# INNOVATION DISTRICTS AND INDUSTRIAL CLUSTERS IN THE BARCELONA METROPOLITAN REGION

ARETIAN

URBAN ANALYTICS AND DESIGN

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# CONTENTS

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# EXECUTIVE SUMMARY

Project Overview

## ABSTRACT

This study presents an overview of the state and competitiveness of different innovation districts and industry clusters in the Barcelona Metropolitan Region. The report includes preliminary analyses of each industry's respective employment, economic, and innovation performance levels, as well as an overview of current, up-and-coming, and potential innovation districts. The chosen areas for analysis have been compared to selected innovation campuses in the USA by means of analogous benchmarks.

## EXECUTIVE SUMMARY

TThe purpose of this study is to present a high level overview of the state of the economy, exports, and innovation scene in the Barcelona Metropolitan Region. The report includes benchmarks and comparisons with comparable metropolitan regions in the United States of America by means of advanced state-of-the-art geospatial analysis and network-theory driven modeling. The goal of the study is to set the path for more complete, in-depth studies on how to best develop Innovation Districts and Industry Clusters in the Barcelona Metropolitan Region for the coming decades. Such studies will provide a roadmap to establish a rigorous, data-driven strategic decision-making road-map for the Àrea Metropolitana de Barcelona and the Barcelona Metropolitan Regional in general so that government officials will be able to provide proper support to the regional economy, boost high quality employment opportunities, define investment prioritization policies, and

design pathways to contribute to the distributed prosperity of the metropolitan region of Barcelona.

**Methodology and Case Studies:** the study has been developed based on complexity science and network theory-driven analytical methodologies and models developed by Harvard University researchers and Aretian co-founders Jeremy Burke and Ramon Gras. The analysis:

- Breaks down the core 5 industrial corridors present in the Barcelona Metropolitan Region into 25 innovation districts and industry clusters by means of a Machine Learning clustering algorithm
- Outlines fundamental statistics and some advanced metrics and visualizations describing their current state,
- Describes qualitatively and quantitatively their strengths and weaknesses,
- Visualizes their comparative advantages, and
- Potential opportunities and risks for the future of Innovation Districts and Industry Clusters.

**Innovation Districts:** The selected Case Studies to describe knowledge-intensive districts include a characterization of the consolidated 22@ Innovation District, as well as preliminary analyses and descriptive visualizations of upcoming potential innovation districts, such as UPC-BSC, Parc Tecnològic del Vallès, Fira de l'Hospitalet, El Prat de Llobregat, Aeronautical Campus in Terrassa, Renewable Energy Hub, Parc de Recerca Biomèdica, etc. Comparable benchmarks include cases such as Kendall Square, Seattle South Lake, LA Boeing, Houston Medical Area, Kendall Square/MIT in Cambridge (MA), Longwood Medical Area (Boston), among others.

**Industrial Clusters:** The selected Case Studies in the Barcelona Metropolitan Region include an overview of all the industries and industrial clusters (automobile, pharmaceutical & biotech,advanced manufacturing and robotics, materials science, agrotechnology, etc), as well as a preliminary assessment of their respective competitive advantage, export levels, embedded knowledge, and innovation performance. The study also presents preliminary insights regarding specific municipalities and clusters susceptible to host industry-specific high technology hubs in the coming years.

# INTRODUCTION

## State of Innovation and Industrial Clusters in the Barcelona Metropolitan Region

Our society is facing three important challenges: growing income inequality, sustainability and health concerns due to climate change, and the accelerating effects of the digital revolution, which threatens to erode the way we work and relate to one another. Meanwhile, more people are choosing to live in urban environments. These trends highlight the importance of urban design, organizational structures, incentive schemes, economic development patterns, and knowledge networks, as areas of rapidly emerging risks and also of extraordinary opportunities.

Inequality rates are greater than ever before. In the 18th century, the wealthiest nation in the world per capita, the Netherlands, was 4 times more prosperous than the poorest country in the world. At the beginning of the XXI Century, the wealthiest countries are now 200 times wealthier per capita than the poorest. This dramatic shift of wealth from the hands of many to the hands of the few has reduced the proper planning of resources to help support life of mankind as informal settlements grow. International migrations are on the rise, eventually inducing social and political distress, as people search for new opportunities to survive. Without proper living environments, people will lack the structure on which to build their lives, their economies, and their futures.

Thoughtful design of our urban environments is paramount as we foster and shape our relationship with the natural world around us and create healthy sustainable spaces. As the built environment accounts for more than 30% of the total energy use

of the planet, it is critical that we address how to best organize our urban systems to decrease total energy consumption, create walkable and livable neighborhoods, and increase access to desirable amenities and employment opportunities.

Moreover, today's urban design decisions will shape the future of work and the economic vitality of our cities. We can expect today's jobs to change dramatically with the introduction of cognitive automation by means of artificial intelligence, robotics, and data-driven decision support systems. While these new tools offer many opportunities to help us solve complex problems, they must also be designed and distributed in a way that does not exacerbate the already-severe income inequality between the rich and the poor. Future prosperity will depend on increasing education among the entire population, as well as upskilling and reskilling traditional workers to ease the transition into the digital economy. It will take conscious effort to prevent large sections of our society from being left behind as the world moves ever faster toward digital solutions.

Thus, for the Barcelona Metropolitan Region to be well-equipped to successfully tackle the societal challenges of the 21st Century, in terms of high quality employment opportunities, decreasing unemployment rates, generating distributed prosperity, and providing a societal response to the job disruption caused by the emergence of AI, robotics, and automation, in a context of increasingly tight global economic competitiveness, the Barcelona Metropolitan Region needs to develop an advanced understanding of its strengths and weaknesses, risks and opportunities, to be prepared to make the best decisions, and support a citizen-centric economy, able to create economic development opportunities and reduce social vulnerability.

## ECONOMIC REGIONS CLUSTERED BY DIFFERENT INDUSTRY TYPES

With these three societal challenges in mind, we are embarking on a process to build digital twin models of cities to describe urban phenomena to help politicians, urban planners, companies, and the public make decisions about how best to build, shape and grow their communities. At the center of this effort is the first ever Atlas of Innovation Districts, developed by the Aretian team, a key tool to help us identify the drivers of economic success and sustainable development: talent networks, meritocratic organizational structures, and urban infrastructure to host economic, social and cultural activities.

Innovation Districts can be the catalyst to spur distributed economic growth in communities because they establish economic centers of activity and innovation which can provide wider societal benefits to the surrounding communities through focusing on knowledge intensive activities, to create high value added services and products, in well-designed and highly sustainable urban neighborhoods.

## PRIORITIZATION OF INTERVENTIONS AND INVESTMENTS IN THE BARCELONA METROPOLITAN REGION

While previous literature describes innovation districts in a qualitative manner, the Atlas of Innovation Districts introduces the very first comprehensive data-driven classification of five types of Innovation District neighborhoods, based on the systematic geospatial analysis of knowledge-intensive activities throughout the entire US territory. Each of the five types is defined by the key institutional drivers which have a significant influence into the characteristics of the urban form, as well as the types of communities where they are based. Every Innovation District type has a different anchor institution which contributes to shape the

experience and quality of the different neighborhoods. The five types of anchor institutions are:

1. Research Centers and Universities,
2. City/Local Governments,
3. Industrial Clusters built around a leading company,
4. Entrepreneurial Ecosystems built around organic business communities,
5. Specialized Governmental Agencies.

Districts of the "Local Government" type, for example, have a more equal distribution of housing, amenities, and job types, but are generally less innovative overall. This contrasts with districts of the "Academic Institution" type, which tend to have clusters of industrial partners located close by, and which foster a great number of entrepreneurs.

## BENCHMARKING ARETIAN ATLAS OF INNOVATION DISTRICTS. A DATA-DRIVEN URBAN PLANNING AND DESIGN METHODOLOGY

Whilst innovation is hard to measure, the Atlas of Innovation Districts presents an original and rigorous methodology to measure how new products and services, research and development, patents and processes, as well as the total sales attributed to each, are distributed by industry types across the landscape. In addition, the report introduces the chronologic causal mechanisms of innovation by segmenting the process into three phases: research and academia, technology transfer, and production development. Each phase uses a different type of skill set, requires different urban environments, and has a different relationship to the broader population in the region in terms of induced employment generation.

## GOALS OF THE STUDY

Describe current state, benchmark with best cases, define pathways to distributed prosperity

The present study aims to describe the current state of current and up-and-coming innovation districts and industry clusters in the Barcelona Metropolitan Region, present benchmark metrics with respect to best cases in the industry, and preliminarily define policies, programmes, and pathways to distributed prosperity.

An Innovation District is a specific geographic location, generally within cities, where high concentrations of people work in advanced industries in conjunction with other related companies and institutions. They also provide a mix of attractive amenities, housing options, and public spaces to give back to the community. In total, Innovation Districts enable greater collaboration, job opportunities, and regional competitiveness through their concentrated activities to unleash the latent potential for knowledge-intensive activities and respond to multiple societal problems.

Given their ability to generate high quality employment opportunities, we observe a trend in many large or mid-scale metropolitan areas to build the most successful Innovation Districts in order to create the most welcoming and supportive environment to attract talented people, enable them to thrive, offer them healthy living environments, while boosting the positive impact that these concentrated, knowledge intensive activities can bring to communities.

In this study, we have:

1. Dissaggregated 5 major corridors into 25 potential innovation and industrial districts
    - Evaluated their industry focus
    - Measured their exports / competitiveness & logistics needs
2. Classified them in 5 types of potential innovation districts & evaluated their performance
    - Measured their innovation intensity, performance, impact
    - Compared them with analogous US Innovation Districts: Benchmarks
3. Provided high level recommendations for the different districts to consolidate their potential
    - Provided examples successful case studies
    - Provided recommendations for further studies

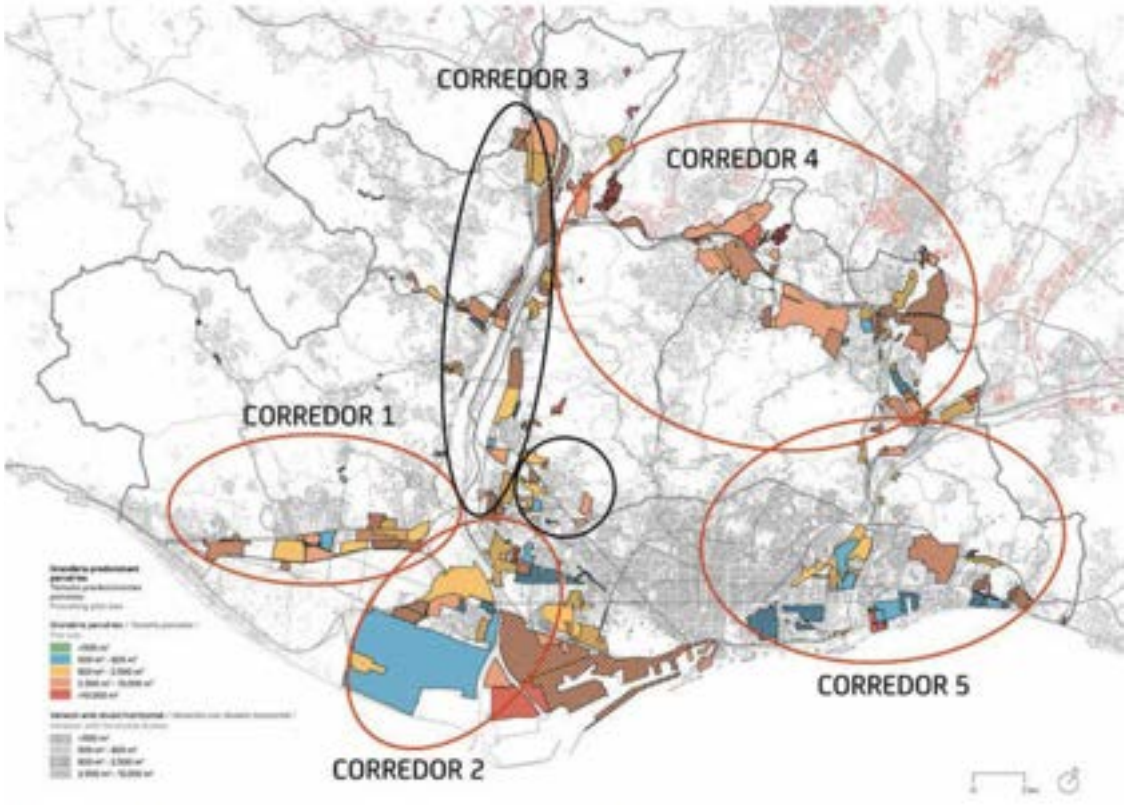
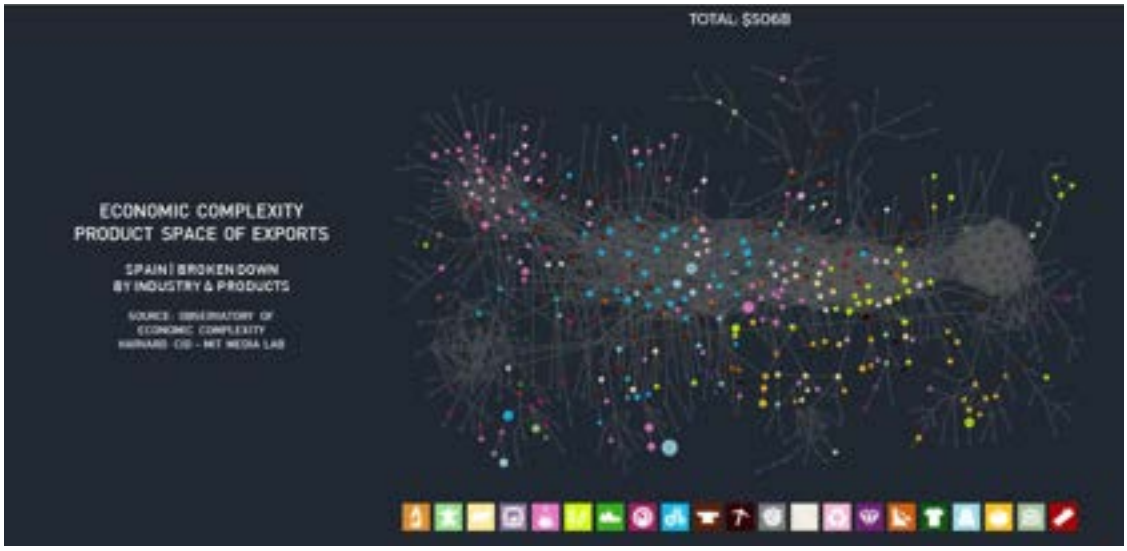


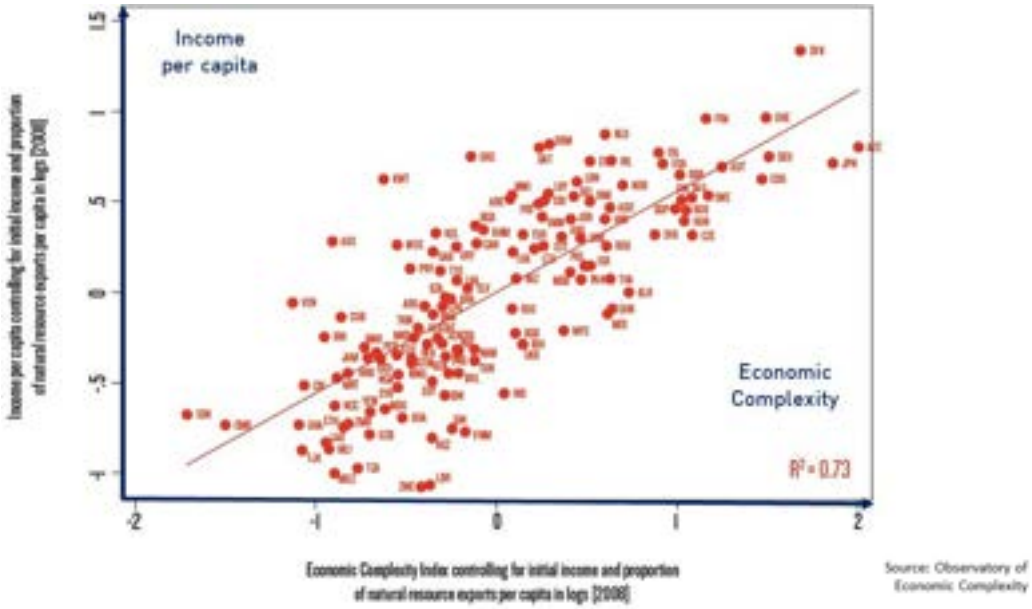

**Fig. 16.** Corredors de polígons d'activitat econòmica de l'AMB. *PDU, Quadern 9.*

# METHODOLOGY

## Introduction to Economic Complexity

Previous literature has failed to create insightful results when attempting to describe local and regional innovation activities. Without granular data, and new methods of information segmentation, it is not possible to create new metrics capable of highlighting business and industry innovation intensity, performance, and impact for the broader society. In order to describe the complex nature of social organization, Aretian has created new models that help to break the complex problem into smaller pieces at different scales and timeframes. This short study allowed Aretian to break the large complex problem of describing innovation activities of four and a half million people into smaller subgroups that can be further studied, analyzed, and compared to one another. Through the following Aretian framework, preliminary results and insights of the Metropolitan Barcelona Regional Area's innovation economy are presented with guides for how to support their further design and development.






## TERRITORIALIZATION OF ECONOMIC COMPLEXITY AT THE METROPOLITAN, CITY, AND ARCHITECTURAL SCALE

Aretian has developed new analytical models to describe innovation activity, performance and impact across three geographic scales: territorial, metropolitan, and architectural. The models are derived from the work on Economic Complexity at the national level by Ricardo Hausmann and César Hidalgo, and use the same rationale, but territorialize the information to make it more actional and useful for city governments, urban planners, and private industries. The preliminary features of the new approach are the following:

NETWORKS OF TALENT

NETWORKS OF ORGANIZATIONAL STRUCTURES

NETWORKS OF URBAN DESIGN

## THE 3 PHASES FOR SOCIETAL INNOVATION

Causal mechanisms:

There are 3 Phases for Innovation, describing the causal mechanisms, technology consolidation, and adoption processes that allow for new ideas to successfully evolve into scalable solutions, new products, and modern services.

Phase 1 - Research & Academia - Theoretical Innovation

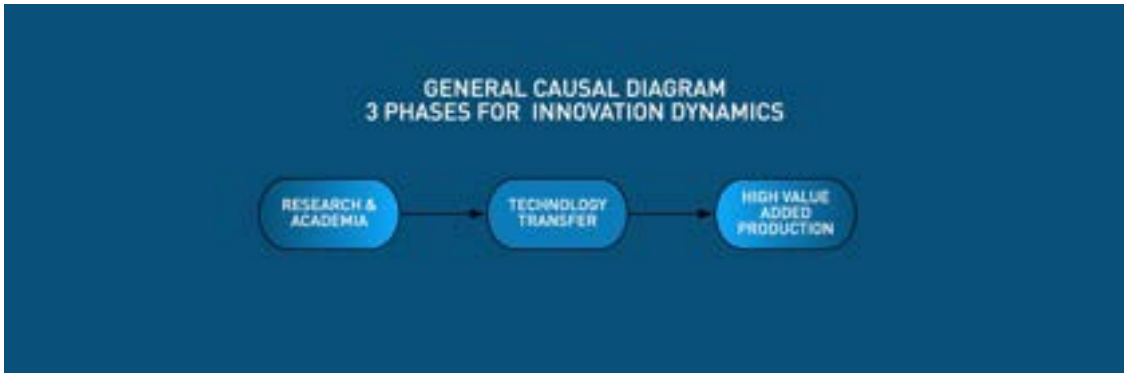
- Organizations and institutions dedicated to the creation of new knowledge in research and academic institutions. Such institutions are capable of making groundbreaking studies, and often employee highly talented, and academic individuals capable of solving complex problems.
- Example: CMU

Phase 2 - Technology Transfer

- Design, engineering, and technology firms that originate or evolve ideas from research and academia, and crystalize them into useful designs, products, and services.
- Example: Microsoft

Phase 3 - Mass Production

- Companies which specialize in manufacturing and creating new processes to mass produce products for the masses, based on the design developed by technology transfer firms.
- Example: Seattle Boeing

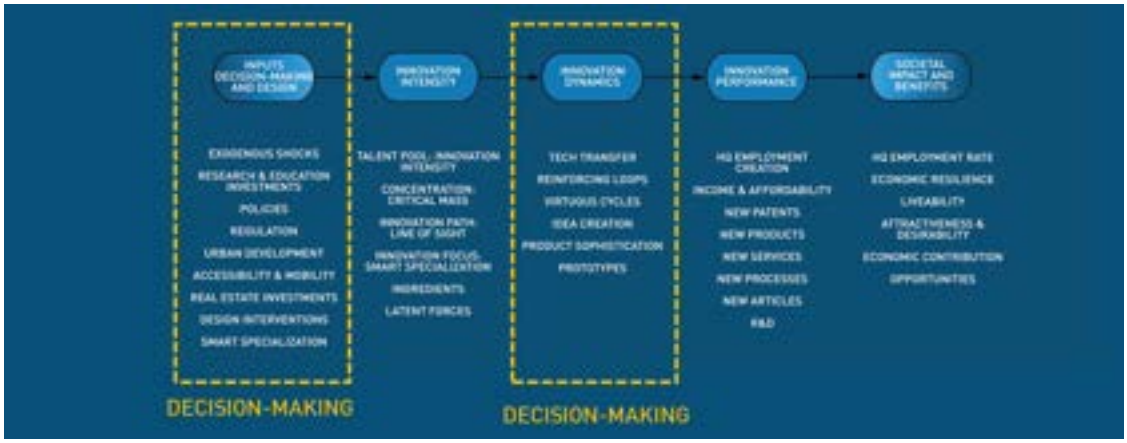


Typically, the three phases are connected together in a sequential fashion, whereby a research group may develop an original idea, which may become a new product, service, process, or solution. This new invention can then be transformed into a working prototype by a technology transfer company, which iterates on the product through testing and calibration. Once the prototype is finalized and verified to go-to-market, it is then produced, at scale, and distributed for the greater population.

## THE 5 PHASES FOR URBAN INNOVATION

The 5 phases of urban innovation describe how organizational structures, decision making and human dynamics have an impact on the greater society. The phases describe:

1. Inputs for Decision-making, Investment and Design: strategic decision-making processes
2. Innovation Intensity: societal effort to support innovation
3. Innovation Dynamics: tactical and operational decision-making processes
4. Innovation Performance: tangible results from knowledge-intensive activities, value creation
5. Societal Impact and Benefits: capitalization on behalf of the society of the benefits derived from the knowledge economy, value capturing

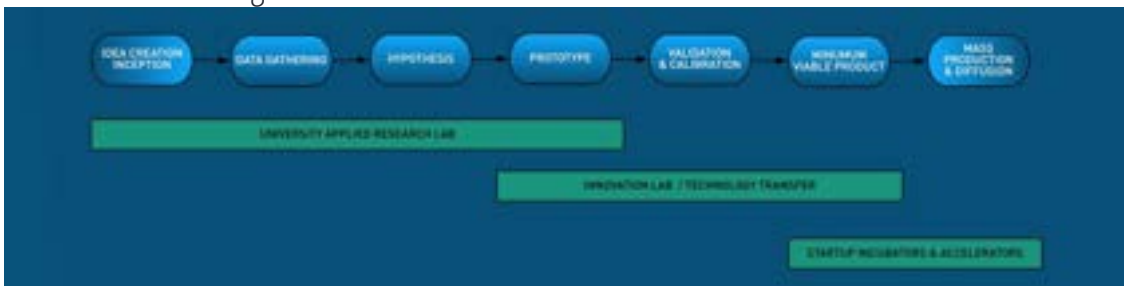


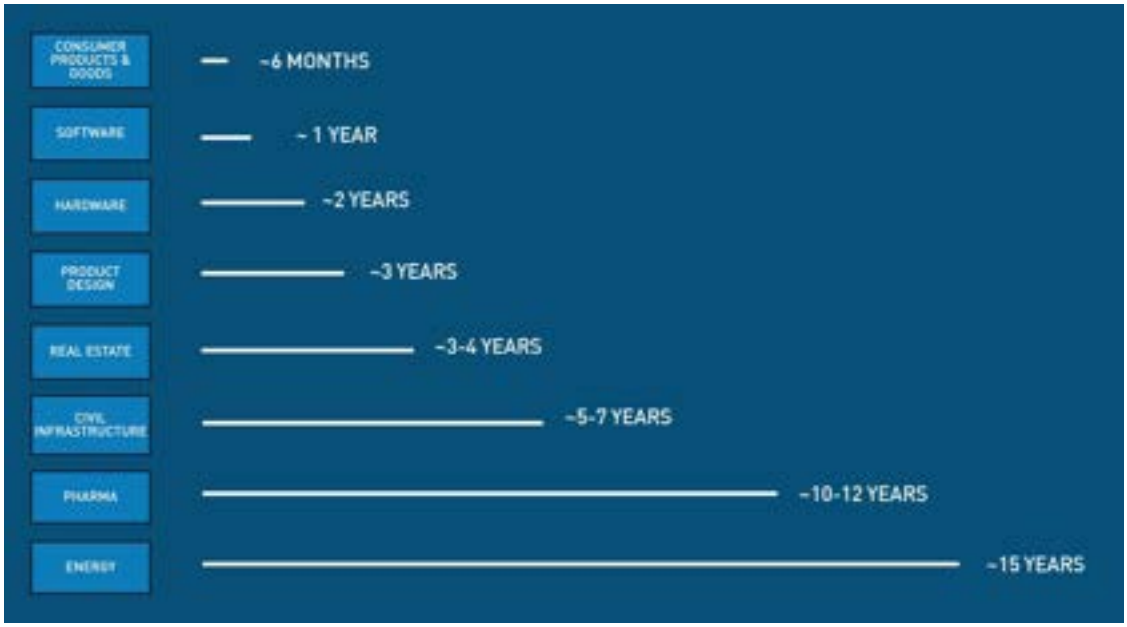
The benefit of the five phases allows for private and public organizations to have a broad view and understanding of how their actions and decisions can have a causal impact on the system in which they work. At both the first step - Inputs, Decision-Making and Design - as well as the third - Innovation Dynamics - organizations can make specific decisions to impact and change the system operations.

At the first step, decision makers can change the amount of investment, the policies, and the design interventions. That change in the input, will affect how people can and will work on the specific problem, in the second step. The third step, focuses on how to refine the ways in which the teams actually work together to develop new solutions. The fourth step is the result of the work, such as new patents, products, and services. The effect of the new products result in new societal impact such as high quality employment, economic contribution, and sustainability, in the fifth step.

## THE 7 PHASES FOR TEAM INNOVATION

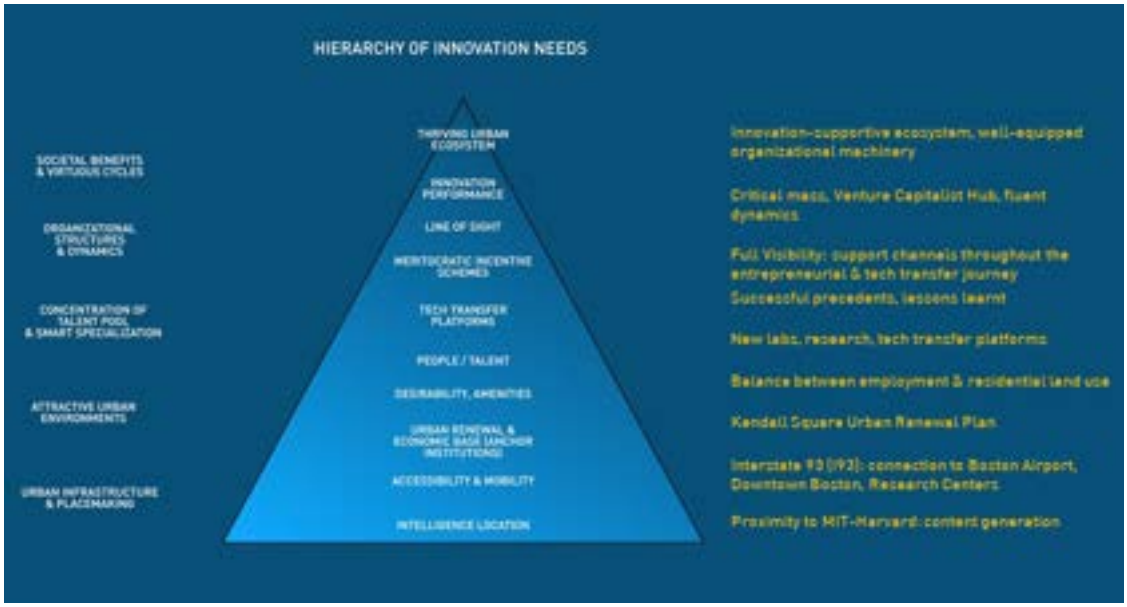
The 7 phases of team innovation speaks to the process by which new ideas are brought from inception to mass production for distribution to the broader community. Each of the seven steps describes the step by step process that teams should follow in order to develop a successful product, process, or service. It also provides a good framework by which organizations can create support networks to help their employees and constituents by avoiding pitfalls, removing obstacles, and achieve their goals.






## THE PYRAMID OF INNOVATION

In order to successfully achieve all 5 steps, it is recommended to evaluate if your organization has all components of the Burke-Gras Hierarchy of Innovation Needs. This pyramidal framework gives the reader a broad set of criteria from location to the quality of amenities, to the innovation performance, all of which are needed to create a thriving urban ecosystem.



## CLUSTERING ANALYSIS: TYPES OF INNOVATION DISTRICTS

City Government led: promoted by municipal or metropolitan governmental agencies:

- Main Characteristics: better overall living environments with different levels of housing, shops and amenities.
- Example: Seattle South Lake

Research & Academic Anchor: built around world class universities and research centers

- Main Characteristics: strong irradiation of scientific articles and patents turning into technology solutions, highly meritocratic environments, radical innovation
- Example: Kendall MIT

Entrepreneurial / Bottom up: organically grown by entrepreneurs and startups

- Main Characteristics: highly meritocratic urban environments, common culture and values, economic incentive schemes, and fluid circulation of talent
- Example: Austin ID

Industry Clusters: built around dominant corporations

- Main Characteristics: strong industry concentration and strategic suppliers located nearby by means of preferential attachment
- Example: LA Sony Studies

Strategic Governmental Agency: high-performance national research and development centers.

- Main Characteristics: often placed in remote locations, ultra-focused on basic science and defence applications, and generating massive technology transfer spillovers in multiple industries
- Example: Oak Ridge NL

| WHERE? | WHAT TYPES? | WHEN? | HOW? |
|---|---|---|---|
| CLASSIFICATION | CLUSTERING | TIME SERIES | DESIGN CAUSALITY |
|  |  |  |  |
| DETECT POTENTIAL INNOVATION DISTRICTS | GROUP DIs WITH COMMON PROPERTIES | UNDERSTAND IMPACT AND EXPANSION | EXTRACT LESSONS TO INFORM DESIGN |

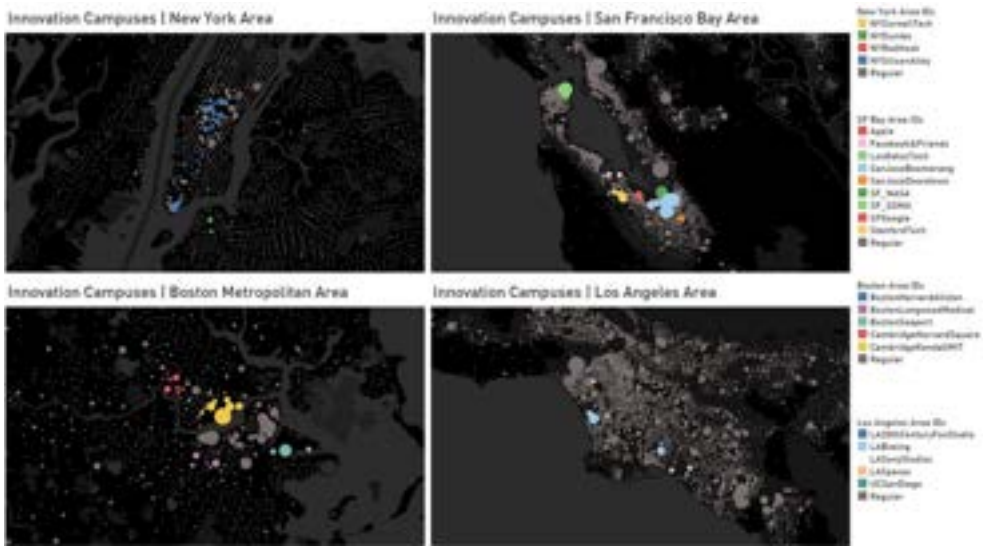
**CITY GOVERNMENT - TOP DOWN**
- HIGH DESIRABILITY / LIVEABILITY
- BALANCE BETWEEN EMPLOYMENT & HOUSING

**ACADEMIC ANCHOR - TECH TRANSFER**
- HIGHER % IN NEW PRODUCTS, SERVICES
- PATENTS, INCOME FROM PATENTS

**ENTREPRENEURIAL - BOTTOM UP**
- HIGHER WAGES, HIGHER INCOME INEQUALITY
- URBAN PLANNING CHAOS

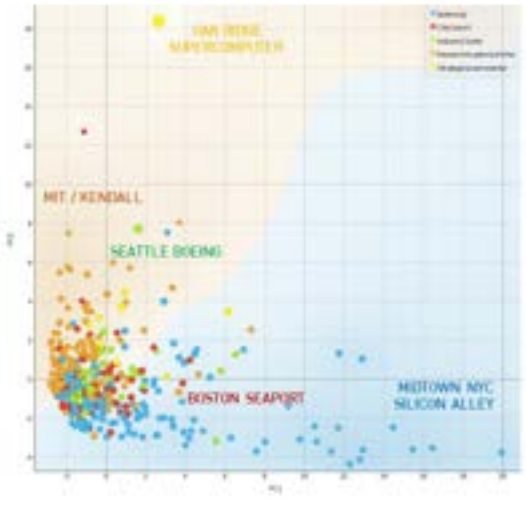
**INDUSTRY CLUSTER**
- STRONG INDUSTRY CONCENTRATION / CLUSTERING
- HIGHER EMPLOYMENT GENERATION

**STRATEGIC GOVERNMENTAL AGENCIES**
- ULTRA FOCUSED HIGH PERFORMANCE
- HIGHER ISOLATION, LESS DESIRABILITY, LESS COMMUNITY



The first version of the Atlas of Innovation District describes the network of knowledge in the United States, emphasizing the contribution of Innovation Districts as key drivers for high quality employment opportunity creation. Subsequent versions of the Atlas will incorporate Europe, Asia, Latin America, Africa and the Middle East, and Oceania to complete the picture of the Atlas of Global Innovation.

By analyzing the 50 most well known Innovation Districts in the United States, we developed the first ever proprietary database, analytics engine, fundamental metrics, and visualizations to describe knowledge-intensive urban ecosystems in their complexity. As a consequence of creating this model, the team has also illuminated hundreds more, which were previously unknown or not considered to be an Innovation District.




**CITY GOVERNMENT-LED**
- HIGH DESIRABILITY / LIVEABILITY
- BALANCE BETWEEN EMPLOYMENT & HOUSING

**RESEARCH / ACADEMIC ANCHOR**
- HIGHER % IN NEW PRODUCTS, SERVICES
- PATENTS, INCOME FROM PATENTS

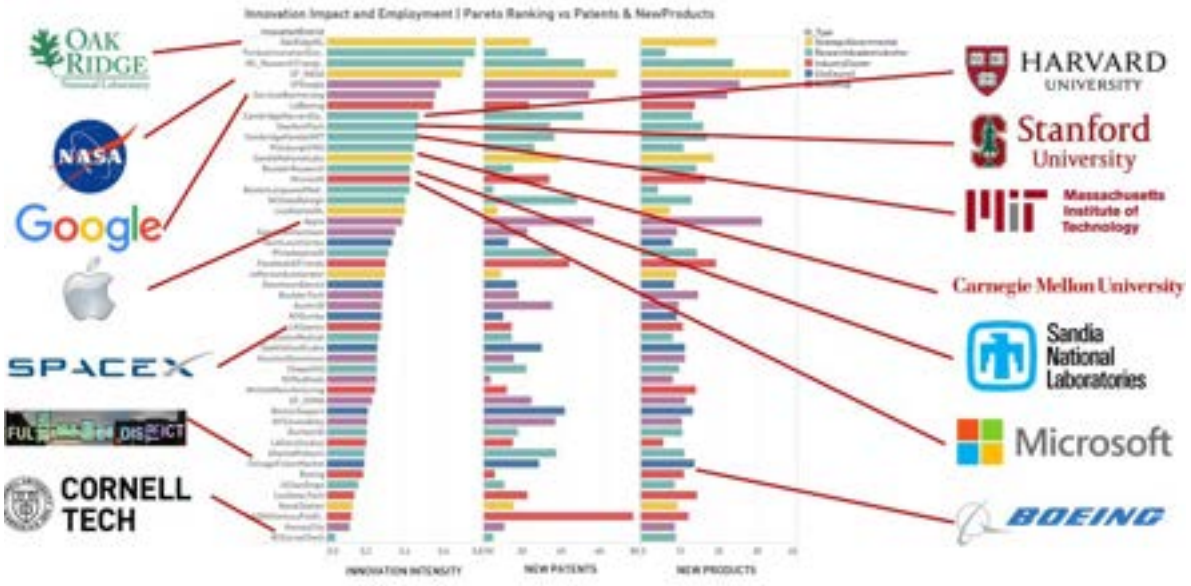
**ENTREPRENEURIAL / BOTTOM UP**
- HIGHER WAGES, HIGHER INCOME INEQUALITY
- URBAN PLANNING CHAOS

**INDUSTRY CLUSTER**
- STRONG INDUSTRY CONCENTRATION / CLUSTERING
- HIGHER EMPLOYMENT GENERATION

**STRATEGIC GOVERNMENTAL AGENCIES**
- ULTRA FOCUSED HIGH PERFORMANCE
- HIGHER ISOLATION, LESS DESIRABILITY, LESS COMMUNITY

From the model, it is clear that innovating is hard, but it definitely pays off: currently Innovation Districts host slightly more than 3 million jobs, of which nearly 998k (32%) have an innovation-related component, as compared to an average business neighbourhood, where only 17% of employees have knowledge-intensive jobs.

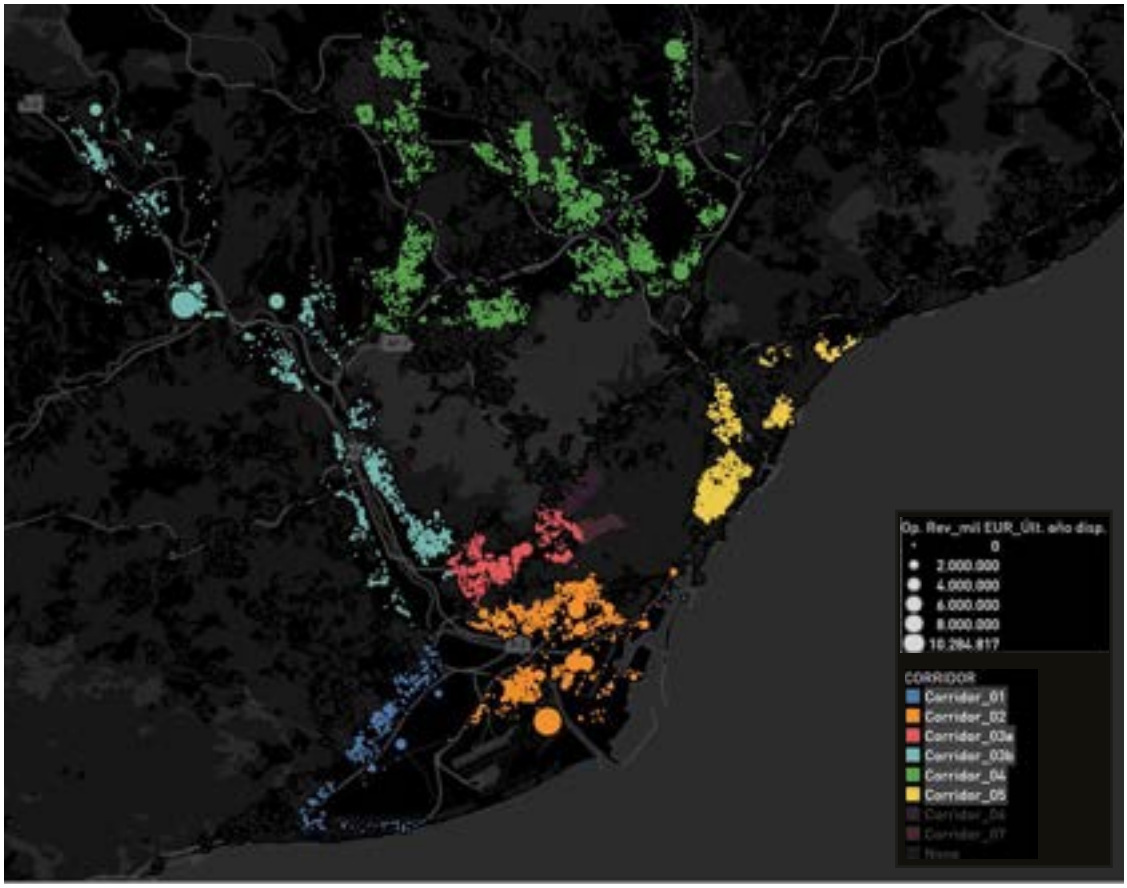
On a per resident basis, Innovation Districts host 9 times more employees, accommodate 15 times more innovation-related jobs, and generate 20 times more wealth than average neighbourhoods. Innovation Districts tend to be dramatically denser than the national average: they concentrate 26 times more density of jobs per square mile.



# RESULTS

Depiction of 25 Innovation Districts and Industrial Clusters in The Barcelona Metropolitan Region

Barcelona Metropolitan Region: 5 Industrial Corridors




Definition of the 5 industrial corridors surrounding the Barcelona Metropolitan Region.

Barcelona Metropolitan Region: 25 Strategic Innovation and Industrial Districts - Nomenclature


There are 25 innovation districts and industry clusters operating in the Barcelona Metropolitan Region. Each district was identified through tagging and clustering analysis based on their geographic proximity, industry relatedness, organizational affinity, and technology compatibility.

BMR: Classification of the 25 Strategic Innovation and Industrial Districts

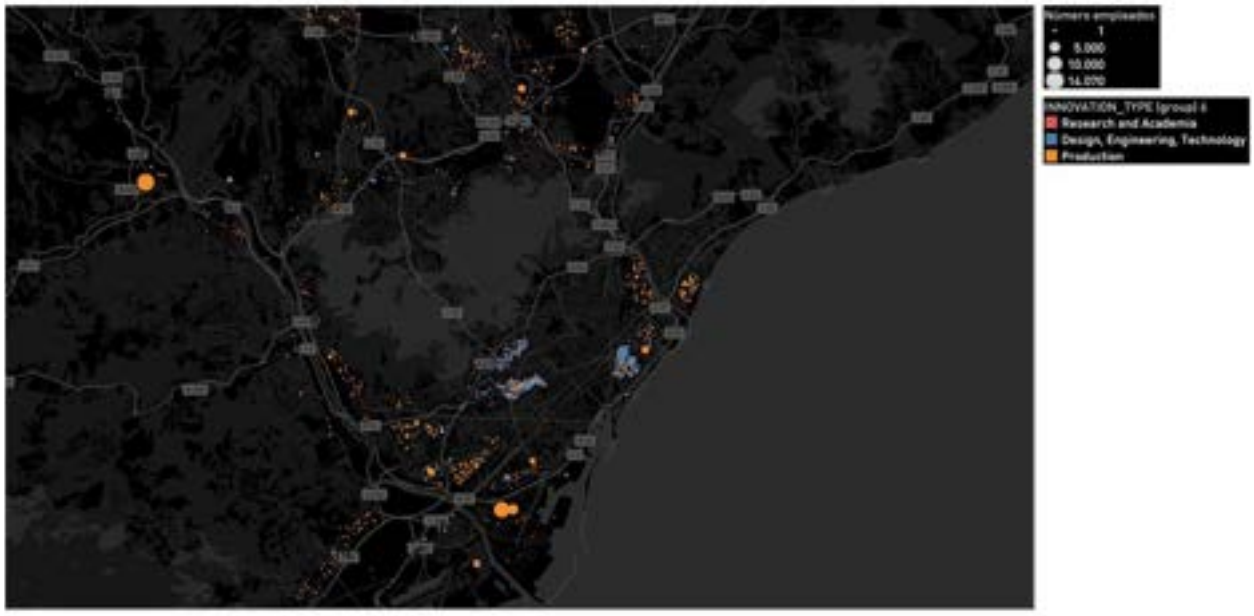
The industrial cluster is the dominant typology with 19 clusters in the region, followed by four non-consolidated Research-led innovation districts, all of which are hosted in the City of Barcelona. There were only singular cases of the City Government-led innovation district, (22@), non-consolidated Strategic Governmental Agency-led (Parc Tecnològic del Vallès / Sincrotró Alba), and an early stage Entrepreneurial Hub (Pier01).

| INNOVATION DISTRICT TYPE | USA TOP50 IDS | BARCELONA METROPOLITAN REGION |
|---|---|---|
| ResearchAcademicAnchor | 38.81% | 19.86% |
| CityGovernment | 25.35% | 44.85% |
| StrategicGovernmental | 51.63% | 46.53% (lacking critical mass) |
| Entrepreneurial | 26.93% | 8.98% |
| IndustryCluster | 43.03% | 27.25% |

The comparisons between the innovation districts in the Barcelona Metropolitan Region and the Top 50 Innovation Districts in the US reveal that the Barcelona Metropolitan Region has had remarkable success in consolidating the City Government-led 22@ Innovation District in less than two decades, because it has a much higher innovation intensity (44.85%) than its counterparts in the US, such as Boston Seaport (21.54%), Seattle South Lake (25.45%), or Saint Louis Cortex (22.4%). However, the 22@ is the single case of a consolidated City Government-led innovation district in the Barcelona Metropolitan Area in terms of both critical mass, innovation intensity and societal benefits. The 22@, however, falls short of its potential impact to the greater metropolitan area as it was designed around 5 unique industry-specific clusters, rather than those present in the regional cities around Barcelona. This lack of a strong relationship with the traditional export-driven products that support a majority of the economy in the region, limits the potential positive societal impact of 22@ beyond the boundaries of the Poblenou neighbourhood.

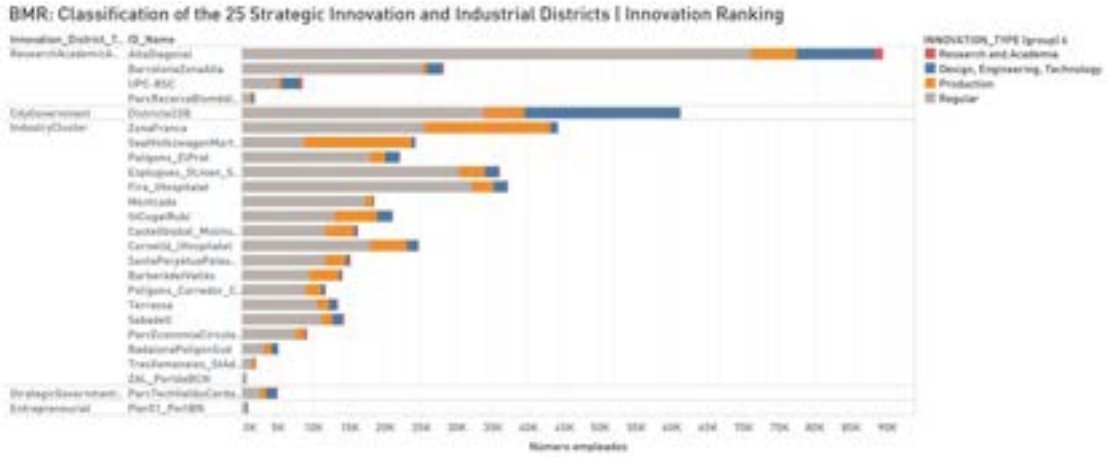
Barcelona Metropolitan Region: 25 Strategic Innovation and Industrial Districts - Patents

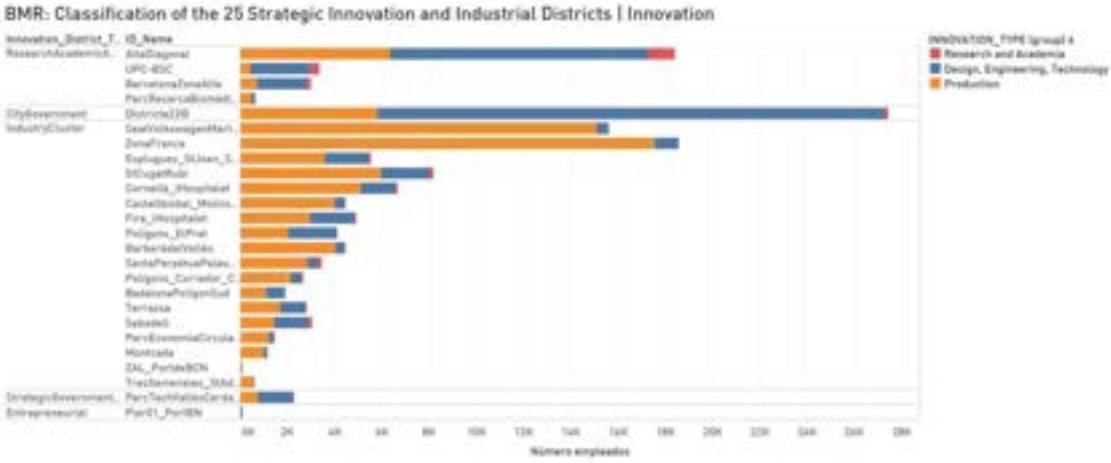
BMR: Classification of the 25 Strategic Innovation and Industrial Districts | Innovation | Map



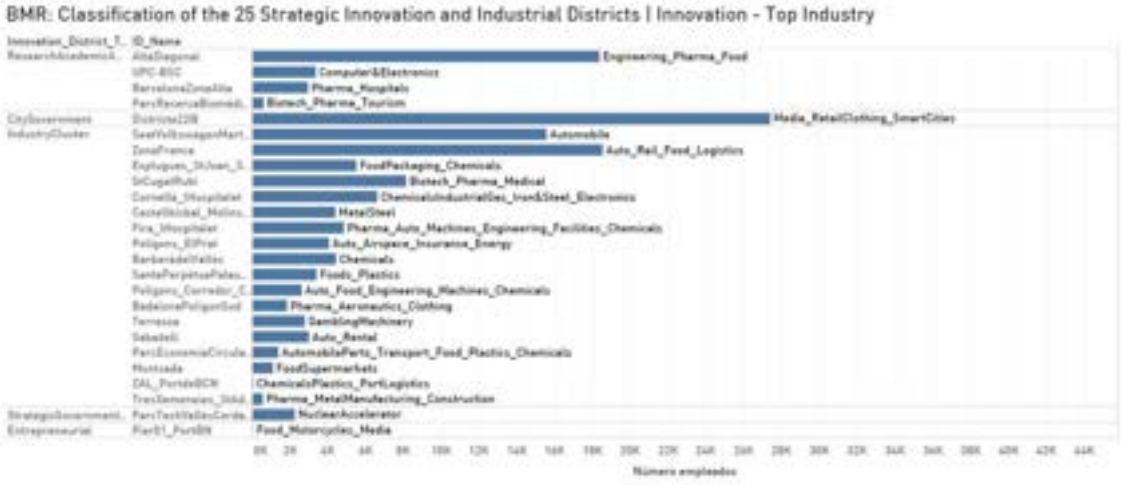

The analysis of the 3 innovation intensity phases reveals that the Barcelona Metropolitan Region is dominated by the third phase: advanced mass production. The Research and Academia as well as the Technology Transfer phases are remarkably weaker than their counterparts in the US, therefore, there is ample room to deploy specific policies, investment prioritization, academic programmes, and urban development opportunities to support and strengthen both research-oriented innovations and technology transfer processes.

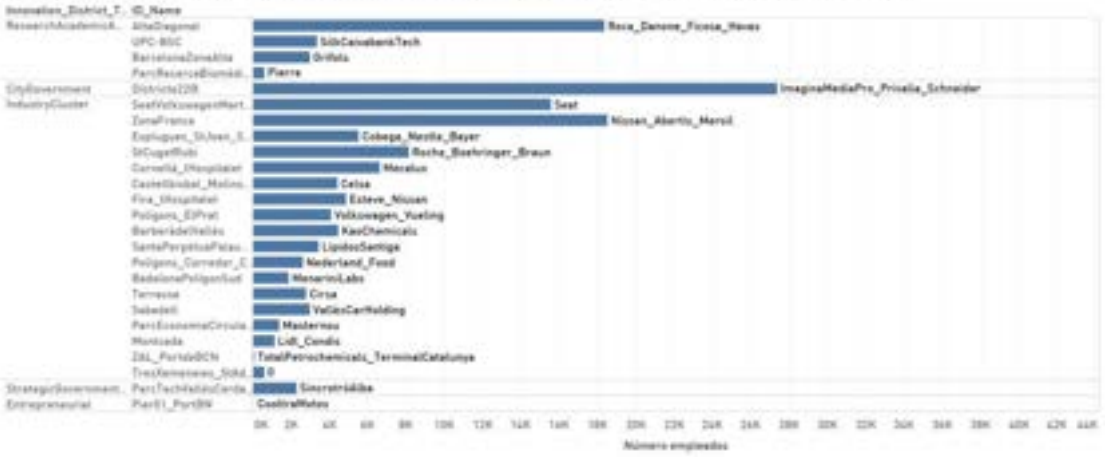
Barcelona_25_Districts | Innovation & Industry Ranking



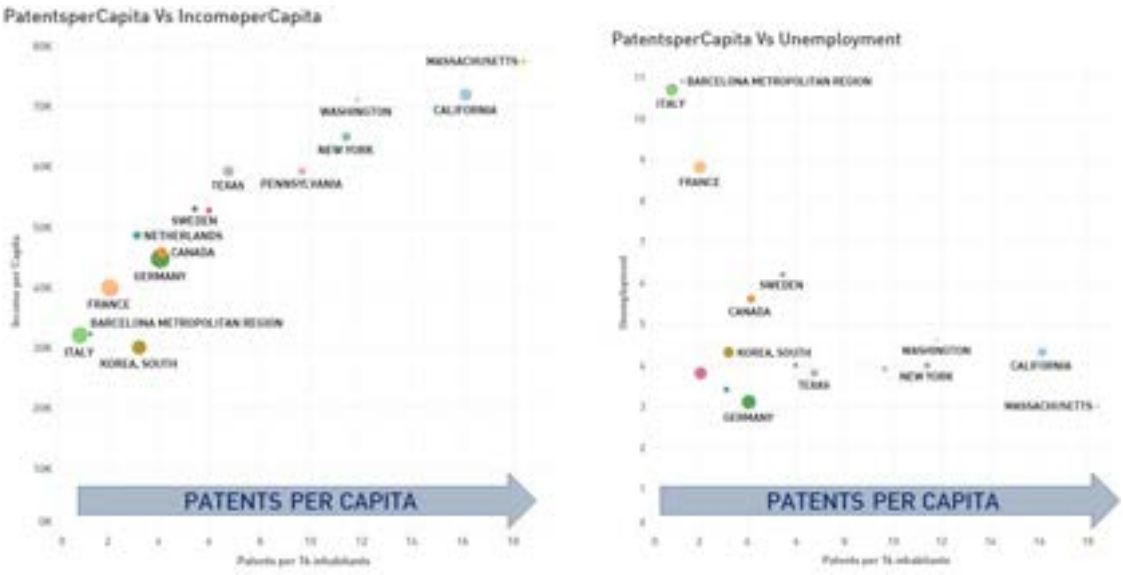

From an Innovation Intensity perspective, there is a non-consolidated (below 30%) Research "boomerang" conformed by 3 potential innovation districts: BSC-UPC, AltaDiagonal, and BarcelonaZonaAlta. A number of the most demanding Catalan and Spanish Universities are located in this stripe, yet their compounded innovation intensity rates are rather low (19%) compared to their American counterparts (39%). Such metrics reveal plenty of room for academic programmes, technology transfer platforms, and initiatives to be implemented to liberate the latent innovation forces within the community.




The innovation performance and impact of the Barcelona Metropolitan Region, succinctly described for example by their ratios of Patents per Capita versus Income per capita and Unemployment Rates, reveals there is ample room for improving the technology transfer mechanism present in the region. The Top 50 Innovation Districts in the US produce:

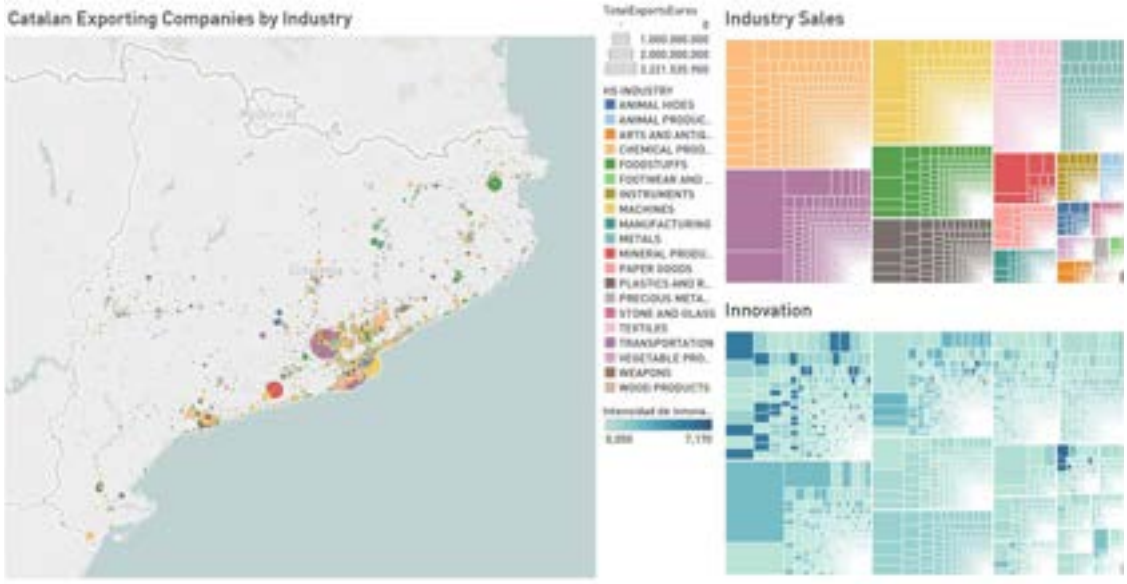
- Around 6 times more solutions (new products, new services, new processes, new patents, R&D, scientific papers),
- Around 2.2 times more income per capita ($70k versus $32k), and
- Around 3 times less unemployment (3.5% versus 11%) than their counterparts in the Barcelona Metropolitan Region.




The analysis of the 3 Phases of Innovation present in the Barcelona Metropolitan Regions reveals that:

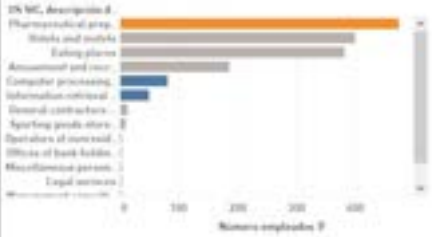
- There is a strategic opportunity to develop a "Research Cluster" between BSC-UPC-IESE-ESADE, AltaDiagonal-UB, and BarcelonaZonaAlta, by promoting a number of initiatives such as joint programmes, university-business research programs, data-science driven academic programs intertwined with traditional fields, technology transfer platforms, entrepreneurship centers, and other strategic initiatives bridging the gap between the corporate and entrepreneurial world as well as the most advanced research developed in the research ecosystem of Barcelona.
- There is an opportunity to develop stronger ties between the high tech hubs hosted in the 22@ District and the regional industries with a revealed comparative advantage.
- There is an opportunity to develop 10-12 high tech hubs, hosted in different municipalities with a revealed comparative advantage for particular industries, to lead the sector-specific technology transfer and mass production processes.


VALUE OF EXPORTS/CARGO: PROXY FOR
VALUE-ADDED & ECONOMIC CONTRIBUTION
EXPORTS BY AUTOMOBILE
BCN HINTERLAND | CATALONIA (SPAIN)
ALL INDUSTRIES
BY VALUE (€)


Catalan Exporting Companies by Industry
Industry Sales
Innovation

Barcelona_25_Districts | Parc de Recerca Biomèdica | District Map

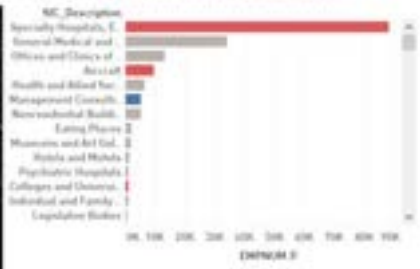
Barcelona_25_Districts | Parc de Recerca Biomèdica | Innovation Phases



Barcelona_25_Districts | Parc de Recerca Biomèdica | Industry Composition

Houston Medical ID Industries

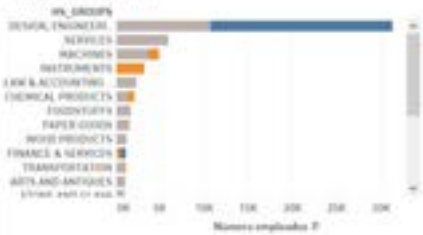
Houston Medical ID Industries Innovation



Houston Medical ID Industries Innovation Tree Map

Barcelona_25_Districts | Districte 22@ | District Map

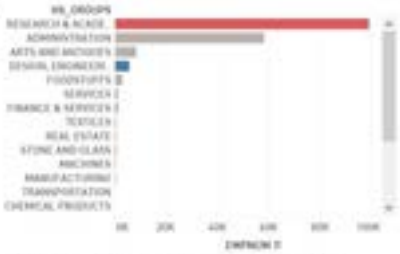
Barcelona_25_Districts | Districte 22@ | Innovation Phases



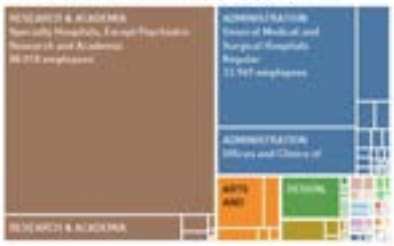
Barcelona_25_Districts | Districte 22@ | Industry Composition

Seattle South Lake | District Map

Seattle South Lake | Innovation Phases

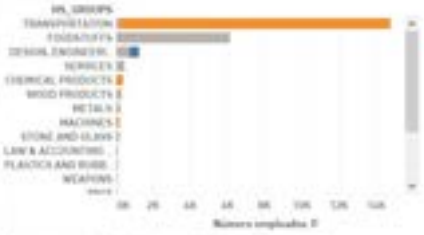


Seattle South Lake | Industry Composition

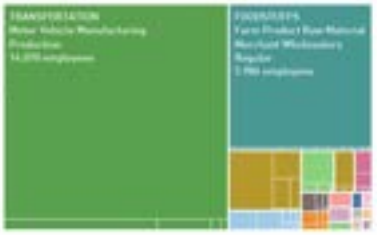


Barcelona_25_Districts | SEAT Martorell | District Map

Barcelona_25_Districts | SEAT Martorell | Innovation Phases

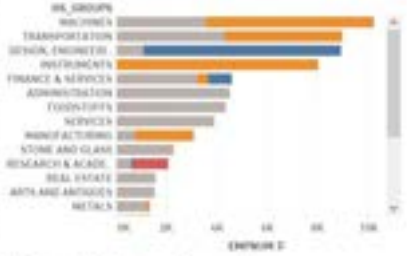


Barcelona_25_Districts | SEAT Martorell | Industry Composition



LA Boeing | ID Innovation Map

LA Boeing | ID Innovation Ranking



LA Boeing | Industry Composition

# CONCLUSIONS

Strengths, Weaknesses, Risks and Opportunities

## INNOVATION DISTRICTS

CityGovernment: there is 1 consolidated (44%, clearly above 30% innovation intensity) Innovation District: 22@, with a high degree of innovation intensity. However, the preliminary relatedness study reveals that the hubs hosted within the 22@ (Media, Retail/Clothing, Smart Cities, IT, Renewable Energy, Smart Cities) are remarkably disconnected at their core from the industries with a revealed comparative advantage (automobile, pharma & biotech, product design, engineering and design, chemical products and polymers, advanced manufacturing, packaging and agricultural, etc)

Research/Academic: there are 4 non-consolidated districts (below 30% innovation intensity) which require more critical mass of knowledge-intensive companies and heavy investment in Research/Academia and Technology Transfer processes:

- AltaDiagonal: engineering, pharma, food
- BarcelonaZonaAlta: pharma, hospitals
- BSC-UPC: computer science & supercomputer, electronics, software
- ParcRecercaBiomèdica: biotech, pharma, tourism

IndustryClusters: there are 4 innovation intensive consolidated industrial clusters:

- Zona Franca: automobile, rail, food, logistics
- SEAT Volkswagen Martorell: automobile
- SantCugatRubí: biotechnology, pharma, medical

- PolígonsElPrat: automobile, airspace, insurance, energy trategic Governmental: there is 1 potential innovation districts which requires intense densification and more critical mass:
- ParcTechVallès-Cerdanyola: StrategicGovernmental, built around nuclear energy, software, renewable energy, robotics

Entrepreneurial: there is 1 non-consolidated innovation district (Pier01), lacking critical mass and synergies with other innovation hubs within the city

## STRENGTHS, WEAKNESSES, RISKS AND OPPORTUNITIES

### Strengths

- Research and academia present a solid talent base, particularly at the undergrad level in multiple fields. The presence of diverse University institutions provide a strong basis for further development of research initiatives and technology transfer programs
- The innovation intensity (societal effort and concentration) is medium-high, particularly for the mass production phase
- The regional industries have a strong amount of diversification
- There is a strong presence of export-driven pharmaceutical and biotechnology companies

### Weaknesses

- The disconnect between graduate programs (Master, PhD) and cutting-edge research and business implementation of advanced solutions is a missed opportunity to support the development of new ideas into market ready products, processes, and services.
- Research and Academia as well as Technology Transfer is at a medium-low innovation intensity level. Raising this would require greater geographic

consolidation of companies or an increase in the total number of institutions dedicated to such practices.

- Investment or changes in the organizational structure could help increase the current medium-low innovation performance and technology transfer rates (new patents, new products, new services, new processes, new patents, R&D programs) from the 5 phases of innovation performance.
- Cluster heterogeneity is too high, often encompassing well over 10 different industry groups. For a particular cluster, 3 to 5 industry hubs concentrating over 70% of employment represent a desirable level of diversity and critical mass, particularly if industry Relatedness laws operate locally (ease of circulation of talent, ideas, technology, solutions, etc)
- Greater connections or more established relationships between research centers and leading companies can boost currently medium-low innovation impact rates (high quality employment generation, decreased unemployment, and increased salaries).

## Risks

- There are lagging developments in Data Science, Machine Learning, AI, software, and IT-related industries.
- Strong international investment are susceptible to be outsourced overseas.
- There is an increasing disconnect between local research and cutting edge research.
- There is an increasing disconnect between industry needs and applied research.
- Lack of critical mass within potential high tech hubs may jeopardize their consolidation and competitiveness.
- The low innovation intensity for phases 1 (research/academia) and 2

(technology transfer) increase the risk for industry displacement and the threat of international entrants, which have the potential to dominate the local market for new disruptive technologies.

## Opportunities

- The creation and refinement of university-business research programs.
- The creation and refinement of university-public administration research programs
- Diversification of academic offerings by introducing Data Science, ML, and AI into more university curriculums.
- Implementing structural changes in academic research programmes and establishing global benchmarking references to compare against.
- Incentivize collaboration between different universities and departments to develop interdisciplinary solutions to both industry-specific and societal problems.
- Develop Technology Transfer Platforms and apply the lessons learnt from best cases in selected US universities.

# RECOMMENDATIONS

Pathways to Distributed Prosperity
Based on the Knowledge Economy

The preliminary results of the analysis suggest that there are 9 potential innovation districts hosting high value added activities, leading industry-specific high tech regional hubs:

## NEW NODES OF CENTRALITY: BUILD HIGH TECH HUBS AROUND SPECIFIC INDUSTRIES WITH A PARTICULAR POTENTIAL IN THE TERRITORY:

- Sant Cugat – Rubí: Pharma, Surgical And Medical Device Manufacturing
- Martorell: Automobile Manufacturing, Electric Vehicles, Self Driving Cars
- El Prat: Polymers, Paint, Chemical Manufacturing
- L'Hospitalet: Pharma, Industrial Machinery
- Cornellà: Industrial Gas Manufacturing, Chemical Products
- Esplugues: Food & Packaging, Gastronomy & Chemicals
- Castellbisbal: Advanced Metal Manufacturing, Robotics
- Santa Perpètua – Palau Solità: Plastics, Polymers
- Cerdanyola: Energy Systems, Nuclear Research, Robotics

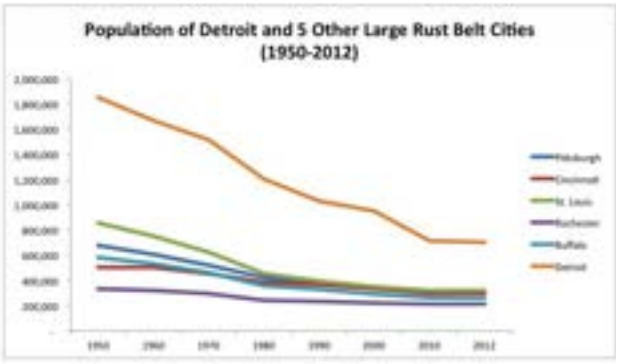
The preliminary results of the analysis suggest that there are 6 potential innovation districts within Barcelona, hosting high value added activities, capable of leading in the mid term industry-specific high tech regional hubs:

## BARCELONA-BASED TECHNOLOGY TRANSFER PROGRAM:

- Bsc-Upc: Software, Data Science, Computer & Electronics
- Alta Diagonal: Machine Learning & Artificial Intelligence
- Barcelona Zona Alta & Prb: Medical Research, Data Science & Biotech
- 22@: Smart Cities, Mobility, Media, Renewable Energy, Research & Tech Transfer
- Zona Franca/Port: Control Instruments, Logistics, Airspace
- Pier01: Software Solutions

PITTSBURGH 1930-50s

INDUSTRIAL ENGINE OF THE US
60% OF US STEEL + 40% OF US PLASTICS
+ 40% OF US GLASS
KEY CONTRIBUTION TO WWII




PITTSBURGH 1960-80s

MASSIVE INDUSTRIAL DE-LOCALIZATION
INDUSTRY COLLAPSE
LOST 400,000 INHABITANTS

MINING - STEEL - METALS - MANUFACTURING -
ADVANCED MANUFACTURING - ROBOTICS - AI

## NETWORKS OF TALENT

- University/Research Reform: Integrate Data Science With Traditional Fields
- University – Business Scientific Collaboration: Tension With The Real World, Not Grant Applications

Between the 1930s and 1950s Pittsburgh was a national industrial powerhouse in the US, producing 60% of the steel and 40% of the glass and plastic for the United States during World War II. During the de-industrialization of the 1960 to 1980's, however, Pittsburgh lost 40% of its population, as a result to changes and shifts in its most dominant industries. It seemed that everything was lost for Pittsburgh.

In spite of the downturn, starting in 2010, Pittsburgh rebounded and is once again a prosperous city. Not only is it gaining popularity for the quality of food and social amenities, it is also one of the most important centers in the world for robotics, advanced manufacturing, and artificial intelligence. How could a city that had lost everything resigned from its ashes?

Pre-existing knowledge and know-how from the original steel, glass, and plastic industries, evolved into shared knowledge of more advanced professions related to steel - mechanical and material design, to develop advanced manufacturing and robotic equipment. Combined with related industries such as computer science and electrical engineering at Carnegie Mellon and University of Pittsburgh, Pittsburgh renewed its historical comparative advantage from steel manufacturing to robotic design.

The potential of the talent network depends on three key factors:

1. Boosting Knowledge: academic and professional training of people, creating

new academic and professional programs specialized in metal technology, advanced manufacturing, robotics and AI

2. Concentration of Knowledge: Strategic specialization, which allows you to have a comparative advantage. It is easier to sophisticate a pre-existing industry, than to start from scratch in a field that requires great investment and many years to consolidate
3. Diversification and Sophistication: accumulation and capitalization of aggregate knowledge.

## NETWORKS OF ORGANIZATIONAL STRUCTURES

- Support 3 Phases Of Societal Innovation, 5 Phases For Cities, 7 Phases For Teams
- Bridge: Ideate, Design, Create, Nurture Technology Transfer Platforms
- Understand Strengths: Focus On The Core, Industry Relatedness

At the Massachusetts Institute of Technology (MIT) 2,000 theses are published every year. While only one-third of these theses and solutions reach the market - about 700 per year - the value of this innovation and technology transfer equate to the 9th economy in the world in GDP. Innovations such as internet, satellite navigation, nuclear and renewable energy solutions, robotics, artificial intelligence, advanced materials, medical, and pharmaceutical research are the main contributors to this market dominance of MIT founded companies.

Attributed to this success are a series of networked organizational structures, which enable students to have stable organizational structures that allow us to successfully complete the 7 phases of team innovation identify problems, gathering necessary information, developing a hypothesis, designing a prototype, calibrating it, converting it into a product or service or solution, and making it scalable for

mass production. MIT creates safety net structures to allow student teams to pass through each phase with an understanding that each industry can have different life cycles of development: Software / AI: 1 year; Hardware / Semiconductors: 2 years; Product design: 2-3 years; Infrastructures: 5-7 years; Pharma: 10-12 years; and Energy systems: 15 years.

In addition to the 7 steps, teams are based on meritocratic evaluates each and every individual based on their intelligence and contribution, rather than their legacy. This non legacy tradition is illustrated by the fact that MIT uses numbers to name it's buildings, rather than the name of wealthy donors.


KENDALL SQUARE 1970
LUNAR LANDSCAPE, CRIME

KENDALL SQUARE 2019
#1 INNOVATION HUB IN THE WORLD

## NETWORKS OF URBAN DESIGN

- Concentration & Critical Mass, Centrality, Gravity, Betweenness
- High quality urban & infrastructural design supporting High Value Added Communities
- Benchmark with Best Practices Globally

In the early 1960s President Kennedy selected Kendall Square (Cambridge, Massachusetts) as the district to be hosting the future NASA Technology Campus. Unfortunately, President Kennedy was assassinated in 1963. His successor, President Johnson decides to locate the aerospace campus in his native state, Texas. For 25 years the area was a lunar landscape, dangerous at night for crime.

The urban renewal plan developed since the late 1990s, taking advantage of the new road artery system I93 in the midst of them allowed Kendall to be connected with downtown Boston and the Boston Airport in less than 15 minutes, boosting the centrality and accessibility of the neighborhood.

During the last 20 years, driven by the intense urban renovation plan, the district has been dramatically redesigned, it has become attractive both from an architectural point of view and with regard to the local cultural amenities, and has been easily connected with the local talent hubs and research institutions.

As a result: Many MIT and Harvard innovation and technology transfer centers have been created, and the neighbourhood has been consolidated as a premium innovation hub, hosting the creation of successful world class startups. At the current moment, the district of Kendall Square presents the lowest level of real estate vacancies of all the United States.

The result of the research we have developed shows that, with regard to the Top 50 innovation districts in the US, they accumulate:

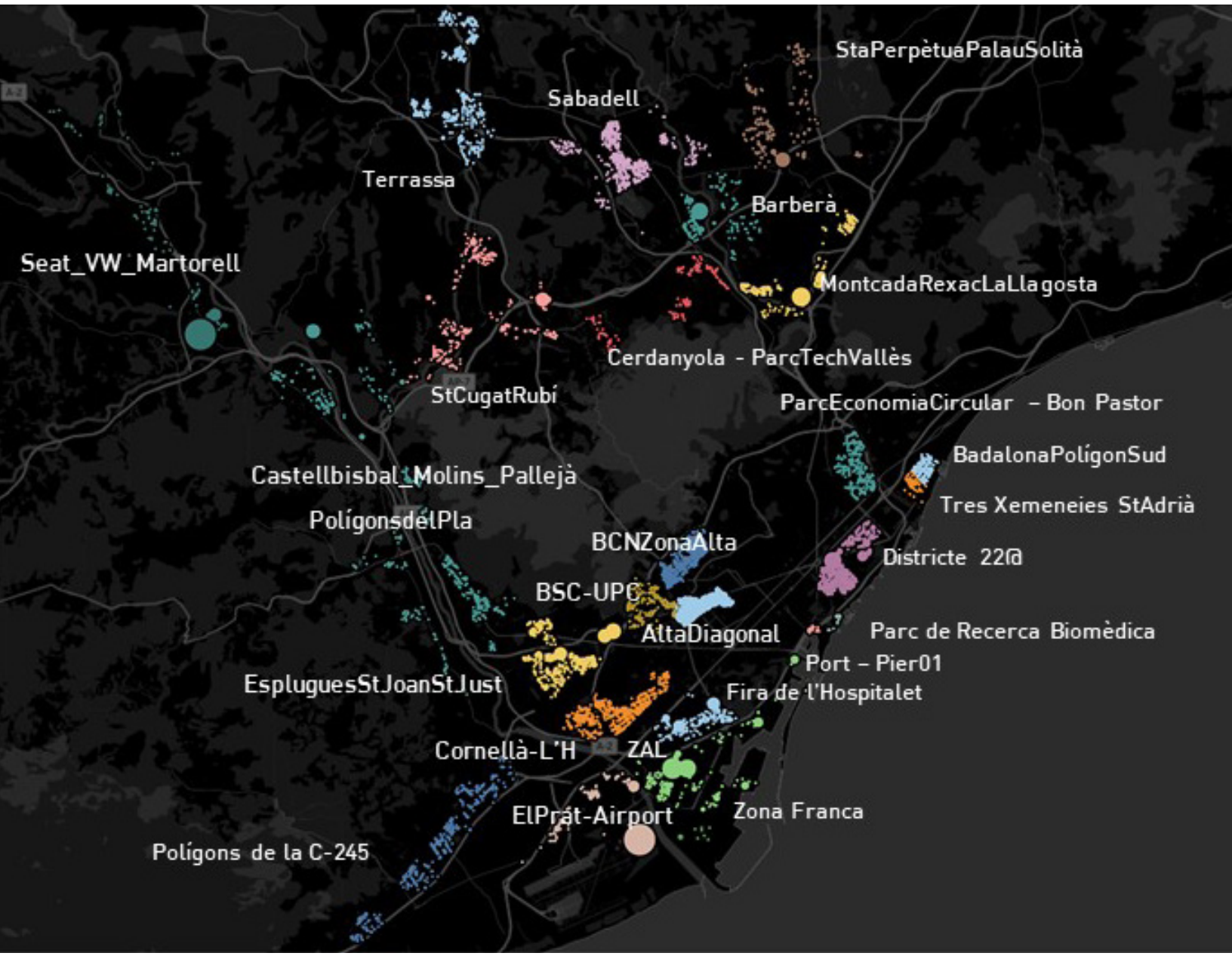
- 4 times more solutions per employee (new patents, new products, new services, new processes, R&D projects, scientific articles)
- 9 times more density of job opportunities per resident
- 15 times more concentration of knowledge-intensive (high quality) jobs per resident
- 20 times more wealth or economic activity per resident than an average neighborhood.
- Every intensive work on innovation generates 4 or 5 jobs more support, reducing unemployment and creating distributed prosperity.

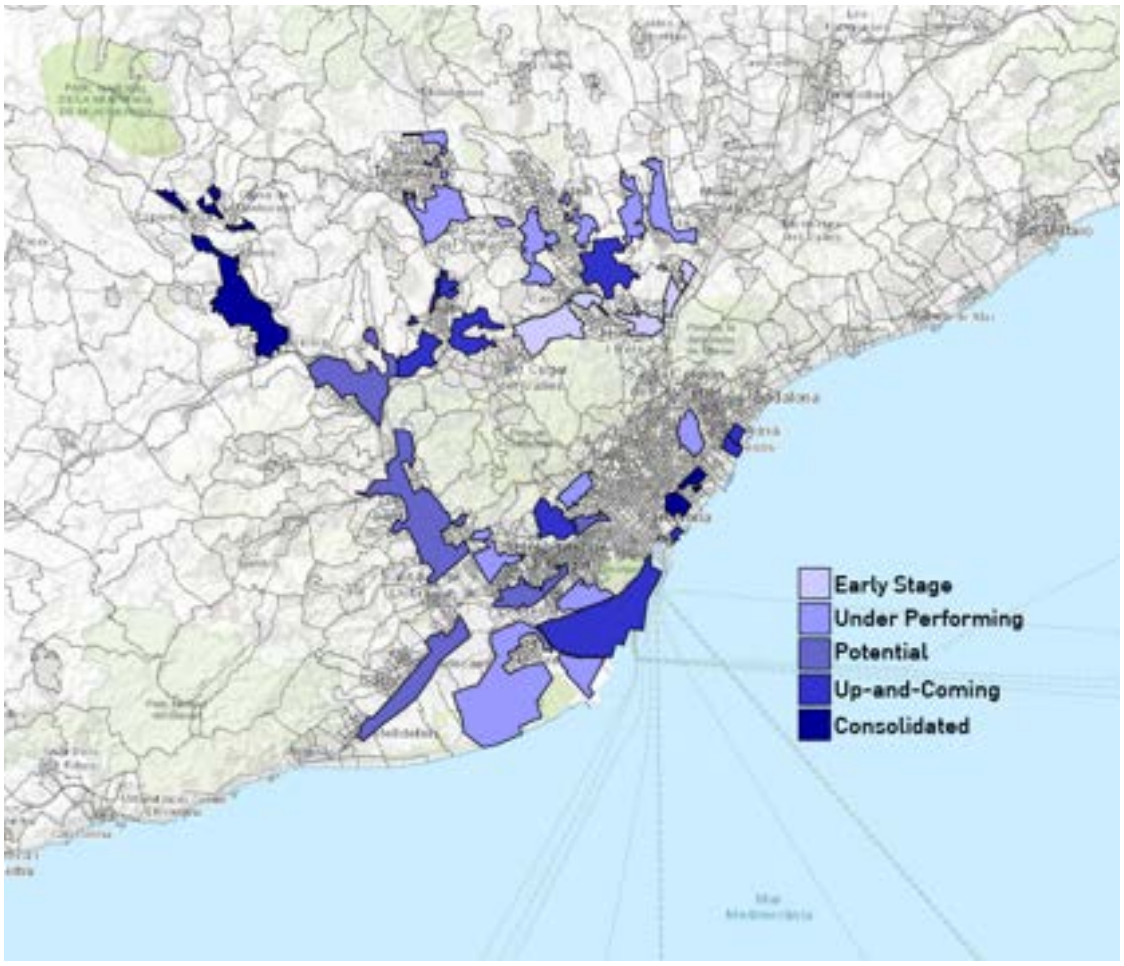
# ARETIAN DATA SUMMARY

Analysis and Results of Information Describing the Barcelona Metropolitan Area

This section presents an overview of the qualitative and quantitative results of the analysis. The following tables include:

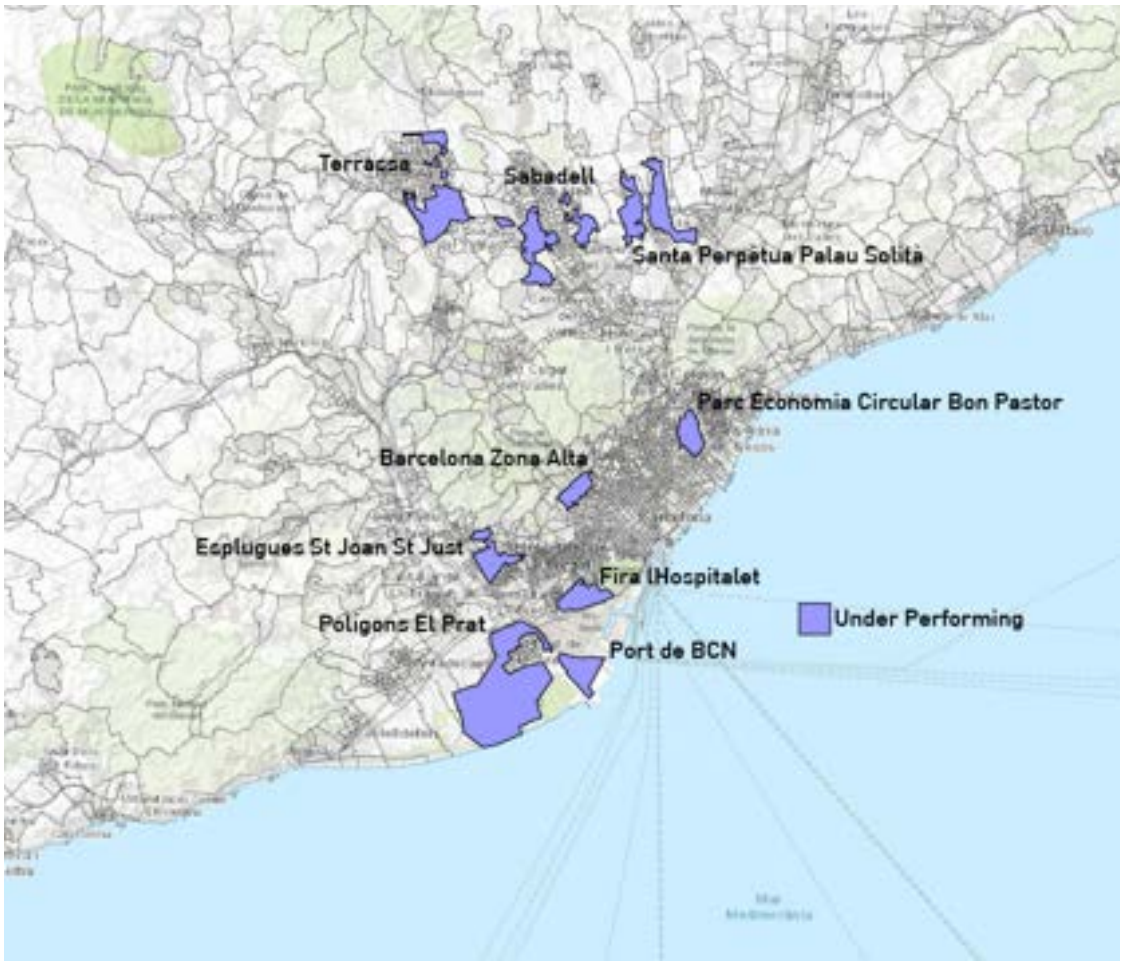
- Innovation District Maturity: classification, level of consolidation
- Industry Concentration: core industries and leading companies/ institutions
- Innovation Intensity: societal effort, knowledge intensive employment, by phase
- Innovation Performance: tangible results of knowledge intensive activities)
- Innovation Impact: societal benefits and positive externalities
- Financials: aggregate economic performance by cluster


StaPerpètuaPalauSolità
Sabadell
Terrassa
Barberà
Seat_VW_Martorell
MontcadaRexacLaLlagosta
Cerdanyola - ParcTechVallès
StCugatRubí
ParcEconomiaCircular – Bon Pastor
BadalonaPolígonSud
Castellbisbal_Molins_Pallejà
Tres Xemeneies StAdrià
PolígonsdelPla
BCNZonaAlta
Districte 22@
BSC-UPC
AltaDiagonal
Parc de Recerca Biomèdica
Port – Pier01
EspluguesStJoanStJust
Fira de l'Hospitalet
Cornellà-L'H
ZAL
ElPrat-Airport
Zona Franca
Polígons de la C-245




Innovation Districts and Industrial Clusters in the
Barcelona Metropolitan Region
Based on their Level of Maturity

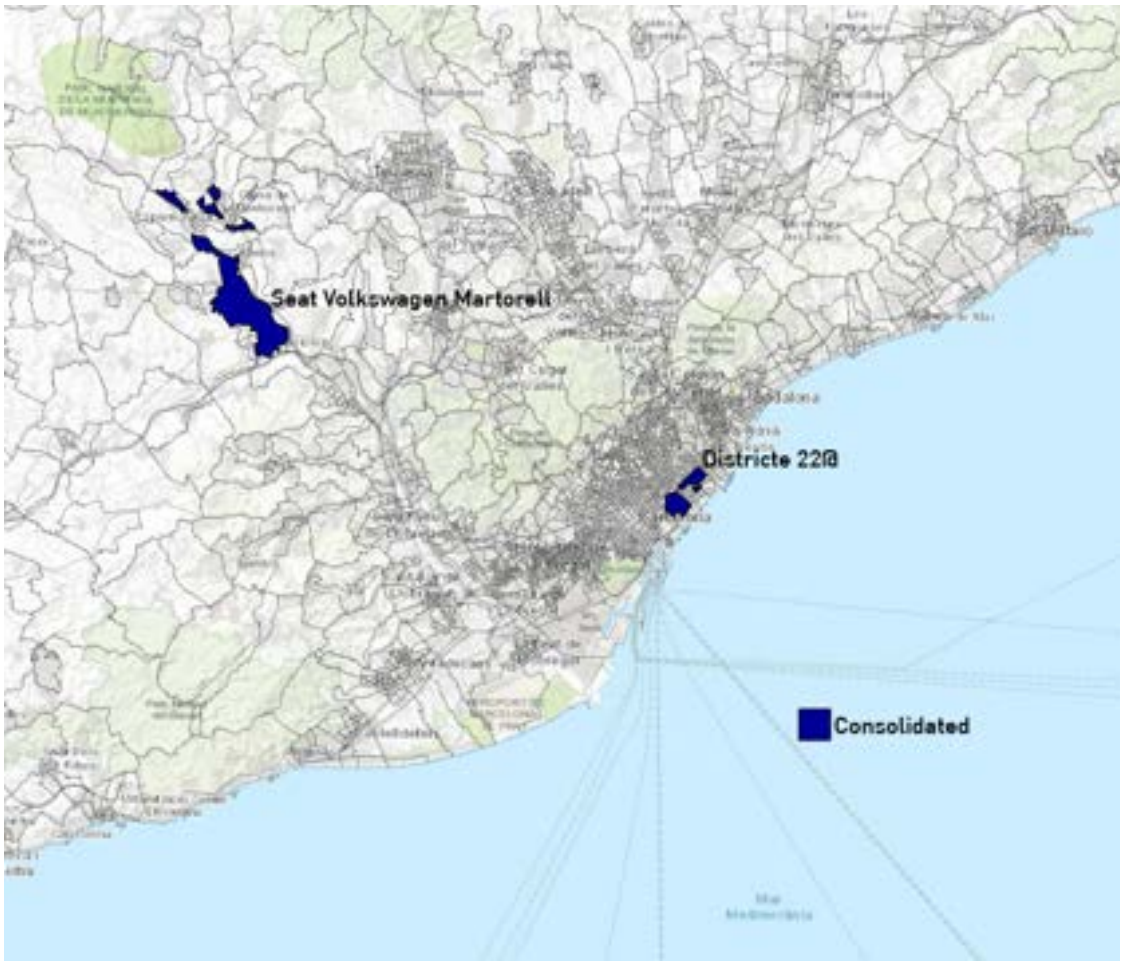

Innovation Districts and Industrial Clusters in the
Barcelona Metropolitan Region
Level 1: Early Stage




Innovation Districts and Industrial Clusters in the
Barcelona Metropolitan Region
Level 2: Under Performing


Innovation Districts and Industrial Clusters in the
Barcelona Metropolitan Region
Level 3: Potential


Innovation Districts and Industrial Clusters in the
Barcelona Metropolitan Region
Level 4: Up-and-Coming




Innovation Districts and Industrial Clusters in the
Barcelona Metropolitan Region
Level 5: Consolidated

## ID_Industries

| Innovation_District_.. | DISTRICT | InnovationDistrict | Primary HS Industry .. | Dominant Industries | Leading Company | Leading Research Ce.. |
|---|---|---|---|---|---|---|
| CityGovernment | District_05_01 | Districte 22@ | Design, Engineering, .. | Media_RetailClothing_SmartCities | ImaginaMediaPro_Priva.. | Null |
| Entrepreneurial | District_05_06 | Pier01_PortBN | Transportation | Food_Motorcycles_Media | CooltraMotos | Null |
| IndustryCluster | District_01_01 | Polígons_Corredor_C-245 | Foodstuffs | Auto_Food_Engineering_Machines_Chemicals | Nederland_Food | Null |
| | District_02_01 | Fira_lHospitalet | Services | Pharma_Auto_Machines_Engineering | Esteve_Nissan | Null |
| | District_02_02 | Cornellà_lHospitalet | Metals | ChemicalsIndustrialGas_Iron&Steel_Electronics | Mecalux | Null |
| | District_02_03 | Polígons_ElPrat | Transportation | Auto_Airspace_Insurance_Energy | Volkswagen_Vueling | Null |
| | District_02_04 | ZonaFranca | Transportation | Auto_Rail_Food_Logistics | Nissan_Abertis_Meroil | Null |
| | District_02_05 | ZAL_PortdeBCN | Transportation | ChemicalsPlastics_PortLogistics | TotalPetrochemicals_T.. | Null |
| | District_03a_02 | PolígonsdelPla_StFeliuMolins | Real Estate | FoodPackaging_Chemicals | Cobega_Nestle_Bayer | Null |
| | District_03b_01 | PolígonsCastellbisbal&Co | Transportation | MetalSteel | Celsa | Null |
| | District_03b_02 | SeatVolkswagenMartorell | Transportation | Automobile | Seat | Null |
| | District_04_02 | StCugatRubi | Services | Biotech_Pharma_Medical | Roche_Boehringer_Bra.. | Null |
| | District_04_03 | BarberàdelVallès | Chemical Products | Chemicals | KaoChemicals | Null |
| | District_04_04 | Montcada | Foodstuffs | FoodSupermarkets | Lidl_Condis | Null |
| | District_04_05 | Sabadell | Services | Auto_Rental | VallèsCarHolding | Null |
| | District_04_06 | SantaPerpètuaPalauSolità | Plastics and Rubbers | Foods_Plastics | LipidosSantiga | Null |
| | District_04_07 | Terrassa | Services | GamblingMachinery | Cirsa | Null |
| | District_05_02 | TresXemeneies_StAdrià | Stone and Glass | Pharma_MetalManufacturing_Construction | MenariniLabs | Null |
| | District_05_04 | ParcEconomiaCircularBonPas.. | Foodstuffs | AutomobileParts_Transport_Food_Plastics | Masternou | Null |
| | District_05_05 | BadalonaPolígonSud | Chemical Products | Pharma_Aeronautics_Clothing | MenariniLabs | Null |
| ResearchAcademicA.. | District_03a_01 | UPC-BSC | Design, Engineering, .. | Computer&Electronics | SilkCaixabankTech | UPC-BSC-IESE-ESADE |
| | District_05_03 | ParcRecercaBiomèdica | Research | Biotech_Pharma_Tourism | Pierre | ParcRecercaBiomèdi.. |
| | District_06_01 | BarcelonaZonaAlta | Research | Pharma_Hospitals | Grifols | IQS_LaSalle_UIC |
| | District_07_01 | AltaDiagonal | Design, Engineering, .. | Engineering_Pharma_Food | Roca_Danone_Ficosa_H.. | UB |
| StrategicGovernment.. | District_04_01 | ParcTechVallèsCerdanyola | Design, Engineering, .. | NuclearAccelerator | SincrotróAlba | SincrotróAlba |

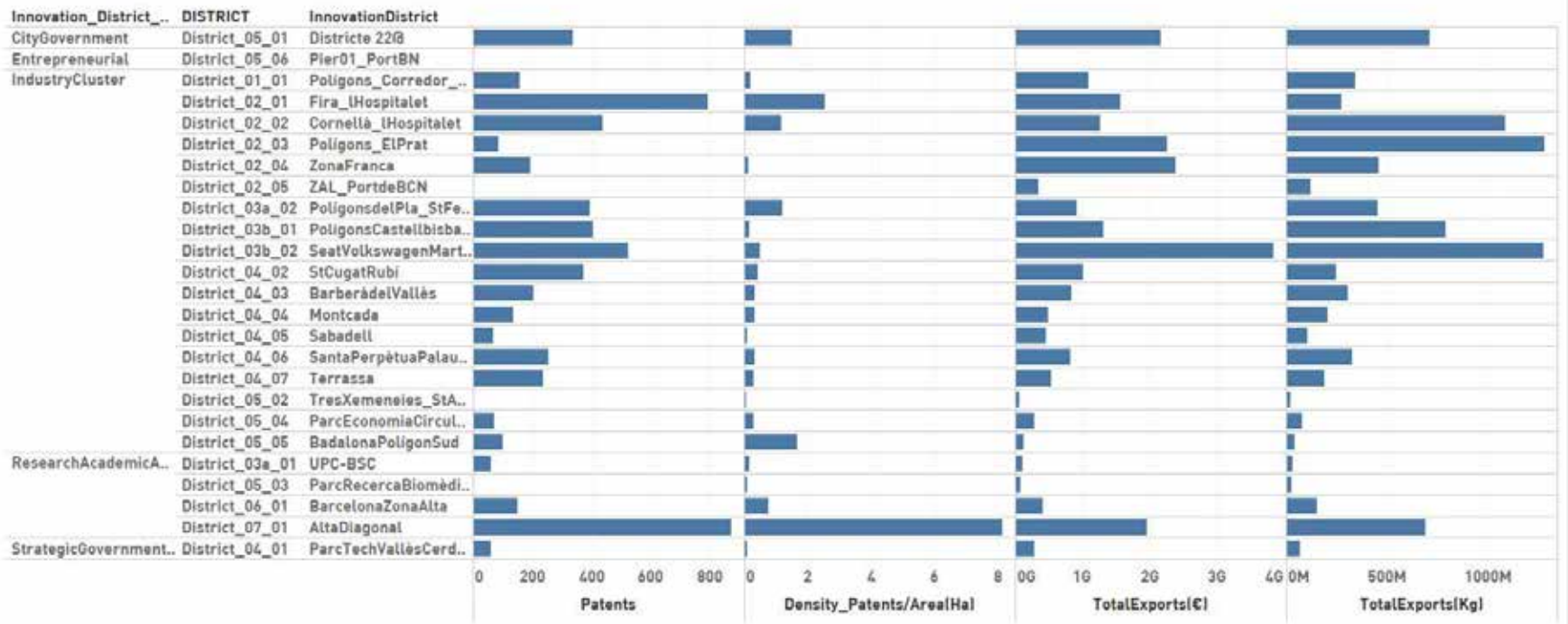
## ID_Maturity

| Innovation_District_.. | DISTRICT | InnovationDistrict | Core City | Corridor | InnovationDistrictMaturity |
|---|---|---|---|---|---|
| CityGovernment | District_05_01 | Districte 22@ | Barcelona | Corridor_05 | 5_Consolidated |
| Entrepreneurial | District_05_06 | Pier01_PortBN | Barcelona | Corridor_05 | 1_EarlyStage |
| IndustryCluster | District_01_01 | Polígons_Corredor_.. | Sant Boi de Llobregat | Corridor_01 | 3_Potential |
| | District_02_01 | Fira_lHospitalet | L'Hospitalet - Cornellà | Corridor_02 | 2_Underperforming |
| | District_02_02 | Cornellà_lHospitalet | L'Hospitalet de Llobr.. | Corridor_02 | 3_Potential |
| | District_02_03 | Polígons_ElPrat | El Prat de Llobregat | Corridor_02 | 2_Underperforming |
| | District_02_04 | ZonaFranca | Barcelona | Corridor_02 | 4_Up and coming |
| | District_02_05 | ZAL_PortdeBCN | El Prat de Llobregat | Corridor_02 | 2_Underperforming |
| | District_03a_02 | PolígonsdelPla_StFe.. | Esplugues de Llobre.. | Corridor_03a | 2_Underperforming |
| | District_03b_01 | PolígonsCastellbisba.. | Castellbisbal | Corridor_03b | 3_Potential |
| | District_03b_02 | SeatVolkswagenMart.. | Martorell | Corridor_03b | 5_Consolidated |
| | District_04_02 | StCugatRubi | Sant Cugat del Vallès | Corridor_04 | 4_Up and coming |
| | District_04_03 | BarberàdelVallès | Barberà del Vallès | Corridor_04 | 4_Up and coming |
| | District_04_04 | Montcada | Montcada i Reixac | Corridor_04 | 1_EarlyStage |
| | District_04_05 | Sabadell | Sabadell | Corridor_04 | 2_Underperforming |
| | District_04_06 | SantaPerpètuaPalau.. | Santa Perpètua de M.. | Corridor_04 | 2_Underperforming |
| | District_04_07 | Terrassa | Terrassa | Corridor_04 | 2_Underperforming |
| | District_05_02 | TresXemeneies_StA.. | Sant Adrià del Besòs | Corridor_05 | 4_Up and coming |
| | District_05_04 | ParcEconomiaCircul.. | Barcelona | Corridor_05 | 2_Underperforming |
| | District_05_05 | BadalonaPolígonSud | Badalona | Corridor_05 | 4_Up and coming |
| ResearchAcademicA.. | District_03a_01 | UPC-BSC | Barcelona | Corridor_03a | 4_Up and coming |
| | District_05_03 | ParcRecercaBiomèdi.. | Barcelona | Corridor_05 | 4_Up and coming |
| | District_06_01 | BarcelonaZonaAlta | Barcelona | Corridor_06 | 2_Underperforming |
| | District_07_01 | AltaDiagonal | Barcelona | Corridor_07 | 3_Potential |
| StrategicGovernment.. | District_04_01 | ParcTechVallèsCerd.. | Cerdanyola del Vallès | Corridor_04 | 1_EarlyStage |

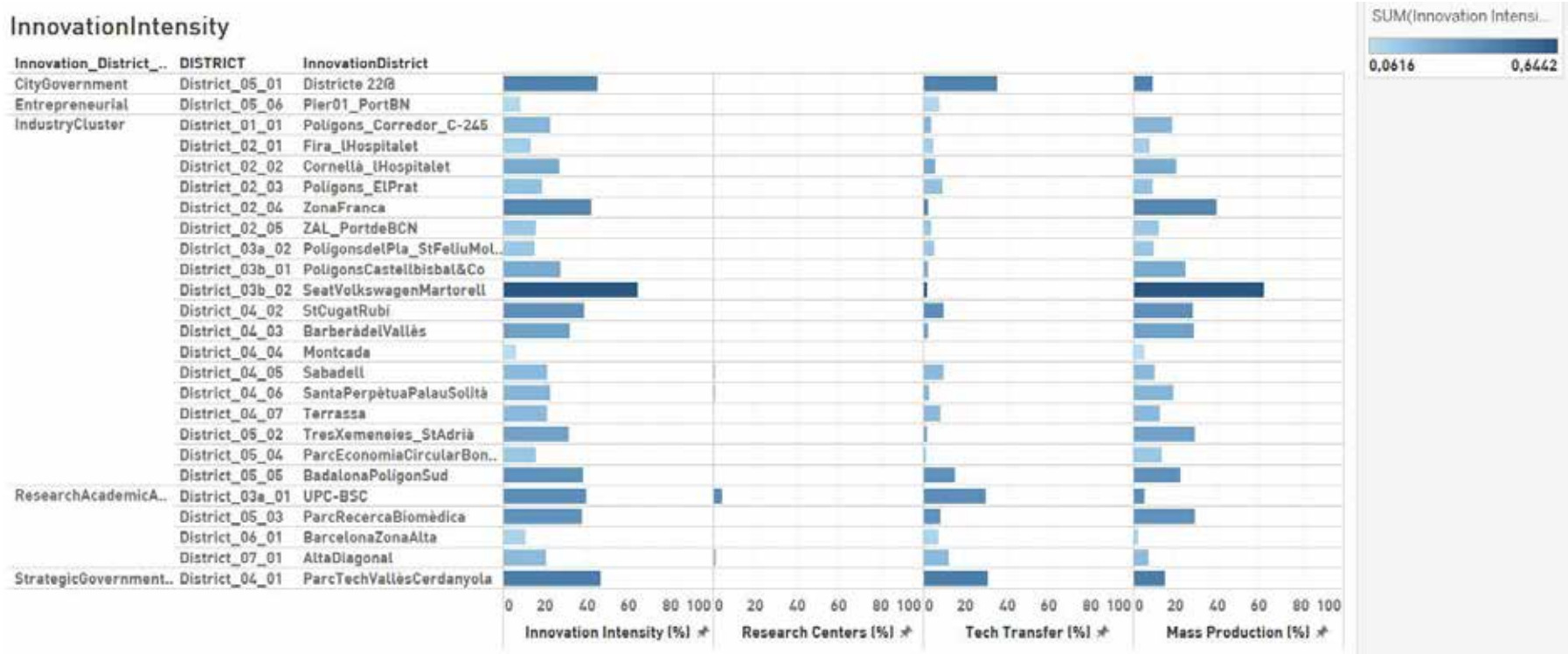
InnovationDistrictMaturity

- 5_Consolidated
- 4_Up and coming
- 3_Potential
- 2_Underperforming
- 1_EarlyStage

## InnovationPerformance

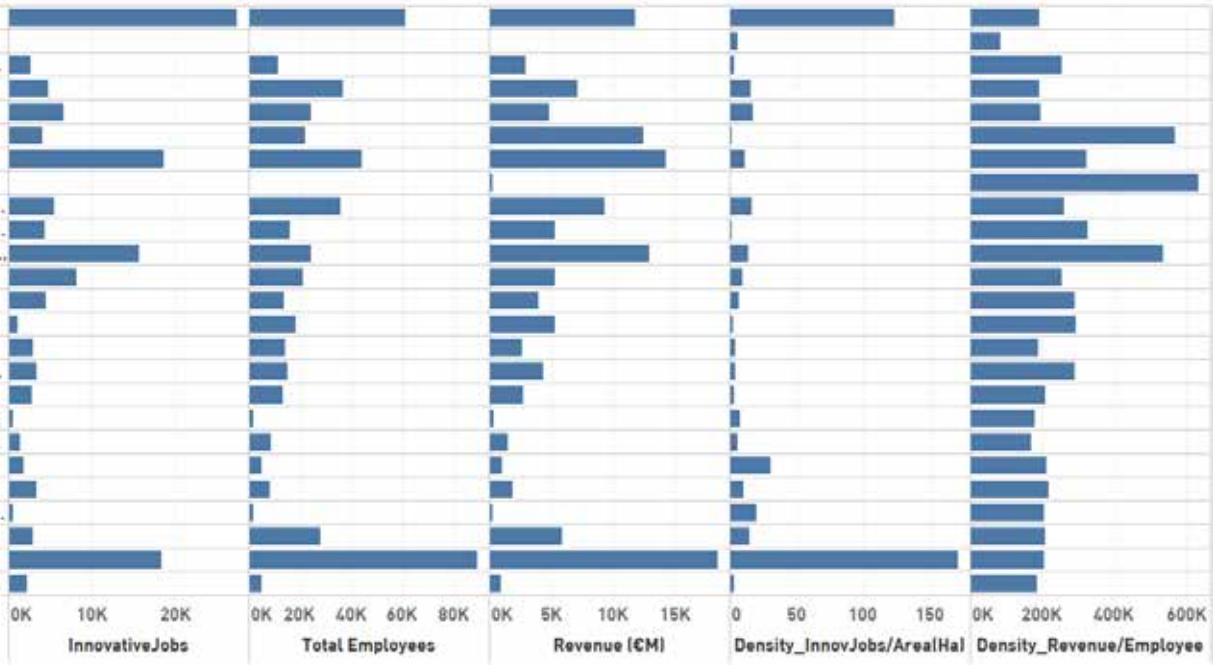


## InnovationIntensity



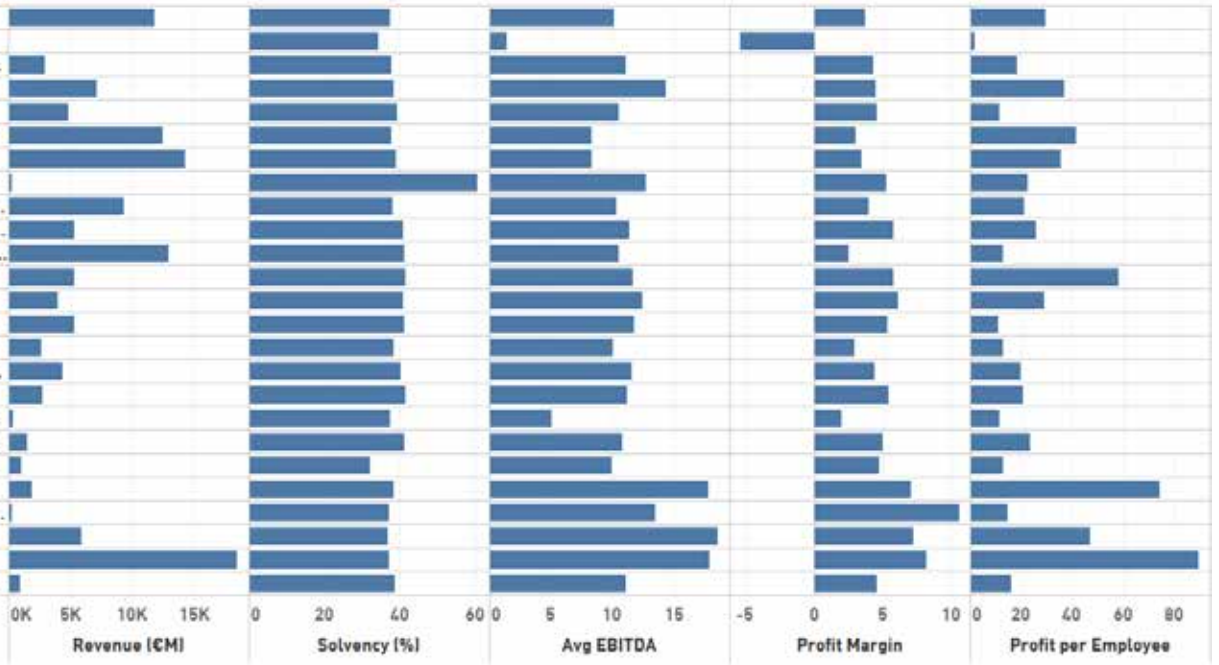
## InnovationImpact

| Innovation_District_.. | DISTRICT | InnovationDistrict |
|---|---|---|
| CityGovernment | District_05_01 | Districte 22@ |
| Entrepreneurial | District_05_06 | Pier01_PortBN |
| IndustryCluster | District_01_01 | Poligons_Corredor_.. |
| | District_02_01 | Fira_lHospitalet |
| | District_02_02 | Cornellà_lHospitalet |
| | District_02_03 | Polígons_ElPrat |
| | District_02_04 | ZonaFranca |
| | District_02_05 | ZAL_PortdeBCN |
| | District_03a_02 | PoligonsdelPla_StFe.. |
| | District_03b_01 | PoligonsCastellbisba.. |
| | District_03b_02 | SeatVolkswagenMart.. |
| | District_04_02 | StCugatRubi |
| | District_04_03 | BarberàdelVallès |
| | District_04_04 | Montcada |
| | District_04_05 | Sabadell |
| | District_04_06 | SantaPerpètuaPalau.. |
| | District_04_07 | Terrassa |
| | District_05_02 | TresXemeneies_StA.. |
| | District_05_04 | ParcEconomiaCircul.. |
| | District_05_05 | BadalonaPolígonSud |
| ResearchAcademicA.. | District_03a_01 | UPC-BSC |
| | District_05_03 | ParcRecercaBiomèdi.. |
| | District_06_01 | BarcelonaZonaAlta |
| | District_07_01 | AltaDiagonal |
| StrategicGovernment.. | District_04_01 | ParcTechVallèsCerd.. |



## Financials

| Innovation_District_.. | DISTRICT | InnovationDistrict |
|---|---|---|
| CityGovernment | District_05_01 | Districte 22@ |
| Entrepreneurial | District_05_06 | Pier01_PortBN |
| IndustryCluster | District_01_01 | Polígons_Corredor_.. |
| | District_02_01 | Fira_lHospitalet |
| | District_02_02 | Cornellà_lHospitalet |
| | District_02_03 | Polígons_ElPrat |
| | District_02_04 | ZonaFranca |
| | District_02_05 | ZAL_PortdeBCN |
| | District_03a_02 | PolígonsdelPla_StFe.. |
| | District_03b_01 | PolígonsCastellbisba.. |
| | District_03b_02 | SeatVolkswagenMart.. |
| | District_04_02 | StCugatRubi |
| | District_04_03 | BarberàdelVallès |
| | District_04_04 | Montcada |
| | District_04_05 | Sabadell |
| | District_04_06 | SantaPerpètuaPalau.. |
| | District_04_07 | Terrassa |
| | District_05_02 | TresXemeneies_StA.. |
| | District_05_04 | ParcEconomiaCircul.. |
| | District_05_05 | BadalonaPolígonSud |
| ResearchAcademicA.. | District_03a_01 | UPC-BSC |
| | District_05_03 | ParcRecercaBiomèdi.. |
| | District_06_01 | BarcelonaZonaAlta |
| | District_07_01 | AltaDiagonal |
| StrategicGovernment.. | District_04_01 | ParcTechVallèsCerd.. |



# NEXT STEPS

Further Studies

As a result of this preliminary study, there are 3 potential follow up studies to be developed further:

## PROJECT 01: PATHWAYS TO DISTRIBUTED PROSPERITY. INNOVATION DISTRICTS AND INDUSTRIAL CLUSTERS IN THE BARCELONA METROPOLITAN REGION

In-depth Analysis of Economic Complexity, Relative Comparative Advantage, and Growth diagnostics for the Top 25 innovation districts and industrial clusters in the Barcelona Metropolitan Area

- Product Space at the Regional/Metropolitan level
- Strategic Plan for the 25 Industrial Clusters
- Focus on 10-12 High Tech Industry Hubs
- Detailed analysis of:
    - Innovation Intensity
    - Innovation Performance
    - Innovation Impact
- Measure Patents, New Products, New Services, New Processes, Scientific Articles, R&D
- High quality employment, induced employment generation & reduced unemployment , benefits for the broader society
- Understand their current state, growth potential
- How to nurture their innovation ecosystem, thus generating high quality employment opportunities and distributed prosperity

## PROJECT 02:TECHNOLOGY TRANSFER PLAN FOR THE BARCELONA METROPOLITAN REGION

- Identify Research and Academic Clusters with the highest latent potential for technology transfer
- Academic programmes to diversity and sophisticate the educational offerings
- Decision-making support to boost Innovation Intensity, Performance, and Impact
- Platforms to enable innovation flow between University and Research Center to Technology Transfer to Mass Production
- Knowledge Network: assessment of strengths, weaknesses, risks, opportunities
- Integrate Data Science, Machine Learning, and Artificial Intelligence in the academic curriculum
- Benchmarks with best practices in technology transfer

## PROJECT 03:URBAN DESIGN AND INFRASTRUCTURE DEVELOPMENT TO SUPPORT HIGH VALUE-ADDED CLUSTERS

- Urban Development and Design to support strategic innovation districts and high value added industrial clusters
- Infrastructure Plan, Operational Systems
- Mobility, Logistics, Supply Chain
- Technology Systems
- Investment prioritization strategy
- Urban Development Phasing

# NOTES

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