly.

It's obvious that the strategic project such as MIND needs to be more open for debate and inclusion for different reasons. First, it can help the district to position itself better within the existing innovation ecosystem in Milan with which it's facing emerging conflicts nowadays. Secondly, to adapt itself better with the actual needs and impulses coming from different actors. And finally, and most importantly, it could be a perfect moment for governmental actors, universities, NGOs, and communities to get involved in the debate and make the planning process more communicative and collaborative, more strategic for the city as for the individual actors interested or possibly influenced by the project. This could not only benefit the MIND in particular but could trigger a planning process and discussion for Milan as a whole and create a great precedent for the future.

Conclusion

Milano innovation district is a significant part and physical micro representation of the existing macro innovation ecosystem that exists in Milan. It's also true that it's not a needs-driven organic development but a consequence of top-down planning and decision making overall. Another significant aspect of this development is the context and historic background where it emerged - While Bovisa and Bicocca had all the preconditions to flourish but never succeeded as intended, what's the guarantee for MIND to reach the goal and not end up as a real estate speculation branded as an innovation district? This could be formulated another way - does Milan really have the capacity to generate global dynamics and sustain its attractiveness at the local level as well?

In this debate, there are four main aspects that we can critically conclude as the highlights of the existing place-based innovation ecosystem in Milan and the role of MIND in bringing this ecosystem to a different level.

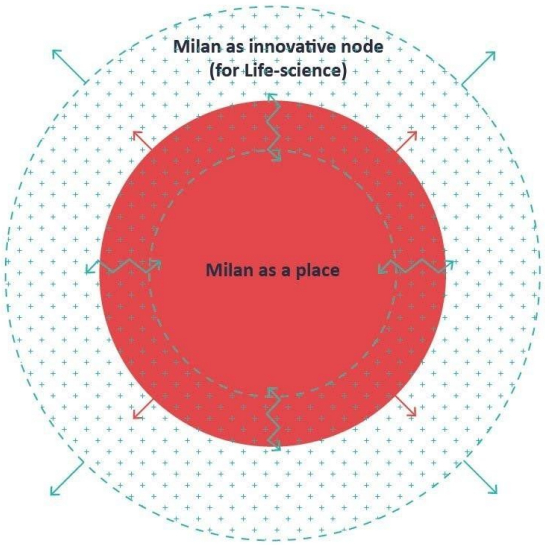
MIND vs Organic development

As mentioned above, MIND is not an organic transformation. In fact, It's a well-working and well-known scenario (that we've seen in Kendall Square for instance) re-played by putting necessary ingredients together in one district. nor the need for a highly specialized innovation district has been a present issue in Milan as there were significant attempts already during the past decades to transform Bicocca and Bovisa into science parks which never made it to the end. It would be fair to assume that even with the insufficient government coordination these areas would have managed to become innovation districts if there was a significant need to have one in Milan.

On the other hand, MIND attracted firms that wouldn't be in Milan if these firms were not suggested in a relevant environment and resources. Even if Milan Innovation District is a top-down planned and managed project, there are several crucial aspects considered in it as lessons learned from the best practices. These elements are governance for instance which is a federated innovation model that creates a platform enabling a wide range of opportunities for further sustainability of the project and remaining diversity in it. Moreover, MIND came with 100 years of commitment to lead the project coupled with a set of requirements from the city government to follow. It's true that none of these elements make MIND an organic development but there are indeed aspects that can influence the sustainability of a project in a long-term vision.

MIND vs Existing city identity

Different innovative and entrepreneurial dynamics have been developed within the city through the times, nourishing it, and building interconnected networks. On the other hand, MIND aims to bring this entrepreneurial culture to a different



level through life science. The clash between these two different synergies might be a trigger for a further conflict especially while the life-science sector represents the most profitable niche in Milan, Creative enterprises lag behind by making much less of the overall national turnover but producing the most of the Italian turnover for the design and fashion industry.

Image 6.7.2 Milan Ongoing Tension Scheme
Source: Author

Therefore, finding a balance between the city as a place VS city as a global node refers to these synergies at some point - In other words, balancing between profit and livability; building and developing highly extraverted life-science cluster not only without interrupting city identity but complementing it in different direct and indirect ways.

MIND vs Existing innovation ecosystem

We've seen that there are innovative dynamics distributed and networked or sometimes clustered in the city that brings entrepreneurial vibes to the urban realm. On the other hand, it represents a critical mass (coupled with other resources attracted for the project) for MIND in order to successfully take off. Moreover, even though the Metropolitan city seems large, the city of Milan itself is relatively small. The aim of MIND is to attract funding and resources as well as accommodate a major part of the city's existing entrepreneurial dynamics. This is the reason why Milan Innovation District is perceived as a competitor for the existing ecosystem and why MIND finds it hard to create trust and networks in the area where there is some dynamics present already.

For the longer-term, Successful innovation districts may bring additional venture capital and R&D investments from which the innovation system of Milan contributes well. The question is when we speak from a longer perspective, how much time does it mean and what's the natural capacity of Milan to "feed" multiscale complex innovation dynamics?

MIND vs Social innovation

Fragmentation is affecting many different levels, especially the perception of social innovation from various actors. However, it's still unclear what social innovation means for Milan. Is it a contextual element embedded in the culture, global priority addressed from the EU, or both? On the other hand, if societies represent one of the most significant priorities for the city, where is the "fourth helix" of people involved in the process as direct actors? Social innovation in Milan could also be an exaggerated element for branding the city at a larger scale as long as there is not yet certain hi-tech entrepreneurial global dynamism or successful unicorns in place to be proud of.

Even though social issues are addressed by numerous initiatives, especially from the city government, these initiatives are scattered and unlinked without an overall mission or a common understanding of the role of societies in the process of building an innovation ecosystem. On the other hand, attempting to commit a MIND to deliver social benefits is a great requirement from the city government but vague at the same time. Therefore, unless there are clear strategic priorities in place, social commitments will hardly make a difference at the end from the perspective of the resilience of the process but will create a diffused benefit in space and scale.

CHAPTER 7. CONCLUSIONS

The idea of branding cities as global hotspots through the concept of innovation is more attractive than ever nowadays. Here the trickiest thing is the word "innovation" itself which can showcase things well, even not so innovative ones. This is well captured internationally as we've seen increasing numbers of place-based innovation microsystems as an innovation district worldwide, or the growing trend of branding social innovation, urban innovation, etc - features that position and "sell" cities through the international competition. Obviously, it doesn't mean that every innovation concept is exaggerated. In fact, innovation is a natural phenomenon and with relevant contextual factors and capacities, it may emerge without coordination as a place-based ecosystem as well. Contextual factors and features that are embedded in each city usually work hand in hand with policies, public support, funding, and governance. We can say that one of the main aspects of a perfect place-based innovation ecosystem (which probably doesn't exist) is an equilibrium where contextual and intentional factors are balanced. This equilibrium itself is a complex concept that goes beyond the debate about place-based innovation systems. However, usually, this is where often misleading assessments of the city's capacity or its exaggerated role at the global scale or ignoring the complexity of cities while making political decisions and combination of many other elements make this balance impossible that drive towards unintended consequences.

The aim of this research was to analyze processes of development of place-based innovation ecosystems in completely different contexts of Boston and Milan, explore them in parallel, and to learn looking from one in the light of the other. Moreover, to understand the spatial dimension of innovation (often spontaneous) beyond Innovation District with additional focuses on the cases of MIND in Milan and Boston Innovation District in the city of Boston and analyze their relation to the areas where they emerge.

Boston itself is a complex phenomenon to be simply defined in space. Basically, due to its ambiguity in geography and governance. While the city is branded globally what actually makes Boston unique is that it's strongly interconnected with neighboring cities (Cambridge, Somerville) who "compete" for the same ecosystem that they build together. Therefore, when we think about the place-based innovation ecosystems of Boston we actually refer to the larger geography in which the city of Boston is the one with the better image. On the other hand, lots of intentional inputs were addressed to build an Innovation District with the aim to transform Boston into a "host" of entrepreneurial dynamics. This strategy didn't refer to the other cities, nor considered the possible and very realistic side effects but opened the door for an increasing competition at all levels.

This is why Boston is associated with knowledge, technologies, and innovation nowadays-obviously not just because of the certain direct strategy but on one hand, because of the existing resources and contextual elements that defined Boston as a strategic geographic location. The presence of top universities that also act as developers, a strong private sector, and accumulation of venture capital were some of the main drivers for the further success of the city. On the other hand, tremendous federal funding, governmental involvement, policies, and initiatives played as significant enablers for the place-based innovation ecosystems to emerge. In this process, public-private contributions were complementary and served the common goal to have a hub of innovation and knowledge.

However, there is the other side of the success story where priorities were clearly arranged in favor of the "winners". City enabled all the conditions to empower disruptive innovation. This raises the question if the capacity of Boston as a city was objectively evaluated and if one large place-based innovation ecosystem is able to satisfy the needs of the city as a complex living and constantly transforming phenomenon. Moreover, considering the statistics that show

gentrification and displacement of local inhabitants (middle class in particular) with the growing international incoming knowledge workers, it's concerning if "supporting interventions" (such as the initiative of neighborhood innovation districts for instance) were really a conscious attempt that not yet managed to succeed or a social commitment that the city government "owed" to its disadvantaged groups. This, however, is a dilemma emerging regarding "the right to the city" which is part of a larger political debate.

Finally, the idea of the innovation district in Boston is part of a cycle of accidentally disrupting vital elements for the city in order to become a "host" but at the end facing the unintended consequences that negatively influence back the primary intention of being a global innovation node. While pushing beyond its capacities, Boston is now facing increasing traffic, increasing prices on housing and commercial rent, congestion and drain of smaller firms and startups from Innovation Districts to spontaneous agglomerations but probably towards elsewhere than Boston in the future, followed by funding and investments. This interconnected dynamic is not well-discussed and addressed yet since the issues are recent but numerous sources showed the evidence. The question is how Boston can rebalance the equilibrium which is affecting larger areas as well as which the city of Boston has weak strategic coordination.

Differently from Boston, Milan is a multiscale geographic phenomenon which itself is strongly embedded in a local context but is also a part of a metropolitan city context, regional context, Northern Italy context, national context as well as the EU context. Most importantly, it's part of a country in which there is a significant lack of innovation systems and financial resources, especially R&D funding. Even if Milan is a relatively developed city in terms of innovation, a weak national context is a crucial limitation for growth. Complex arrangement and overrepresentation of formal and informal actors, different strategic documents, and projects implemented on different levels with no certain coordination create ambiguity in understanding a clear strategic vision of Milan.

The temporality of innovation policies and initiatives are sometimes underestimated in the discussion as well as they are much dependent on the occasional funding that also comes with certain priorities such as smart city or social innovation. On the other hand, the absence of a "mutual platform" that would link all the mentioned elements, opens another door for an effective open-ended process and experimentation.

Evidence from the past examples in Milan showed that attempting to build a place-based innovation ecosystem without strong vision and coordination, or objective assessment of the city's actual needs and capacities could drive to uncertain outcomes and diffused benefits that we've seen in the Bicocca case, especially with the presence of strong and competitive real estate market in the city. On the other hand, the existing networks of diffused innovation systems in Milan are in better condition nowadays than it was in the 80s. Therefore, MIND has clearly more possibilities to attract critical mass and to actually take off. In this case, the district might be conflictual with the existing innovation ecosystem developed within the city as there will be a competition between MIND and scattered but also important entrepreneurial dynamics for Milan. However, if the city will show resistance to the new innovation district where MIND and Arexpo are committed to managing the area for 99 years, there is still a chance for the project to end up as a real estate speculation with many smart facilities inside but a minor element of the innovation district in it. These consequences might be driven by diffused public coordination between shareholders and leading private interests to make the scheme viable rather than the inevitable need of having an innovation district.

Transforming Milan into a global innovative node is clearly an opportunity to position the city at the international dynamics. It's concerning though if the increasing tension around the idea of innovation is a part of a branding or an actual capacity of the city that requires enablers to develop its entrepreneurial resources. The answer here might be more open processes and interconnected

actors that would let the discourse find the actual organic pathway of Milan towards a unique innovation system that can work successfully on different levels.

Finally, Boston and Milan represent not only two different scenarios but actually two alternative pathways of place-based innovation ecosystems. Boston is an example of strong context and enabling intentional factors driven by similar goals which don't create a balance but a competition with different unintended consequences. On the other hand, Milan is complex geography where contextual factors are underestimated due to the desire of branding the city as an innovative node which triggers tension between different actors. Again, there's no blueprint for developing a perfect place-based innovation ecosystem but shortly, what can be learned looking at the pathway that Boston and Milan have followed while building innovation ecosystems is the importance of the unique complexity of cities where ignoring some elements lead towards contentious issues larger than expected.

Further remarks and limitations:

One of the primary limitations of this research was the lockdown caused by COVID19 which interrupted a large part of the site visits, face-to-face meetings, short discussions with random users of the areas, and a better understanding of the user experience. This challenge, however, was balanced by comprehensive desk research and in-depth online interviews.

Secondly, the two cases were studied in Parallel. However, collecting and analyzing the same kind of data and numbers due to the availability of different resources for each city is another limitation of this work. Therefore, conclusions are based on the critical qualitative assessment of a combination of different resources that were possible to be gathered through this work.

Spontaneous agglomerations of innovation is a topic, not in-depth studied yet. Therefore, on one hand, the absence of the relevant data that would enable more

comprehensive spatial analysis and on the other hand lack of the methodological frameworks to analyze these informal systems was one of the limitations of the thesis.

Finally, Innovation districts and micro place-based innovation ecosystems are the physical phenomenon but it's also true that the related debates go beyond the concept of the neighborhood scale urban issues towards a larger political dilemma which is a broader and more complex topic to be analyzed in this thesis. Moreover, place-based innovation ecosystems and especially Innovation Districts are often perceived as an ultimate tool for success and literature often doesn't study further concepts of this phenomena, only discusses the district context of it which most of the time is a well-planned urban design and well-created scenario. In fact, this phenomenon requires a comprehensive understanding in a complex way in relation to different economic, social, political, or spatial issues on various levels. Therefore, due to the interdisciplinary nature of the subject, it's been challenging for all the comlex elements to be fully covered by this thesis, however, speaking of the analysis of place-based innovation ecosystems, this issue appears to be a common limitation.

LIST OF INTERVIEWS

Gabriele Pasqui - *Full professor at Politecnico di Milano, Department of Architecture and Urban Studies*
Interview type: *Online, via teams /* Interview date: 29.10.2020 / 25.11.2020

Laura Pellegrinelli - *Placemaking Development Manager at Lendlease*
Interview type: *Online, via zoom/* Interview date: 19.11.2020

Kairos Shen - *Executive Director and Associate Professor of the Practice at MIT's Center for Real Estate (CRE). Former Director of Planning at the Boston Redevelopment Authority, Boston's Economic Development and Planning Agency (1993-2015)*
Interview type: *Online, via zoom /* Interview date: 06.11.2020

Fiorenza Lipparini - *Co-founder & Director of Research at Plusvalue*
Interview type: *Online, via teams/* Interview date: 03.11.2020

Lucia Scopelitti - *Head of Unit, Economic Development, Municipality of Milan. Expert at UIA (Urban Innovative Actions)*
Interview type: *Online, via teams/* Interview date: 27.10.2020

Kristopher Carter - *Co-Chair of the Mayor's Office of New Urban Mechanics*
Interview type: *Online, via zoom /* Interview date: 23.09.2020

Christian Appia - *Program Coordinator at Venture Café New England*
Interview type: *Online, via zoom /* Interview date: 18.09.2020

Kevin Wiant - *Director Board Of Directors of Venture Café New England*
Interview type: *Online, via zoom /* Interview date: 11.09.2020

Christopher May - *Boston resident, entrepreneur*
Interview type: *Online, via zoom /* Interview date: 20.08.2020

Michele Coletti - *Associate Professor at Grenoble Ecole de Management. Adviser on innovation management, systems, and policies.*
Interview type: *Online, via teams/* Interview date: 08.05.2020

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