

# **POLICIES AND INNOVATION HUBS:**

Evaluating Policies that Support and Sustain the Tech Industry in New York City

Maryam Z. Yaghoubi

A Thesis Presented to the Faculty of Architecture and Planning

COLUMBIA UNIVERSITY

In Partial Fulfillment

of the Requirements for the Degree

Master of Science in Urban Planning

## **Thesis Committee:**

### **Advisor**

Prof. R. Beauregard

Director, Urban Planning Ph.D. Program, GSAPP

### **Reader**

Prof. E. Sclar

Professor of Urban Planning and International Affairs

May 2017



## **Acknowledgments**

This thesis would have not been possible without the introduction of the topic by Dr. Patrice Derrington during the 2016 summer StudioX exploring the possibility of an innovation hub in Harlem. It was only through participating in that studio that I was inspired to take on this thesis.

I am grateful to my professor, Robert Beauregard, who have helped me every step of the way by providing me with continuous and constructive feedback for the duration of this thesis.

I am thankful to my reader, Professor Elliott Sclar who, as my studio instructor, provided me with an alternative perspective evaluating policy and planning issues in New York City. I would have not taken on this thesis if I had not been part of his studio in spring of 2016.

Last but not least, I am tremendously thankful to my parents and family who have been supporting me with utmost optimism throughout my journey.



## Table of Content

### Acknowledgments

○ Chapter 1: Introduction	1 - 2
- Why does innovation matter?	
- Why the urban context?	
- What does policy have to do with it?	
○ Chapter 2: Background Study	3 - 7
- New York City: The Center for Tech and Innovation Hubs	
○ Chapter 3: Literature Review	8 - 14
- Concepts Old and New	
- Technology and New York City	
- Technology and Externalities	
○ Chapter 4: Research Design	15 - 21
- Introduction	
- Methodology	
- Limitations	
- Case Selection	
○ Chapter 5: Case Studies and Findings	22 - 37
○ Chapter 5: Data Analysis and Findings	38 - 42
○ Chapter 6: Conclusion	43 - 44
○ Chapter 7: Recommendations	45 - 47
- Recommendations for the City	
- Recommendations for Innovation Districts	
○ Bibliography	49 - 52
○ Appendices	53 - 54



# 1. Introduction

## 1.1 Why does innovation matter?

Cities around the world are seeking to accommodate the needs of a new generation of technology based industries and firms, whose innovation model depends on proximity and whose talent pool prefers urban locations and lifestyles. Such cities are motivated to host a larger portion of this innovation economy in order to grow a new base of jobs, adjust to the process of industrial change, or leverage technology for the challenges of sustainability, resilience, and social cohesion. Many are trying to raise their innovation profile by focusing investment and promotion on new ‘innovation hubs or districts’, locations within their city where the innovation economy might cluster and concentrate. The innovation economy is proving to be a disruptor and opportunity for cities, businesses and the real estate sector (Clark, 2016). Consequently, this thesis focuses on the effectiveness of governmental policies in promoting and sustaining the tech industry and its spatial manifestation, innovation districts, in New York City.

## 1.2 Why the urban context?

The city environment might only explain a sliver of new product development. Some complex combination of other forces (e.g. creative inspiration or specific demands or more approaches to problem-solving) also involved. When it comes to new business processes, however, the urban advantage seems to rely on ideas learned from neighboring firms as opposed to ideas generated within the firm. Here the city appears to play the greatest role in innovation by facilitating “serendipitous encounters”. Greater proximity to other firms and perhaps also greater employee movement from company to company increases the flow of outside information and leads to new ways of working (Jaffe, 2013). Additionally, in a paper published by Wei Pan and several colleagues in 2013, “Urban Characteristics Attributable to Density-Driven Tie Formation”, the authors argue that the underlying force that drives productivity in cities is the

density that enables formation of social ties; the larger the city, the more people that come into contact with each other. "If you think about productivity, it's all about ideas, information flows, how easily you can access ideas and opportunities," Pan says. "We believe that the interaction mechanism is what drives the productivity of the city.

Why is it that the current literature on innovation districts does not take into consideration the spatial implication of policies that allow for such conditions? This thesis will evaluate such policies in relationship to the tech industry and established innovation districts in New York City.

### **1.3 What does policy have to do with it?**

Innovation districts vary in size, structure and level of influence. Studies reveal that the Triple Helix model of governance that consists of structured interactions between industry, research universities, and government, is fundamental to the success of innovation hubs or districts (Ivanova, 2014). Growth of startups and formation of innovation districts will enhance cities' already considerable prowess at problem solving, helping them function as laboratories for solutions to the most pressing social and environmental problems of the day from energy and pollution to affordable housing, better schooling, and reduced crime (Florida, 2013). Moreover, this thesis will explore other governmental policies that manifest themselves in spatial terms and indirectly influence the innovation districts. These policies are related to land use and zoning. While the existence and the changes in the innovation districts are not entirely dependent on the governmental policies (Clark, 2016), the study looks at direct and indirect policies taking into consideration to market forces and the preferences of workers and entrepreneurs on where they locate their firms. These firms tend to form clusters known as innovation districts.



## 2. Background Study

### 2.1 New York City, the Center for Tech and Innovation Districts

Since taking office in 2002 and until 2012, Mayor Bloomberg championed the city's tech sector. His administration launched an array of programs and policies to support the tech sector's growth. The creation of a new applied sciences campus on Roosevelt Island, the development of several incubators, and the hiring of a chief digital officer are among those programs (CUF, 2012). This goal was to diversify the economy from being heavily dependent on Wall Street. In just a few years after the initial launch of such policies, New York's tech sector emerged as an increasingly powerful economic driver (CUF, 2014). Even after leaving office, in June 2015, the former mayor Michael Bloomberg donated \$100 million to Cornell Tech, continuing his support for the new applied sciences campus on Roosevelt Island and the tech industry. The campus is permanent home to an entirely new graduate school that city officials' hope will position New York City as a major tech center. The school is also home to a startup incubator called "The Bridge" (Stone, 2015).

Based on the report published by Center for an Urban Future in 2012, at a time when few other industries were growing in New York City, more than a thousand new tech start-ups were formed. The flood of digital start-ups in recent years has also transformed the city from a second-rate tech center to the nation's second leading hub for technology companies. Among the tech-related industries in New York City are Tech Education, Health Tech, Fine Tech, E-commerce, Social Networking, Ad Tech and Digital Media.

By 2014, based on "NYC's Tech Profile" a report produced by Center for Urban Future in 2015, the New York City's "tech sector" employed 117,147 people which was a 71% increase from a decade earlier (see chart 1). The tech sector is defined by the Federal Reserve Bank of New York to include seven industries: Computer Manufacturing, Electronic Shopping, Software Publishing, Data Processing & Hosting, Internet Publishing & Broadcasting & Web Search

Portals, Computer Systems Design and Scientific R&D Services. The number of people working in technology jobs goes well beyond those employed in the seven industries that make up the “tech sector”. Indeed, businesses in most industries today are integrating technology into their operations. “This is what makes New York City different than other tech lenient cities. The City has naturalized technology in its fabric” said Erik Grimmellann the president of NYC Tech Alliance in an interview that I conducted earlier in March. “This naturalization has made the tech industry sustainable in New York City”. It is therefore important to study the tech industry as “tech ecosystem” rather than depending on the Fed’s definition of it: "companies that use technology as their core business strategy.”

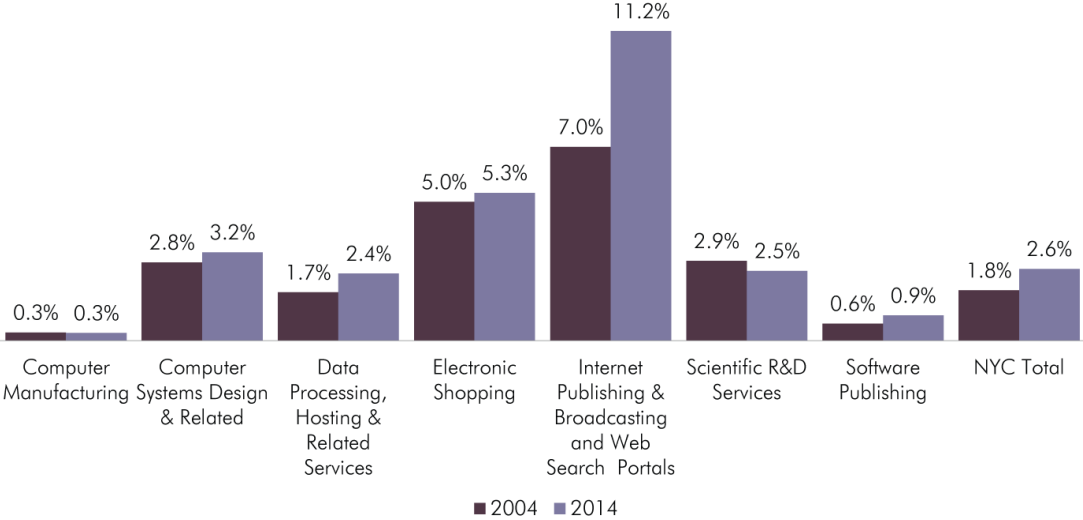


Chart 1 NYC Share of Nationwide Tech Sector Jobs, By Industry, 2004 vs 2014 (Center for Urban Future, 2015)

The study also found that the majority (83%) of tech sector jobs were located in Manhattan which had almost doubled since 2004. By 2014, Brooklyn and Queens respectively had the leading number of tech sector jobs following the lead of Manhattan though by a landslide (see chart 2).

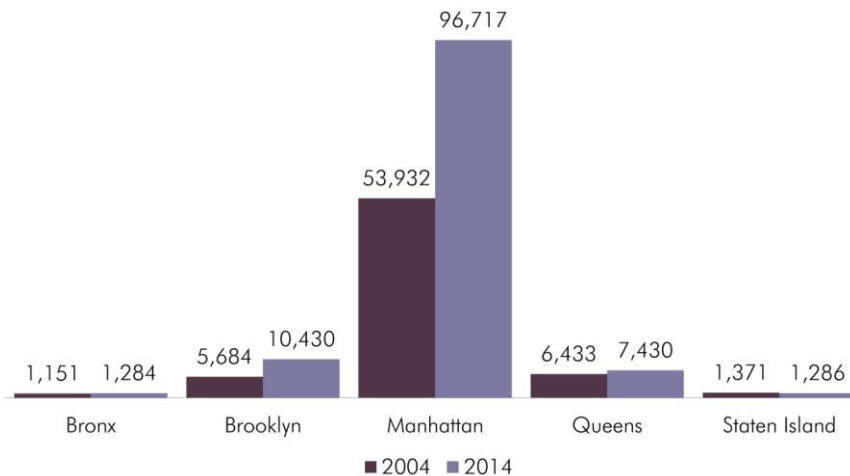


Chart 2 NYC Tech Sector Employment by Borough (Center for Urban Future, 2015)

Following in the footsteps of the previous administration, in April 2015, Mayor de Blasio announced the release of “One New York: The Plan for a Strong and Just City”. The plan is a roadmap for a sustainable and resilient city to address social, economic, and environmental challenges of the City (MOTI, 2015). During the same year, the “Building a Smart + Equitable City” report was published by Mayor’s Office of Technology and Innovation (MOTI). The report focused on improving amenities to sustain the notion of a smart and innovative New York City.

“More than the previous mayor, the de Blasio’s administration has mainly focused on issues of equitability” Erik Grimmelmann elaborated on the role of the mayor in regards to the tech industry in New York City. “His challenge is not to push for more startups but rather how to make the industry sustainable”. “Calls for Innovations” is a complimentary program run by the New York City Mayor’s Office of Technology and Innovation that goes a step further when it comes to new technologies. The strategies that are proposed vary from smart infrastructure to smart safety measures across the city using technology.

On the private side, a few advocacy groups have. Earlier in 2016, Tech:NYC a new tech advocacy group, emerged as a nonprofit member organization that represents New York City’s technology sector and is co-chaired by venture capitalist Fred Wilson and AOL CEO Tim

Armstrong. The organization declared that it will advocate for a regulatory environment that supports the growth of technology companies and technology talent; promote inclusivity; and ensure access for all New Yorkers to connectivity, technology tools, and training. The group is funded through membership fees, calculated based on the company's employee count, or a flat fee for venture capital firms and individual angel investors (Kokalitcheva, 2016).

In February of 2016, the New York City Economic Development Corporation (NYCEDC) announced the Urbantech NYC initiative. The initiative is a comprehensive program to help entrepreneurs and innovators address New York City's most pressing urban challenges in sectors such as energy, waste, transportation, agriculture, and water. Essentially, a smart city approach in tackling urban challenges by using the existing tech and innovation ecosystem.

NYCEDC has also committed up to \$7.2 million to create two Urban Technology Growth Hubs in Brooklyn and Manhattan in partnership with New Lab and Grand Central Tech (see map 1). The hubs provide approximately 100,000 square feet of flexible and affordable space, as well as provide dedicated resources for fast-growing cleantech and smart cities companies that have outgrown business incubators, accelerators, and other early-stage programs.

NYCEDC also continues to provide space and resources to early-stage cleantech and smart cities through the Urban Future Lab which houses the ACRE incubator run by the New York University's Tandon School of Engineering. The rents are negotiated individually between the tenants, but are set below market rate (Leon, 2016).



Map 1 NYCEDC's Urbantech Ecosystem (original data retrieved from NYCEDC's [urbantechNYC.com](http://urbantechNYC.com), 2017)

## 3. Literature Review

### 3.1 Smart City, Innovation Districts and Technology

A smart city is a new concept of partnership and governance developed through electronic linkage of multi-level, multi-jurisdictional governments and all non-governmental stakeholders such as firms, nonprofits and citizens. A smart city is not a replacement of physical structures but a harmony between material and virtual world. A majority of smart city studies are technology-oriented and optimistic for the future of smart city initiatives. A smart city is not system-driven but service-oriented (Nam, 2011).

The smart city is an extension and evolution of other concepts of the city, such as the 'digital city', the 'ubiquitous city' and 'knowledge city'. In essence, a smart city is purposely designed to encourage and nurture the collective knowledge, that is, the intellectual capital of the community, seen as a determinant factor for the sustainable creation of local public value. This city-model derives its social, environmental and economic success from a series of factors, notably: the allocation of facilities, networks and tangible and intangible assets for the production of goods and services based on knowledge (in the broadest sense of the word and, thus, potentially in its scientific, technological, cultural, and artistic manifestation); the development of conditions able to promote talent, creativity, innovation and entrepreneurship; the availability of technologies, instruments and services for the systematic, effective and efficient dissemination of knowledge; the presence of actual and virtual places that can facilitate interpersonal relations, the exchange of information and the sharing of experiences; and, finally, the ability to generate, attract and retain citizens who are not only highly qualified from a professional point of view but also engaged with the political-institutional life and

environmentally-conscious. New York City has adopted smart city principals to a degree that it was called “the 2016 best smart city” by the Smart City Expo World Congress in Spain<sup>1</sup>.

Within smart cities spur innovation districts; the true purpose of an innovation district is idea-generation and the commercialization of research (Katz, 2015). Moreover, innovation districts are the antithesis of the isolated business parks and corporate campuses that define Silicon Valley. Innovation districts facilitate the creation and commercialization of new ideas and support metropolitan economies and smart cities by growing jobs in ways that leverage their distinct economic attributes (Brookings, 2017). Some of the common characteristics of an innovation district are transparency, flexible spaces, and opportunities for people to spontaneously meet. The most successful districts promote the "bump and mingle" effect. Inside, the spaces are flexible and accommodate co-working and collaboration. Outside, the public spaces are animated and vibrant, whether it's from pop-ups or public programs or just a welcoming space (Budds, 2016).

Innovation districts are the manifestation of mega-trends altering the locational preferences of people and firms and, in the process, re-conceiving the very link between economy-shaping, place-making and social-networking (Bradley, 2015). Here, the concept of ‘innovation ecosystem’ or ‘tech ecosystem’ (see diagram 1) manifests itself where there is a synergistic relationship between people, firms and place (the physical geography of the district) that facilitates idea generation and accelerates commercialization (Wagner, 2014).

The question remains whether such ecosystem could be designed by city policies? The research shows that such formula, where a tech ecosystem is designed by city policies, does not exist since assembling a critical mass of tech development goes beyond a few well-placed buildings (Sission, 2016). Cities can provide the right framework specifically a skilled workforce

---

<sup>1</sup> Office of the Mayor. “New York Named ‘2016 Best Smart City,’ NYC to Host International Conference on Urban Technology.”

and a good, research-intensive university or similar research centers. According to Enrico Moretti, who has done extensive research on urban innovation, including charting development in each of the country's 320 metro areas there are not any examples where deliberate policy by a state or local government in the United States that created a successful innovation cluster on its own, and he's is deeply skeptical that anybody, especially government, can engineer this kind of innovation (Sisson, 2016).

His research also shows that an average of five jobs are created in a city for every single high-tech job, and the disparity in pay between high-performing cities and underperforming ones is more than double the disparity between workers with different levels of education in a successful city (Moretti, 2012).

The Brookings Institute, a nonprofit public policy organization based in Washington, DC, advises practitioners to consider the following lessons when it comes to innovation districts (see diagram 1). These recommendations are based on 300+ case studies on innovation districts around the US and abroad. First, they need to build a collaborative leadership network. That is a collection of leaders from key institutions, firms and sectors who regularly and formally cooperate on the design, delivery, marketing and governance of the district.

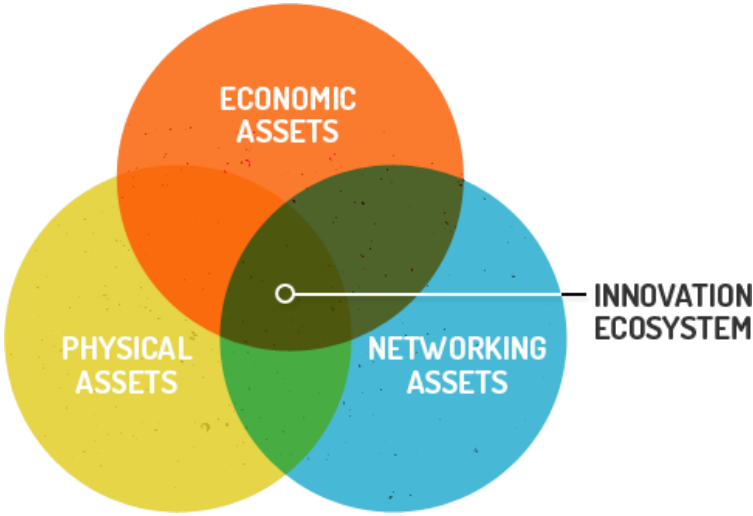


Diagram 1 Innovation Ecosystem (Brookings Institute, 2015)



This type of network known as the Triple Helix model consists of structured interactions between industry, research universities, and government. Second, they need to set a vision for growth by providing actionable guidance for how an innovation district should grow and develop in the short to long-term along economic, physical and social dimensions. Third, they need to pursue talent and technology given that educated and skilled workers and sophisticated infrastructure and systems are the twin drivers of innovation. Fourth, they need to promote inclusive growth by using the innovation district as a platform to regenerate adjoining distressed neighborhoods as well as creating educational, employment and other opportunities for low-income residents of the city. They can equip workers with the skills they need to participate in the innovation economy or other secondary and tertiary jobs generated by innovative growth. Lastly, they need to enhance access to capital to support basic science and applied research; the commercialization of innovation; entrepreneurial start-ups and expansion (including business incubators and accelerators); urban residential, industrial and commercial real estate (including new collaborative spaces); place-based infrastructure (e.g., energy, utilities, broadband, and transportation); education and training facilities; and intermediaries to steward the innovation ecosystem.

### **3.2 Technology and Externalities**

It is crucial to address some of the externalities that are generated by tech and innovation hubs in the urban context. Rising rents threaten to overshadow the very attributes that made these innovation magnet locations centers for innovation in the first place, pricing out innovative talent and enterprises. The more homogeneous cities become in terms of habitants, the less creative and ultimately the less productive they become. Jane Jacobs once said: “when a place gets boring, even the rich people leave” (Florida, 2013).

Given the proximity of many districts to low-income neighborhoods and the large number of sub-baccalaureate jobs many provide, their intentional development can be a tool to connect disadvantaged populations to employment and educational opportunities (Brookings, 2017).

Neil Lee in his paper, “Is There Trickle-Down from Tech? Poverty, Employment, and the High-Technology Multiplier in U.S. Cities,” looked at nearly 300 U.S. cities and argued that as a city’s tech economy grows, income inequality increases. Tech hubs and innovation districts are often criticized as rewarding the winners, giving precedence to the tech economy over the greater good. The results of the paper, 2005 to 2011, show that there are no real impacts of high-technology industries on poverty and, especially, extreme poverty. Yet there is strong evidence that tech employment increases wages for non-degree-educated workers and, to a lesser extent, employment for those without degrees. Lee’s findings suggest that although tech employment has some role in improving welfare for non-degree-educated workers, tech employment alone is not enough to reduce poverty (Lee, 2016).

The report, “60 Ways To Cut Red Tape and Help Small Businesses Grow” conducted by New York City’s Comptrollers Scott Stringer in 2016, offers a host of intriguing policy proposals to help urban neighborhoods maintain their technological and innovative edge while extending their benefits to less-advantaged groups by eliminating red tape, creating more affordable co-work spaces, upgrading science and technology education in schools (especially to prepare disadvantaged youth for tech employment), improving infrastructure and transportation to connect disadvantaged people and neighborhoods to high-tech corridors, and spurring high-tech development around transit nodes in less-advantaged areas outside of the current high-tech clusters.

Even though, New York is considered the third most diverse city in the country, where almost 40% of the population is foreign-born when it comes to its tech sector, the diversity of the

workforce is lacking (CUF, 2015). An analysis, “NYC’s Tech Profile” by the Center for Urban Future in 2015, reveals that 62% of NYC’s tech sector employees are white (see chart 5).

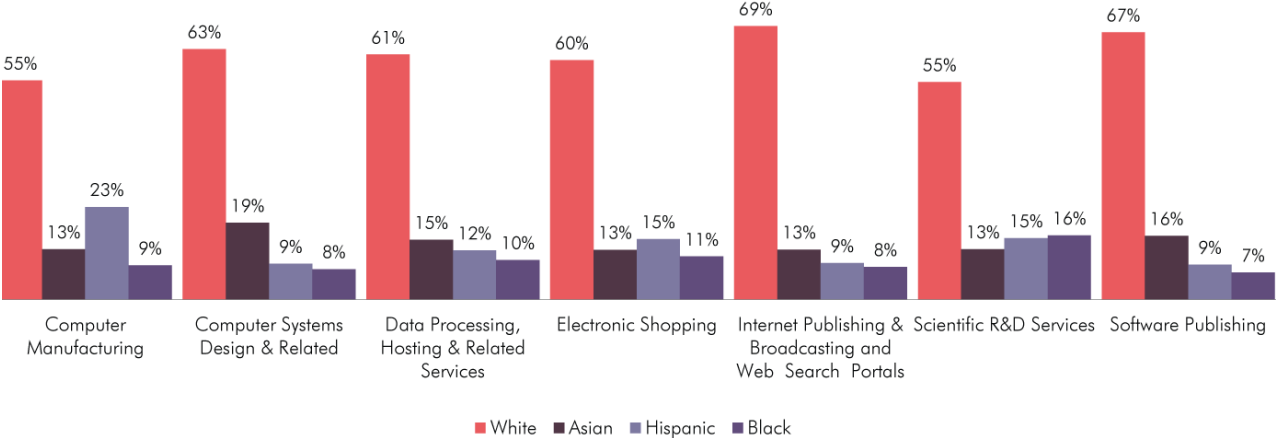


Chart 3 Distribution of Employment in NYC Tech Industries, By Race (Center for Urban Future, 2015)

There seems to be a wide disparity in opportunity along racial lines. According to 2010 Census data, the city has a population of 8,175,133 while blacks and Latinos constitute 25.1% and 27.5% of the population, respectively, only 9% and 11%, respectively, are employed in the tech sector. These findings bring to light some issues within the tech industry that could possibly be addressed through governmental initiatives aligned with private sector’s input.

In NYC, women entrepreneurs generate almost \$50 billion in sales, and employed almost 200,000 people (Glen, 2016). According to Alicia Glen, the Deputy Mayor for Housing and Economic Development, “supporting women-owned businesses and giving women the tools they need to found and grow their own companies is vital for New York City. Women are the breadwinners in our town. They support families. They support communities” (see chart 6). While there is greater diversity based on age, the NYC tech sector seems to be unequally dominated by men that are over the age of 35.

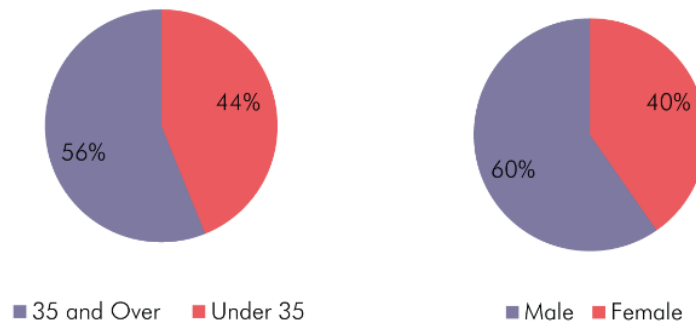


Chart 4 Distribution of NYC Tech Sector Jobs: By Age and By Sex (Center for Urban Future, 2015)

These issues, whether lack of diversity (e.g. race or gender) or displacement due to rising rents<sup>2</sup>, are not mutually exclusive. To diversify the tech and innovation ecosystems citywide perhaps the location of the future innovation hubs should be reflective of that goal.

---

<sup>2</sup> Wink, "How Brooklyn Can Deal with Tech Business Gentrification."

## 4. Research Design

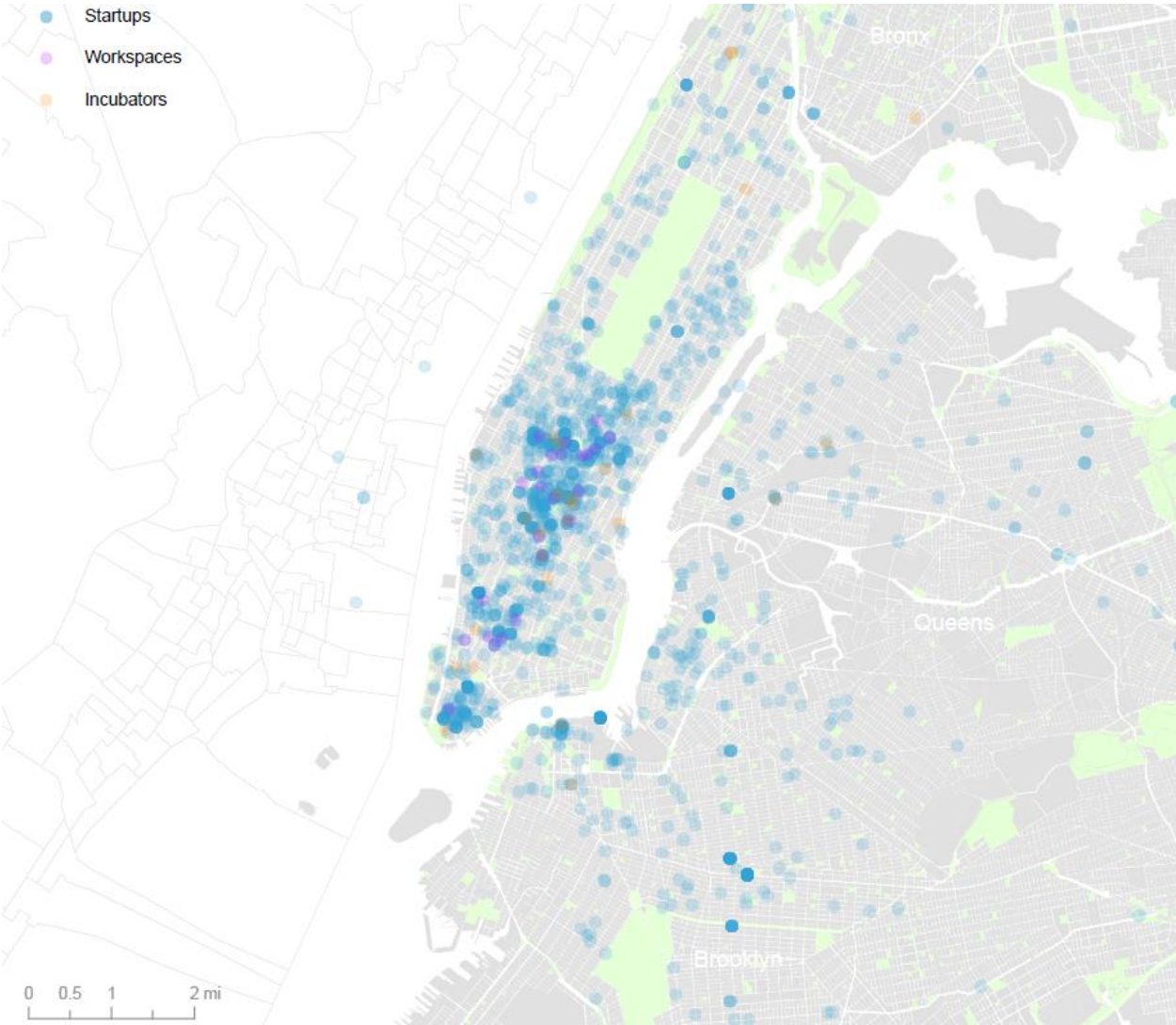
### 4.1 Introduction

The goal of this thesis is to evaluate the role and effectiveness of governmental policies in promoting and sustaining tech industry and essentially innovation hubs in NYC. While the existence and the changes in the condition of the latter are not entirely dependent on the governmental policies; the study aims at evaluating such policies parallel to market forces and the preferences of workers and entrepreneurs on where to locate their firms. These findings could shed a light on specific policies that could affect the growth of tech initiatives in an upcoming innovation district such as Harlem and elsewhere.

### 4.2 Methodology

In order to understand policies adopted in New York City in regards to innovation districts, my research heavily relied on studying both governmental reports as well as privately published reports by Center for Urban Future (three reports), HR & A (one report), the Brookings Institution (two reports), Brooklyn Tech Triangle (two reports) related to such policies. Additionally, given the tech and evolving nature of the research topic, the majority of the preliminary data and literature was collected through online search engines. My evaluation of whether such policies had been successful has also been based on the same reports as well as eight interviews and meetings. In order to find literature on innovation districts, I expanded my search to include the following terms: tech hubs, tech industry, tech firms, startups, incubators and shared working spaces. However, obtaining data on the number of tech-related jobs, in order to measure economic impact, and entities participating in the tech sector proved to be a difficult task given that the Department of Labor breaks down “tech industry” based on outdated terms (Mandel, 2013). There are however, other ways to measure the growth of tech in New York. Data on startups, an essential representative of innovation districts, were then obtained from Digital.nyc. The website has compiled tech related companies (e.g. startups, incubators

and workspaces) from variety of resources such as National Venture Capital Association (NVCA), major funding resource for startups, We Are Made in NY campaign, NY Tech Meetup and Other resources. The startups are then displayed on the website’s “map” section. The latter map is rich with startup and accelerator locations as well as tech related events and job opening announcements. Through coding, I was able to scrape and obtain most of the names, locations and founding years for the startups as well as incubator and co-working spaces displayed on the map. A preliminary look at the data scraped from Digital.nyc revealed the clustering of tech related startups city-wide (see map 2).



Map 2 Startups, Incubators and Workspaces (data retrieved from Digital.nyc, 2017)

These clusterings correlated with the already known and established innovation districts in NYC (see map 3).

Evaluating policies would have not been possible without categorizing the literature reviewed policies into sections based on their intent and relationship to the tech and innovation industry. I divided these policies into two categories: direct and indirect policies that had been adopted and implemented during the past two administrations. The former category comprise of policies that had been adopted explicitly in response to innovation and tech industry while the latter category, defined by me, had some impact on the innovation districts but it had not been measured or quantified in any of the literature that I had reviewed and analyzed. Nonetheless, the literature on indirect (or spatial) policies such as land use and zoning seemed to be greatly lacking.

The policies could have also been categorized further based on whether they were introduced via governmental departments or the New York City Economic Development Corporation (NYCEDC) agency that is the City's not-for-profit corporation that promotes economic growth across New York City's five boroughs. For the purposes of this thesis, such categorization did not take place and both of the latter policies and initiatives were considered as 'governmental' initiatives.

Table 1 showcases the breakdown of policies and initiatives based on their intent and relationship to the tech and innovation industry:

<b>Direct [explicitly related to innovation districts]</b>			<i>Assigned Scores</i>			
<i>Category</i>	<i>Policies and Initiatives</i>	<i>Agency</i>				
Broadband Provisions	Fiber Network Infrastructure <sup>3</sup>	NYC DoITT	●	●	●	
	Connect NYC / IBZ / Wired NYC <sup>4</sup>	NYCEDC	●	●	●	
	LinkNYC <sup>5</sup>	NYC DoITT	●	●		
Financial Incentives	R & D Tax Credit <sup>6</sup>	IRS - Federal	●	●	●	
	QETCs <sup>7</sup>	DTF - State	●	●	●	●
	Biotechnology Tax Credit <sup>8</sup>	NYC Business	●	●	●	●
	NYC Seed	NYC EDC	●	●	●	
	The Life Science Funding Initiative <sup>9</sup>	NYC EDC	●			
Tech Talent Growth	Tech Talent Pipeline <sup>10</sup>	Mayor's Office	●	●	●	●
	IN2NYC <sup>11</sup>	NYC EDC	●	●		
Sharing, Connecting and Partnership Programs	Digital.nyc (Made in NY) <sup>12</sup>	NYC EDC	●	●	●	
	Urbantech NYC <sup>13</sup>	NYC EDC	●	●		
	Mayor's Office of Tech + Innovation	MoTI	●	●	●	
Providing Workspaces	Incubators <sup>14</sup>	NYC EDC	●	●	●	●
	Co-working Spaces	NYC EDC	●	●	●	●
Educational Incentives	Workshops <sup>15</sup>	NYC EDC	●	●	●	
	CS4ALL <sup>16</sup>	Mayor's Office	●	●	●	●
	Higher Education Partnerships <sup>17</sup>	NYC EDC	●	●	●	●
Legal Assistance	Free Legal Advice <sup>18</sup>	SBS	●			
Facilitating Events	Hackathons <sup>19</sup>	NYC EDC	●	●	●	
	Hire & Expand in MN Competition	NYC EDC	●	●		
<b>Indirect [have consequently influenced innovation districts]</b>						
Affordable Housing	MIH and ZQA <sup>20</sup>	DCP/CC	●	●	●	●
Land Use Provisions	Empire Zones / Empowerment Zones <sup>21</sup>	NYC ESD/EZP	●	●		
	Zoning Amendments*	DCP/CC				

Table 1 Tech and Innovation Related Policies and Initiatives in New York City

<sup>3</sup> "DoITT - Broadband Deployment."

<sup>4</sup> "NYCEDC Announces the Launch of Connect IBZ."

<sup>5</sup> "DoITT - LinkNYC Franchises."

<sup>6</sup> "Research and Development - Manufacturing Tax Tips."

<sup>7</sup> "QETC Capital Tax Credit."

<sup>8</sup> "NYC BioTech Tax Credit - NYC Business."

<sup>9</sup> "NYC Early-Stage Life Sciences Funding Initiative."

<sup>10</sup> "Mayor Bill de Blasio Announces NYC Tech Talent Pipeline Industry Partners."

<sup>11</sup> "NYCEDC And CUNY Launch IN2NYC Program for International Entrepreneurs."

<sup>12</sup> "DIGITAL.NYC to Kick off Five-Borough Tour."

<sup>13</sup> "NYCEDC Launches Urbantech NYC to Support Companies Building Smart and Sustainable Cities."

<sup>14</sup> "EDC: Incubators & Workspace Resources."

<sup>15</sup> "NYCEDC Hosts Research and Development Grant Workshop for Applied Science Companies."

<sup>16</sup> "\$20 Million in Private Donations Raised for Mayor de Blasio's Computer Science For All Initiative."

<sup>17</sup> "Applied Sciences NYC."

<sup>18</sup> "Get Free Legal Advice - NYC Business."

<sup>19</sup> "High School Students Code4Tomorrow At NYC GenTech's First Hackathon."

<sup>20</sup> "Mandatory Inclusionary Housing."

<sup>21</sup> "New York Empowerment Zone Program | Empire State Development."



By conducting interviews, I gave weight to policies whether there were considered as the most effective or simply because the interviewees mentioned certain policy more frequently over the others. The interviewed entities have had associations with the neighborhood of Harlem, have been involved with NYC Mayor's economic and development office or represented the tech sector in the City (see table 1 in appendices). A sample of questions tailored for different entities is attached to the appendices section of this thesis report. Through these interviews, I set out to support some of the data and claims that were made in regards to City's policies toward tech industry and innovation hubs and specifically the position of Harlem as the next tech or innovation hub.

#### **4.3 Limitations**

There were limitations involved with this study. The existence and the changes in the condition of the tech industry as well as innovation districts in cities are not entirely dependent on the governmental policies (Clark, 2016). Nonetheless, there was evidence that suggest that without adequate governmental policies tech and innovation would not flourish. The thesis also relied on the premise that the focus of governments to diversify their economy through tech and innovation is generally a positive approach to planning despite the externalities that it may cause.

In cities and communities, drawing direct and quantitative correlation between governmental policies and the growth of the tech sector in the City is nearly impossible. Moreover, some of the datasets needed to perform such correlations were not accessible for public use. Although the policies may not suggest direct causation to the growth of the innovation economy, the study of various improvements within the industry suggest that there is indeed a strong correlation between rise in number of tech-related startups and policies focused to support them.

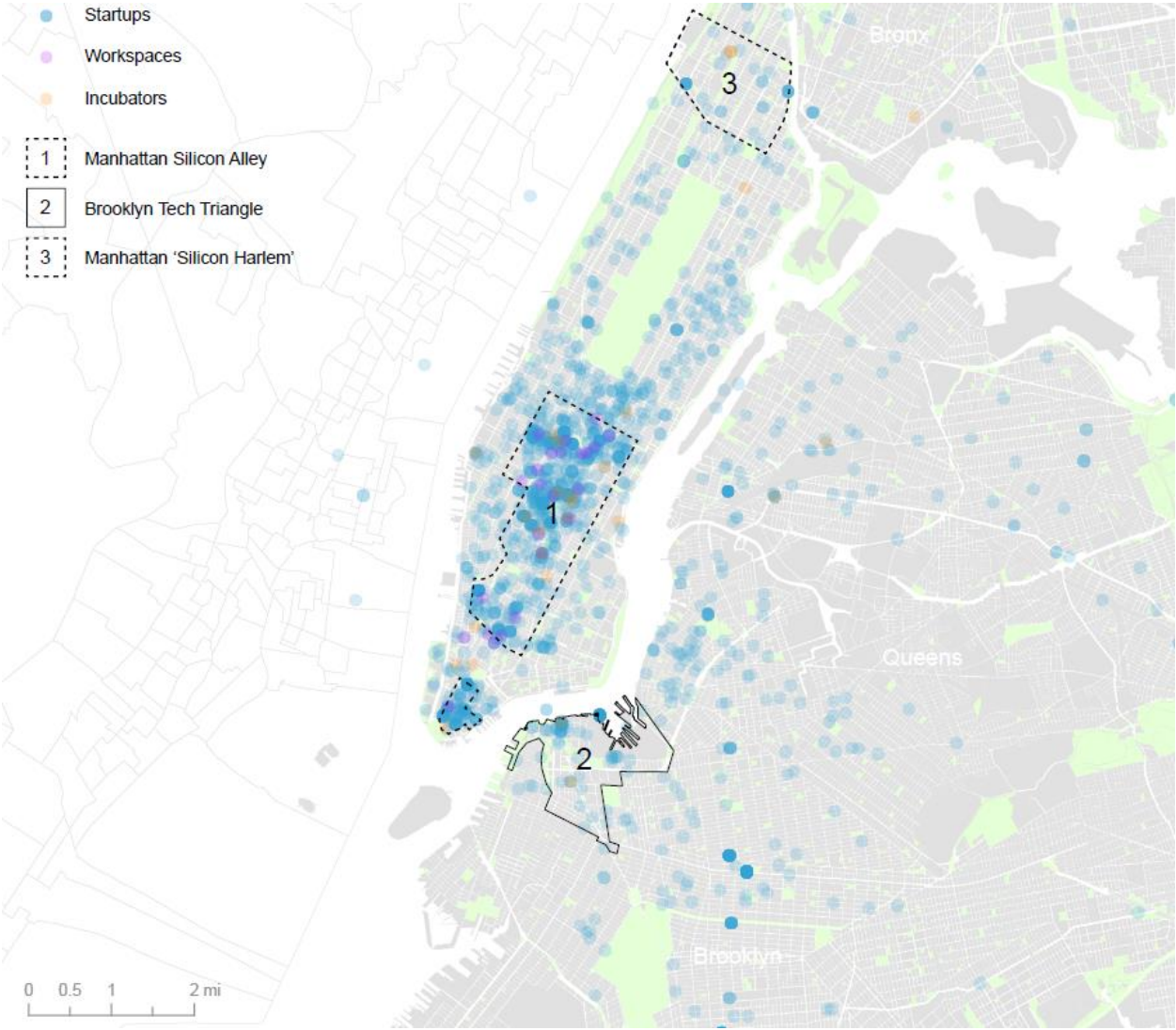
The data on startups and other tech related firms obtained by scraping the Digital.nyc map was not indicative of all of the startups in New York City given that not every company had their business registered on this map. Moreover, there were also few issues encountered while scraping data from Digital.nyc map. The coding methodology that was used for the latter task did not allow for all the startups to be scraped from the map. Only 87% of startups, 68% of incubators and 75% of workspaces listed on the Digital.nyc map were scraped and therefore the data provided is not indicative of all the startups, incubators and workspaces in NYC.

#### **4.4 Case Selection**

According to Bruce Katz, the vice president and director of the Metropolitan Policy Program at the Brookings Institute, there are five categories separating an ‘actual innovation district’ from an ‘aspirational one’. A critical mass of activity, connectivity, a competitive advantage, diversity, and physical qualities (e.g. architecture, amenities, and location) are those characteristics. In order to choose appropriate case studies I used the latter description. Moreover, I used the concept of critical mass to select appropriate innovation districts and to draw approximate boundaries for cases that did not have designated boundaries. These boundaries were drawn around where startup companies were most concentrated. The first two case studies Brooklyn Tech Triangle and Silicon Alley are well-established innovation districts in New York City based on literature and mass of startups (see map 3).

However, the exact boundary of Manhattan’s Silicon Alley remained undefined and I used the critical mass concept to draw an approximate boundary. The last case study is Harlem, a non-established yet debated innovation hub in Upper Manhattan (Wojcik, 2016). The area, named for the purposes of this study as “Silicon Harlem” and after the name of the non-profit organization that is transforming the neighborhood into an innovation hub, does not have defined boundaries as well. I drew an approximate boundary for the purposes of this thesis

based on the mass of startups and other elements, such as educational institutions and physical qualities, which are needed for an innovation ecosystem.



Map 3 Case Selection Map (data retrieved from Digital.nyc, 2017)

By studying the former two case studies I set out to provide recommendations that could be utilized for the latter case study of Harlem. While these recommendations are not meant to be specific they have been paramount to the already established innovation districts. The following three sections will expand on the conditions of the chosen case studies in boroughs of Manhattan and Brooklyn in New York City.

## 5. Case Studies and Findings

### 5.0 Technology and New York City

For three out of four quarters in 2015, New York City's tech ecosystem has had more startup funding requests than any other region in the country that includes California's Silicon Valley. After a dip in third quarter, New York rebounded in fourth quarter claiming nearly 20% of every funding application around the country followed by California at 17.8% (Rose, 2016).

Today, young workers want to live in a city where they can ride bikes, shop locally, walk to their favorite restaurants and bars, and live in a dense urban or urban-light environment with nearby amenities. Fred Wilson, a New York City based venture capitalist and the co-chair of Tech:NYC, wrote in his foreword to *Tech and the City*, "the story of NYC is a story of entrepreneurship, evolution, and energy" (Florida, 2013).

New York City is known for a number of things, from big buildings to historical landmarks to the various financial and media empires scattered throughout the metropolis. It is also known for its technology (TEKconn, 2013). The current startups, tech companies, venture capitals and angels parallel with governmental support make New York City one of the technology capitals of the world (Kerpen, 2013). Location is also a key factor fueling New York's emergence in tech, but perhaps the biggest catalyst behind the movement is government assistance. Kerpen (2013) suggests that the support from the city government has been a major influence in the growth of technology scene. He confirms the latter statement by pointing out how Mayor Michael Bloomberg had made technology entrepreneurs a strategic priority in his final term in office. Kerpen writes that Mayor Bloomberg hired the city's first Chief Digital Officer in Rachel Sterne Haot. The City had also put its resources behind a major "We are Made in New York" campaign highlighting hundreds of tech startups via an interactive map and assisting technology startups with recruitment, mentoring, networking and other support. The Mayor and city agencies

appeared determined to support the city's thriving startup community. While the campaign is no longer part of Mayor de Blasio's agenda, it brought tremendous attention nationally and internationally to the tech industry according to some of the leaders in the tech industry.

By the end of Mayor Bloomberg's administration and beginning of Mayor de Blasio's term, New York City had emerged as a national leader in fields that leverage the internet and mobile technologies. This development provided a key economic boost and left the city well-positioned for future tech growth (CUF, 2014). In an interview with Erik Grimmelmann, the president of NYC Tech Alliance, he expressed great optimism regarding the longevity of the tech industry in the city due to the embeddedness of 'tech' in variety of industries.

According to the report, "NYC Tech Ecosystem: Generating Economic Opportunity for All New Yorkers", prepared by HR&A advisors in 2014, the New York City tech ecosystem included 291,000 jobs that were enabled by, produced, or facilitated technology (see chart 3).

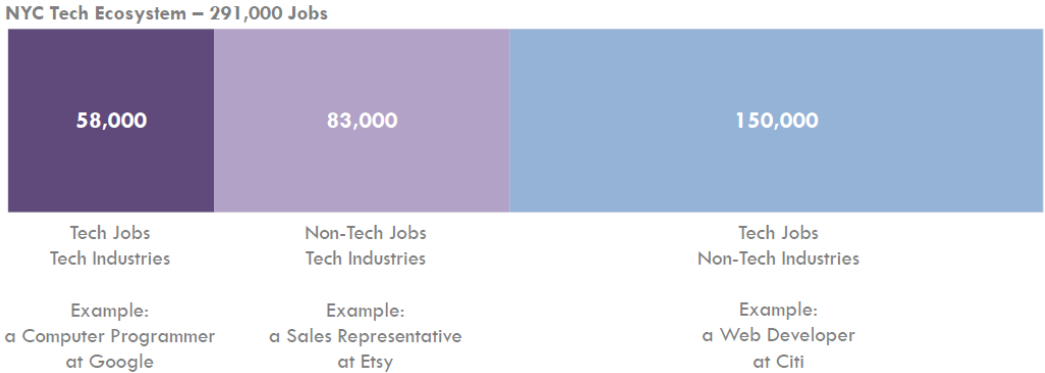


Chart 5 NYC Tech Ecosystem Jobs Breakdown (HR & A Advisors, 2014)

Tech industries generate 58,000 tech jobs and 83,000 non-tech jobs, while non-tech industries generate 150,000 tech jobs. In total, New York tech ecosystem employed 291,000 people or 7% of the 4.27 million people working in New York City. To put this figure into context, the retail sector employs 354,000 people or 8% of the total workers, while healthcare employs 665,000

people or 16% of the total workers. Consequently, the city’s tech sector accounted for \$50.6 billion in annual wages and \$124.7 billion in output (see chart 4).

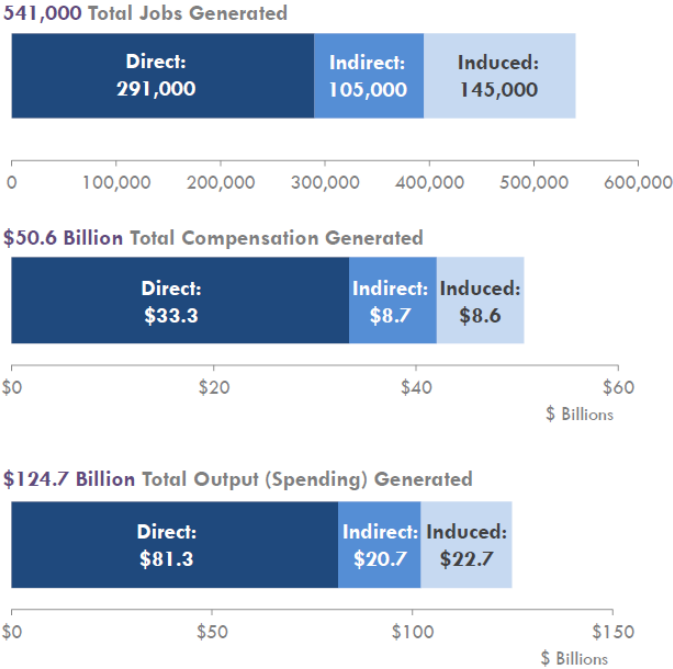


Chart 6 Total Jobs, Compensation and Output Generated in Tech Ecosystem (HR&A Advisors, 2014)

Moreover, The New York City tech ecosystem generated over \$5.6 billion in annual tax revenues to the City, representing 12.3% of the City’s 2013 tax revenue. \$2.5 billion came from property taxes, \$1.3 billion from personal income taxes, \$0.9 billion from sales and use taxes, and \$0.9 billion from corporation and business income taxes (HR & A advisors, 2014). Even with inflation, the tech industry’s importance to New York’s real estate market goes far beyond office leasing in Midtown South (Putizer, 2017). The study also found that workers in the NYC tech ecosystem earn 49% more than the average NYC hourly wage (HR & A advisors, 2014).

Following previous administration, Mayor de Blasio’s Office of Tech and Innovation (OT+I), which is an initiative on its own, has four major goals to further advance technological and economic initiatives. These four initiatives, Growing Tech Talent, Broadband Connectivity, Innovation and Open Government and Economic opportunity, are set to advance Mayor’s vision

in making NYC “the most innovative, tech-friendly and equitable city in the world” (*Mayor’s Office of Tech + Innovation*. Retrieved from <http://www1.nyc.gov/site/forward/index.page>).

The first initiative is to address the need for a “Growing Tech Talent”. During my conversations with the tech leaders in the industry and tech advocacy groups I was assured that there has indeed been a deficit in number of workers with the necessary tech training to support the tech industry’s growth. The following programs fall under this initiative.

Tech Talent Pipeline was launched by Mayor Bill de Blasio in 2014. It is a \$10 million industry partnership and collaboration with LinkedIn. The goal is to recruit and train New Yorkers to become suitable job candidates in the tech scene. It is designed to deliver quality jobs for New Yorkers and quality talent for New York’s businesses (Robinson, 2015). Another higher education program that was initiated in 2014 was the Tech Education CUNY. The City announced plans to invest an additional \$20M to expand science, technology, engineering and mathematics (STEM) programs at the City University of New York (CUNY), reaching 5,000 students in its first year. Funding was increased to \$29M in fiscal year 2016 and is slated to expand to \$51M in 2017. Moreover, the Tech Education K-12 was a \$20-million investment, announced by the Mayor in 2014, in new devices and software to increase classroom connectivity. It was also a \$650 million capital investment in wiring City schools and securing new hardware that keeps pace with New York City’s emerging tech ecosystem.

Computer Science for All (CS4ALL) is an \$81 million public-private partnership that will ensure that every single public school student has access to computer science education within the next 10 years. De Blasio’s administration also aims to install 100,000 high school students in summer jobs, internships, or mentorship programs annually by 2020 (Robinson, 2015). These students will enter the workforce with the necessary skills and contacts they need in the tech ecosystem. Additionally, the city recently partnered with City University of New York to create 85 new entrepreneur visas in a forward-thinking and exciting program, IN2NYC (NYCEDC, 2016).

By September of 2016, CS4All had trained teachers in nearly 150% of NYC public schools and provided instruction to students in 14% of schools in the Bronx, 18% of schools in Brooklyn, 13% of schools in Manhattan, 14% of schools in Queens and 16% of schools in Manhattan (TechNYC, 2016).

The “Broadband Connectivity” is the second program envisioned by OT+I. “Call for Innovations” and the “Broadband Taskforce” that is comprised of a diverse group of industry leaders from the private, academic, and nonprofit sectors, are strategies to deal with the issues of connectivity. While the initiative is rather new, with help of advocacy groups involved with the program such as Silicon Harlem and Tech NYC the LinkNYC kiosks have reached communities that did not previously have access to such facilities. In an interview with Clayton Banks the co-founder of Silicon Harlem, I learned more about the partnerships that the organization is undertaking with the city to extend such efforts. “The promise is, with help of the city, to bring broadband to all households in our community by 2025” said Banks at a conference held by the organization in October 2016 on broadband issues.

The third program envisioned by OT+I is “Innovation + Open Government”. Both “Open Government” and “NYC Big Apps” are initiatives that involve the tech community with coming with a solution for better city governance by both making data accessible and digitalizing certain aspects of governmental services making them accessible to all.

The fourth and the last program from OT+I is the “Economic Opportunity”. The .nyc web address makes the City of New York the first city in the country with a class of generic top-level domain names. It creates new opportunities to support local businesses, organizations, and residents, and establishing an unprecedented level of geographic authority to the digital sphere. Moreover, neighborhoods have now their own domain names, connecting eligible not-for-profit, public benefit corporation or local development corporation located within the neighborhood digitally to the rest of the city. Lastly, the Digital.nyc website brings together every company,



startup, investor, event, job, class, blog, video, workspace, accelerator, incubator, resource and organization in the five boroughs. Digital.nyc is the official online hub of the New York City startup and technology ecosystem. It is the result of a unique public/private partnership between the office of Mayor Bill de Blasio, the New York City Economic Development Corporation, IBM, Gust, and over a dozen leading NYC-based technology and media companies. Consequently, it was only through this platform that I was able to learn about the 'tech ecosystem' in a visual (through mapping) and comprehensive fashion.

Over the first two quarters of 2016, city agencies have participated in nearly three dozen citywide tech events and hackathons promoting the growth and diversity of NYC's tech ecosystem, STEM education initiatives, smart and equitable city, and innovation and entrepreneurs in NYC (Tanntoco, 2016). Today, the City's digital ecosystem supports more than 300,000 tech jobs and an additional 250,000 supporting jobs (Rose, 2016). However, there seems to be a shortage of tech related candidates in NYC. In an interview with Adam Forman, a researcher at Center Urban Future in September 2016, it became clear that tech sector is the city's fastest growing industry while it is lacking adequate tech talent. He continued that when it comes to better education opportunities, schools with better curricular are located in wealthier districts. Moreover, he applauded the initiatives such as CS4ALL and other initiatives that mayor de Blasio have started as well as partnership with CUNY school system through Tech Talent Pipeline and considered these efforts as long term approaches in fixing the tech talent gap.

**5.1 Silicon Alley:** Silicon Alley stretches from midtown Manhattan all the way south to Wall Street (see map 4). The term ‘Silicon Alley’ first emerged in the mid-1990s as a way to group the wave of new media tech startups that were located around the Flatiron neighborhood of Manhattan near Madison Square Park. The physical alley referred to the corridor that connected Midtown to Lower Manhattan, running past the Flatiron building at Madison Square Park and Union Square towards South of Houston Street area. At the heart of these companies were digital advertising platforms (Gallagher, 2015).



Map 4 Some of NYC Tech Companies in Silicon Alley (The Square Foot, 2014)

The study by Center for Urban Future, “NYC’s Tech Profile” in 2015, showed that Manhattan is home to 83% of all tech sector jobs in the city. However, the study uses the Federal Reserve Bank of New York new definition of ‘tech sector’ limited to seven industries “in which firms use technology as their core business strategy”. Majority of these tech sector jobs hence are located in Silicon Alley and its vicinity as opposed to other neighborhoods in Manhattan.

There are great advantages for startups moving or spurring in NYC; the credit for Qualified Emerging Technology Companies (QETC), a New York State initiative, as well as the federal Tax Credit for Research and Development are among the few.

The Research and Development Tax Credit, was federally enacted in 1981 that allows a credit of up to 13% of eligible spending for new and improved products and processes. Qualified research must meet the following four criteria:

- new or improved product, processes or software;
- technological in nature;
- elimination of uncertainty; and
- process of experimentation.

Eligible costs include employee wages, cost of supplies, and cost of testing, contract research expenses and costs associated with obtaining a patent. The high concentration of resources in one geographic area provides efficiencies similar to those enjoyed by companies clustered in Silicon Valley, California. R&D activity in both areas reflects a movement toward interconnectedness and open knowledge sharing. Rather than pour large sums of money into in-house R&D programs, high-tech firms are finding ways to leverage the knowledge and creativity of outside sources. Geographic clustering facilitates this trend (Marr, 2012). In addition to the R&D tax credit, New York State offers an additional 18% credit for Qualified Emerging Technology Companies (QETC). The startups moving into Silicon Alley are primed for the QETC credit, as the majority of them are in a qualifying industry and meet the criteria necessary

to receive an 18% R&D tax credit. To qualify, a company must meet requirements similar to those for the R&D tax credit. In addition, a qualifying firm must have: 100 or fewer full-time employees; at least 75% of full-time employees employed in New York State; annual sales less than \$10M and gross revenue less than \$20M; and New York-based R&D expenses must be over 6% of net sales. Additionally, New York State qualifying companies must be in one of the following industries:

- information and computer technologies;
- advanced materials and processing technologies;
- engineering, production, and defense technologies;
- electronic and photonic devices;
- biotechnologies;
- or remanufacturing technologies.

The QETC credit has the added benefit of being fully refundable, unlike the federal R&D credit. This means that a qualifying company without the tax capacity to utilize the credit can essentially use the New York State credit as cash venture capital funding (Marr, 2012).

Silicon Alley has also had the benefit of Mayor Bill de Blasio's Digital.NYC platform, established in 2014 it is a centralized online hub tying together the entirety of New York City's tech ecosystem, which provides the online visitors with the information and resources that are promised to turn ideas into businesses.

**5.2 Brooklyn Tech Tringle:** Downtown Brooklyn, DUMBO, and the Brooklyn Navy Yard form New York City’s largest cluster of tech activity outside of Manhattan known as Brooklyn Tech Triangle (see figure 2). The Brooklyn Tech Triangle made up of Downtown Brooklyn, DUMBO, and the Brooklyn Navy Yard has attracted pioneering, energetic, and creative entrepreneurs and has emerged as New York City’s largest cluster of tech activity outside of Manhattan (Brooklyn Tech Triangle, 2017). The three entities managing the Triangle are: The Brooklyn Navy Yard Development Corporation (BNYDC) a not-for-profit corporation, The DUMBO Improvement District a 501(c)3 non-profit organization and Downtown Brooklyn Partnership a not-for-profit local development corporation. The Triangle has defined boundaries following its 2013 master plan review by DUMBO Improvement District. Moreover, it has clear objectives and a transparent and accessible platform for individuals and firms to contact the partners and seek assistance.

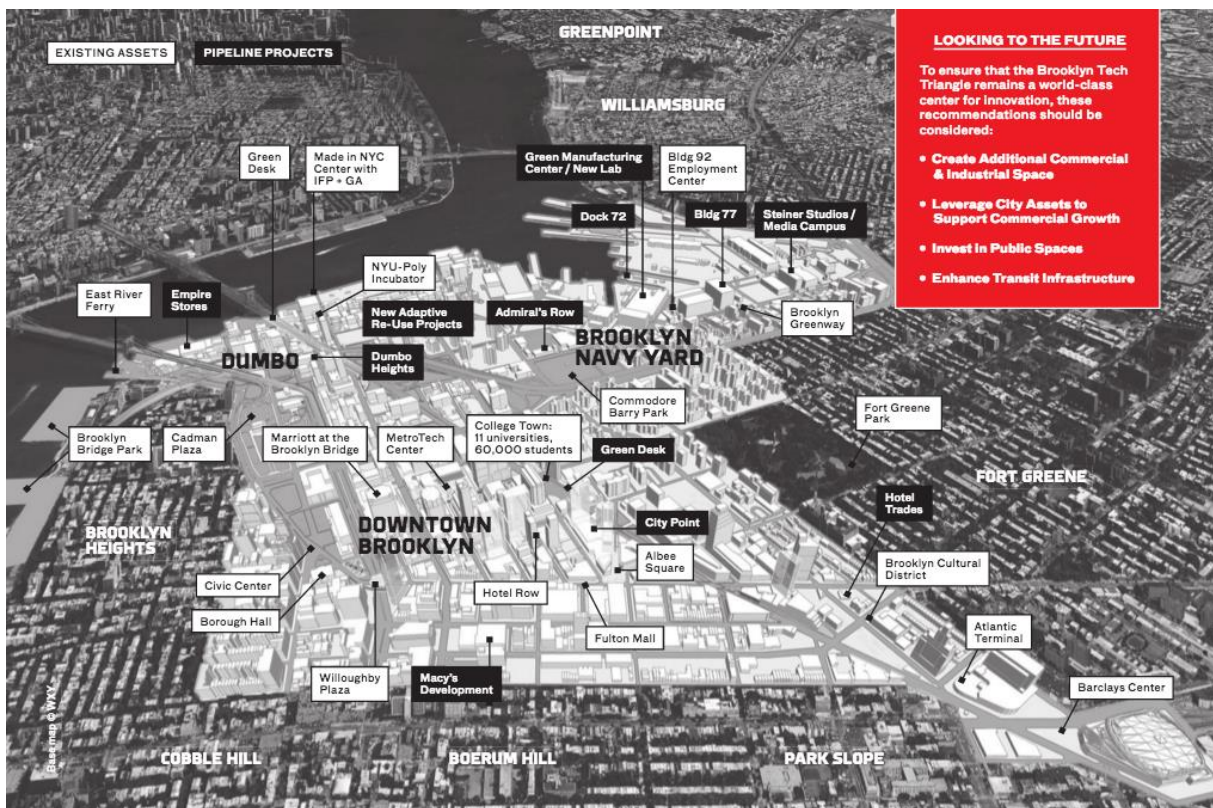


Figure 1 Aerial View of Brooklyn Tech Triangle: Existing Assets and Pipeline Projects (Brooklyn Tech Triangle, 2016)



Manhattan seems to be losing ground to the outer boroughs. Massive growth has led to high rents and lack of space for burgeoning businesses mostly located in Silicon Alley (Mandell, 2016). According to the study “Commercial Real Estate Competitiveness Study” by NYCEDC in 2013, demand for office space by tech companies increased 177% from 2002-2012, representing 25% of New York City leases. The vacancy rate in NYC was at 9% (compared to 15% nationwide), creating supply and demand issues that grossly impacted rents.

As shown in Map 1, NYCEDC has also supported the Tringle through projects like the Urban Future Lab, Made in NY Media Center, and the NYU Center for Urban Science and Progress at Metrotech. Downtown Brooklyn has increasingly become an attractive place for tech, due to a burgeoning ecosystem that fosters the innovation economy’s growth and bolsters its potential.



Figure 2 A New Tech Ecosystem (Brooklyn Tech Triangle, 2013)

The recently formed Brooklyn Education innovation Network, a consortium of 11 institutions of higher education focused on building academic and industry partnerships and creating a job and

internship pipeline with local businesses (see figure 3). A study in coordination with the Tech Triangle update found that those institutions contribute \$2.8 billion to the local economy annually (Brooklyn Eagle, 2015).

The total economic impact of the Tech Triangle has grown significantly, from \$3.5 billion in 2012 to \$5.3 billion in 2015 and that growth is expected to skyrocket to \$15.5 billion by 2025 (Brooklyn Tech Triangle, 2013). Over the past decade, the number of technology jobs in Brooklyn has increased 56% and employment in the borough's creative industries rose 60% (CUF, 2016). Home to 1,350 innovation companies, Brooklyn Tech Triangle, has had an employment increase of 45% reaching more than 17,300 between 2012 and 2015 making it a major economic engine for New York City (Brooklyn Tech Triangle, 2016).

Despite the increase in technology jobs, however, there seems to be a shortage of skilled workers in the Triangle and the borough. In Brooklyn, many of the fast-growing tech companies desperately need talented workers. At the same time, however, too many of the high-quality jobs emerging from these fields remain out of reach for Brooklyn residents from low- and moderate-income backgrounds (CUF, 2016). Nonetheless, through my conversations with Alan Washington, the managing director of real estate and economic development at Downtown Brooklyn Partnership, I learned that there is a mandate in place for the Brooklyn Tech Triangle as a whole to meet a locally hired quota. This means that 60% of the total employees in the Brooklyn Tech Triangle must be residents of the community or neighboring communities. The concept is in place to promote tech related positions to the local community and by providing the necessary training and assistance and essentially helping the long-time residents avoid being priced out and consequently displaced.

The proceedings of the policy symposium, Expanding Opportunities in Brooklyn's Tech and Creative Sectors, held in December 2016 that was convened by the Center for an Urban Future made it clear that New York City and increasingly Brooklyn is home to several high-quality

programs aimed at expanding the pipeline of residents with the skills required to access jobs in the tech sector. The sought after programs discussed during the symposium included the Mayor de Blasio Tech-Talent-Pipeline, widely acclaimed educational initiatives like P-Tech, programs ran by celebrated nonprofits such as Per Scholas and Coalition for Queens, and on-site industry training centers at the Brooklyn Navy Yard and Industry City. Among qualities that make Brooklyn Tech Triangle an attractive location for individuals and firms is the tech Triangle's effort to make the area highly connected and accessible (figure 4).



Figure 3 Connections Across The Tech Triangle (Brooklyn Tech Triangle, 2013)

The Triangle, through 2013 strategic plan, had recognized that it is easier to get to Manhattan from Downtown Brooklyn than it is to other parts of the Tech Triangle. The Plan proposed extension of the B67 bus service and by 2013 MTA NYC Transit announced that it will implement the extension recognizing importance of the Triangle. Among other attractive characteristics of the Triangle are the Brooklyn Cultural District and free public WiFi.



**5.3 Harlem:** The neighborhood of Harlem with population of close to 400,000 residents (ACS 2010), constitute of community boards 9, 10, 11 and 12. It is home to variety of educational institutions; Columbia University's Morningside Campus as well as its Medical Center encompasses the far proximities of the neighborhood while Community College of New York is located at the heart of this diverse neighborhood.

Harlem has received a tech-led makeover due to series of economic development initiatives aimed at combating the neighborhood's infamous high unemployment rates and widespread poverty (Gayles, 2014). Moreover, the neighborhood is undergoing a significant transformation, with new high-rise condos, a rapidly expanding restaurant row and a changing demographic makeup. Nonetheless, it is cheaper to live and work in Harlem than most other New York neighborhoods that are home to tech initiatives such as Flatiron District, home to Silicon Alley, and Williamsburg, home to Brooklyn Tech Triangle (Banks, 2016).

Silicon Harlem, a nonprofit community organization launched in 2013, is partnering with local and national politicians and entrepreneurs to develop Harlem's tech scene. It is supporting tech education initiatives, building up the neighborhood's broadband infrastructure and attempting to lure innovators to the neighborhood (Gayles, 2014). "Today 25% of households in the neighborhood of Harlem do not have access to internet", said Clayton Banks the Co-Founder and CEO of Silicon Harlem, "despite the latter obstacle, there is an identified tech community in Harlem that has now joined Silicon Harlem to transform Harlem into a tech and innovation hub". Silicon Harlem's mission has been to provide leadership in sustainable, technology led economic development for emerging urban communities and essentially transform Harlem into a Technology and Innovation Hub.

According to Black Enterprise, a premier business, investing, and wealth-building resource for African Americans, Silicon Harlem aspires to transfer Harlem into an innovation and technology hub that will thrive and inspire the global digital economy. The hope is that another 'renaissance

movement' can take place in the tech sector. Moreover, the local politicians and entrepreneurs behind Silicon Harlem believe that they can create the relationships, knowledge and resources for industries to be successful in the neighborhood. They believe that by bringing technology and engineering interests into the community, economic development is accelerated and education can also be positively impacted in the short-term. In the long-term, the shift toward technology has the potential to impact the area's high unemployment rates (8.1% compared to 4.4% in NYC) and poverty (Stitt, 2015).

Universities produce new research that essentially makes them anchoring institutions for an innovation district. These entities benefit from federal grants and have access to equipment and resources that the average businesses do not have (Katz, 2014). Harlem has abundance of educational institution that could serve as its anchoring institutions.

In July 2012, Mayor Bloomberg and Columbia University President Bollinger announced an agreement to create a new Institute for data sciences and engineering (DSI). The City provided Columbia with \$15 million in financial assistance to develop the institute, and the University contributed about \$80 million in private investments. The agreement also included the creation of 44,000 square feet of new space on Columbia's campus and the addition of 75 new faculty members from engineering and other disciplines over the course of next decade (NYCEDC, 2012).

Broadband access plays a vital role in attracting and sustaining startup firms the community (see image 1). The first step in achieving the latter goals is to provide the community with adequate broadband. Continuing an initiative started by former New York Mayor Michael Bloomberg, Mayor Bill De Blasio's administration has been deploying the largest, continuous free Wi-Fi network in the United States at the center of Harlem (Gayles, 2014). However, today 20% of households in Harlem still remain without access to broadband.



Image 1 3rd Annual Silicon Harlem Conference: Broadband Matters (Silicon Harlem, 2016)

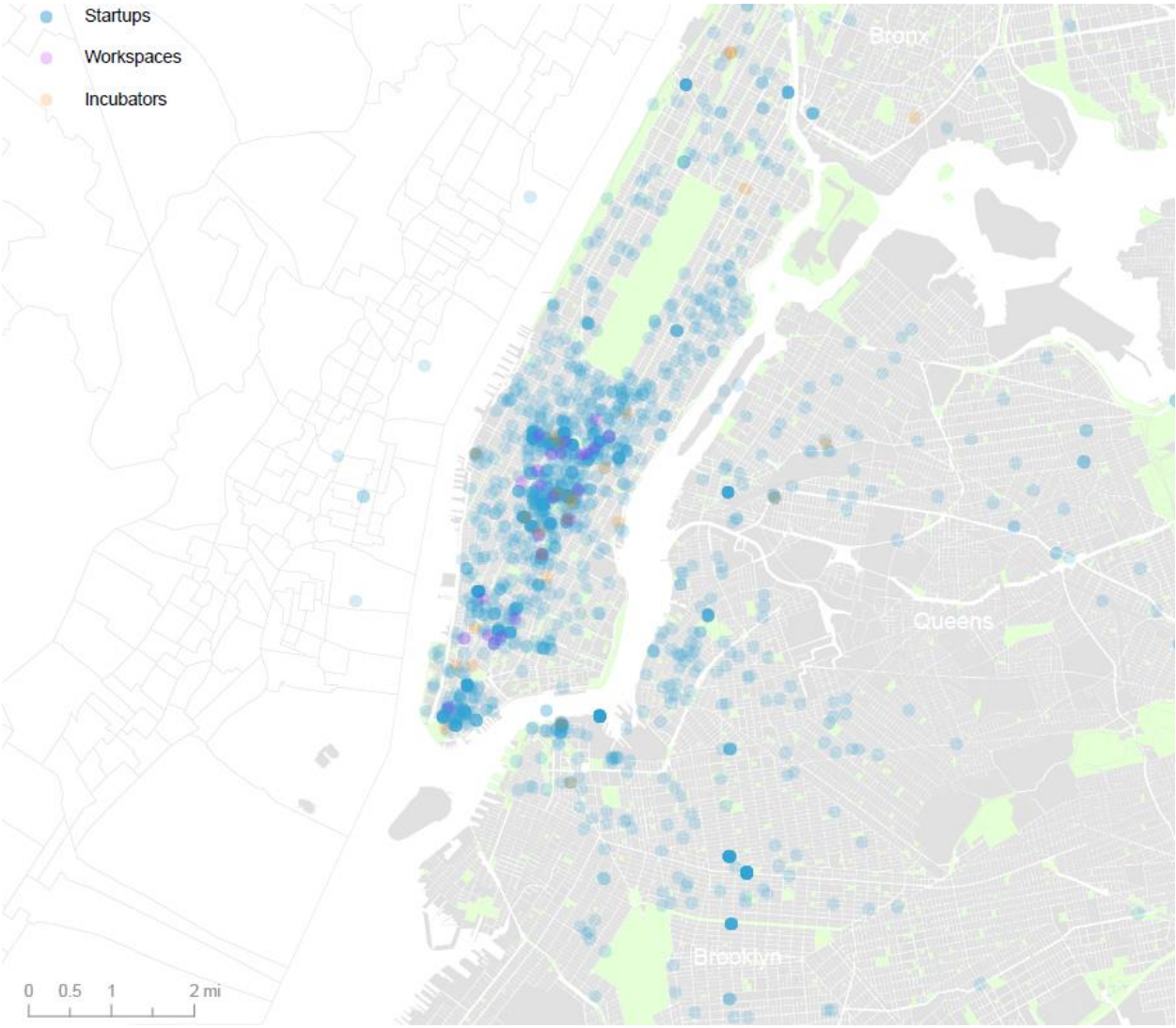
## 6. Data Analysis and Findings

In order to analyze different policies in regards to innovation districts and the tech industry in New York City, I gave a point to policies that were most frequently mentioned by the six interviewees as well as other individuals whom I have met as the most successful policies and initiatives. Moreover, by reviewing literature on the topic and the reports produced by entities such as Center for Urban Future, HR & A and NYCEDC I added additional points to those policies (see table 2).

<b>Direct [explicitly related to innovation districts]</b>								
<i>Category</i>	<i>Policies and Initiatives</i>	<i>Agency</i>	<i>Assigned Scores</i>					
Broadband Provisions	Fiber Network Infrastructure	NYC DoITT	●	●	●			
	Connect NYC / IBZ / Wired NYC	NYCEDC	●	●	●			
	LinkNYC	NYC DoITT	●	●				
Financial Incentives	R & D Tax Credit	IRS - Federal	●	●	●			
	QETCs	DTF - State	●	●	●	●		
	Biotechnology Tax Credit	NYC Business	●	●	●	●	●	
	NYC Seed	NYC EDC	●	●	●			
	The Life Science Funding Initiative	NYC EDC	●					
Tech Talent Growth	Tech Talent Pipeline	Mayor's Office	●	●	●	●	●	●
	IN2NYC	NYC EDC	●	●				
Sharing, Connecting and Partnership Programs	Digital.nyc (Made in NY)	NYC EDC	●	●	●			
	Urbantech NYC	NYC EDC	●	●				
	Mayor's Office of Tech + Innovation	MoTI	●	●	●			
Providing Workspaces	Incubators	NYC EDC	●	●	●	●		
	Co-working Spaces	NYC EDC	●	●	●	●		
Educational Incentives	Workshops	NYC EDC	●	●	●			
	CS4ALL	Mayor's Office	●	●	●	●	●	
	Higher Education Partnerships	NYC EDC	●	●	●	●	●	
Legal Assistance	Free Legal Advice	SBS	●					
Facilitating Events	Hackathons	NYC EDC	●	●	●			
	Hire & Expand in MN Competition	NYC EDC	●	●				
<b>Indirect [have consequently influenced innovation districts]</b>								
Affordable Housing	MIH and ZQA	DCP/CC	●	●	●	●		
Land Use Provisions	Empire Zones / Empowerment Zones	NYC ESD/EZP	●	●				
	Zoning Amendments*	DCP/CC						

Table 2 Scored Policies and Initiatives Based on Interviews and Literature Review – Refer to Table 1 for References

Each policy and/or initiative received different weight or amount of points based on the aforementioned criteria. Parallel to the policies and initiatives I wanted to compare the changes



Map 4 Startups, Incubators and Workspaces in NYC (data retrieved from Digital.nyc, 2017)

in number of startups that were founded during different administrations. I then extracted the 1,890 startups mapped on the Digital.nyc tech ecosystem map (see map 4) and created a chart reflecting the timeline of the tech industry’s growth based on the startups’ founding years. It is important to note that the data obtained from Digital.nyc map only provides founding years of startups and not their exit years (see figure 5). Exists occur when establishments go from

having at least one employee to having none and then remain closed for at least a year (NY Small Business, 2016).

	A	B	C	D	E	F	G
1	title	uri	coordinates_001	coordinates_002	founded	bundle	id
2	Gabrielle Sanchez, Inc.	/startups/gabrielle-sanchez-inc	-73.9892	40.7357	1986	company	1976812
3	Cohn Legal Group	/startups/cohn-legal-group	-73.9842	40.753	1992	company	77496
4	Bisma Mobil Service Station	/startups/bisma-mobil-service-station	-73.9941	40.7663	1993	company	1597858
5	Express Trade Capital	/startups/express-trade-capital	-73.9867	40.753	1993	company	2089326
6	Netfast Technology Solutions	/startups/netfast-technology-solutions	-73.9869	40.7516	1996	company	405101
7	Avalon Hosting, LLC	/startups/avalon-hosting-llc	-73.9706	40.7611	1997	company	986962
8	Gust Test Company 2	/startups/gust-test-company-2-0	-73.9898	40.7456	2000	company	1172839
9	Genuine Ten Ten	/startups/genuine-ten-ten	-73.9859	40.752	2000	company	1701741
10	Constructive	/startups/constructive	-73.9969	40.7259	2000	company	1220885
11	digitaltoprint	/startups/digitaltoprint	-73.9759	40.7545	2002	company	9642
12	Assertmeds	/startups/assertmeds	-73.9685	40.7585	2003	company	9990
13	Wongsang worldwide	/startups/wongsang-worldwide	-74.0109	40.7053	2003	company	1590893
14	Gramercy Tech	/startups/gramercy-tech	-73.9916	40.7475	2003	company	1552886
15	eBrandz Inc	/startups/ebrandz-inc	-73.9832	40.7472	2003	company	140976
16	Entermedia	/startups/entermedia	-73.9913	40.7519	2004	company	1200798
17	Lumina	/startups/lumina	-73.9891	40.7435	2004	company	512612
18	GrubHub	/startups/grubhub-0	-74.014	40.7054	2004	company	5811
19	675 Beech, LLC	/startups/675-beech-llc	-73.9907	40.7528	2005	company	9235
20	Kaneron Systems	/startups/kaneron-systems	-74.0003	40.7217	2005	company	3953
21	Ecologic Solutions, Inc.	/startups/ecologic-solutions-inc	-73.9753	40.6985	2005	company	6615
22	Asahi Technologies	/startups/asahi-technologies	-73.9842	40.753	2005	company	1209885
23	Financial Technologies Forum, LLC	/startups/financial-technologies-forum-llc	-73.9934	40.7553	2006	company	438759
24	ORAIKO	/startups/oraiko	-74.014	40.7053	2006	company	375634
25	Immediate Pain Relief, LLC	/startups/immediate-pain-relief-llc-0	-73.978	40.7056	2006	company	8342

Figure 4 Snapshot of 25 of 1890 Citywide Startup Data Extracted from Digital.nyc map, February 2017

Additionally, I overlaid the policies that had received the most points based on my interviews and literature review on the same chart. The chart (see chart 7) reflected that during the last term of Mayor Bloomberg (2010 – 2014) the number of startups exponentially increased. The same trend continued into Mayor de Blasio’s term (2014 – today) and has continued to this date. To put this data into perspective, 2013 also marks as an important year for tech acquisitions in the City’s tech history. Yahoo acquired Tumblr, a quintessentially New York startup, in that it combined tech, media, and culture for \$1.1 billion<sup>22</sup>. It was the city's first venture backed startup company to be acquired for more than a billion dollars. That sparked a confidence with venture capitalists to invest in startups in the city (Lagorio, 2016). My initial take was that there seems to be a relationship between certain policies and increased number of

<sup>22</sup> Simpson, “Yahoo! Just Bought Tumblr for \$1.1 Billion.”



startups. For example, when the Biotechnology Tax Credit as well as NYC Seed initiative were enacted there seems to be a sudden increase in the number of startups founded in the City (see chart 7).

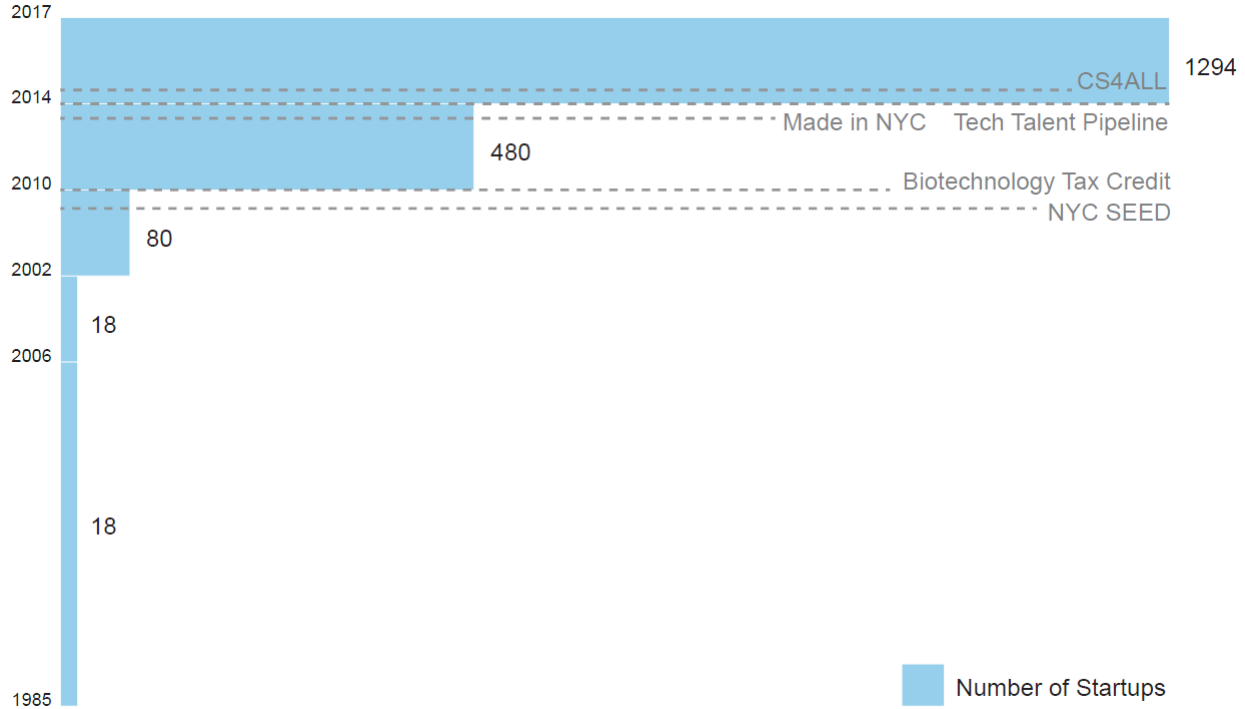


Chart 7 Startups founded between 1985 - 2017 and tech related policies (Startup data retrieved from Digital.nyc, Feb 2017)

The same correlation seems to exist with enactment of Tech Talent Pipeline initiative and other educational programs such as Computer Science for All (CS4ALL) and City’s partnership with Cornell Tech. In 2014, the literature showed that, EDC gave away more than \$35 million and Empire State Development (est. 1995) had hundreds of millions in funding and loans. The ESD had also launched an online platform that connected 1,400 budding entrepreneurs and established business owners in that year. While the correlations do not necessarily prove that these policies have resulted in exponential increase in the number of startups it does suggest that the city the increase in number tech related policies, especially the policies that all well received by the tech community, during the time when startups have burgeoned is indicative of City’s attention and response to the importance of tech and innovation ecosystem.

## 6. Conclusion

The growth and the increase in number of startups over the past decade suggest that separate from market forces, the firms' choice to locate in New York City is based on certain resources that the city has to offer. These resources, in many cases, would have not been possible if it was not for planning and policies that the city government has have adopted.

The preliminary response received from the individuals (see table 1 in appendices) involved with the evolution of the tech industry in New York City seem to support the claim that governmental policies have indeed had an impact in supporting and sustaining the tech industry in the city. While policies associated with Mayor Bloomberg's term are associated with the growth of tech industry, mayor de Blasio's policies seem to be supplementary in sustaining the already established tech ecosystem in the city. Moreover, the data gathered from multiple research institutions support the latter claim by quantifying the growth of tech industry in terms of job creation whether those jobs are directly related to tech or are indirectly influenced by the industry.

Through my interviews and a conversation specifically with Kate Wittels, Principal at HR&A advisors, I learned that New York City offers a wide range of programs to attract and retain tech and non-tech firms. Centralizing and coordinating New York City's existing and impactful tech-oriented programs and services would make it easier for individuals in the ecosystem to seek out assistance. Platforms such as [digital.nyc](http://digital.nyc), [techtalentpipeline.nyc](http://techtalentpipeline.nyc) and [urbantechnyc.com](http://urbantechnyc.com) supported by NYCEDC reveal to be aligned with such recommendations.

"New York City might not have West Coast's Google or a Facebook", said Erik Grimmelmann in an interview conducted for this thesis in March, "but that is not the only way to define a healthy tech ecosystem." He continued to explain what indeed makes the city's tech and innovation ecosystem sustainable is the fact that tech is now embedded in different industries. Blockchain



technology and the financial sector, or drones and the future of logistics and infrastructure are examples of such embeddedness. Moreover, the innovation that happens in New York is not limited to tech; it is in theater, energy, health, transportation, and even government. The City has recognized the latter considering the range of policies and initiatives (see table 1) that have been put in place during the past two administrations.

Nonetheless, there are areas that could be addressed further by the City when it comes to the tech industry and its spatial manifestation, innovation districts.

## 7. Recommendations

### Recommendations for the City

*Increase and Diversify the Tech Talent:* Despite the recent efforts of the City to increase the tech talent gap with sought after Tech Talent Pipeline initiative and CS4ALL there still seems to be shortage of qualified candidates to fill in tech related positions at various innovation hubs in the city. While most of the interviewees welcomed the latter efforts, they also expressed the importance of such initiative in expanding and sustaining the tech industry in New York City.”.

Brooklyn Tech Triangle encourage all the businesses in their innovation district to hire locally. Moreover, the promise of job creation has been the winning argument at the community board meetings by the Brooklyn Tech Triangle’s managing partners. Therefore, setting a minimum mandate by the City, for example a percentage of the innovation hub workers being long-term residents of the community, will further insure an inclusive workforce and environment at the innovation districts.

There are other ways to both diversify and add to the tech talent pool. “Incentivizing for international talent to move to the city through similar programs to International Innovators Initiative (IN2NYC) will help with the shortage”, said Sarah Appleton a Senior Project Manager at NYCEDC in an interview in regards to this thesis in March; “although IN2NYC is a pilot program it has potential to address talent shortage

*More Affordable Working Spaces:* Rising rents is a reoccurring theme not only related to the tech and innovation ecosystem but New York City as a whole. The rent flexibility that the incubators and coworking spaces provide for startups and smaller tech firms has made it possible for the industry to grow. However, even the rents for such spaces have been increasing over time. The City has nonetheless, partnered with tech entities to provide additional work spaces (see map 1) in various locations in Manhattan and Brooklyn. Providing more

spaces with adequate rent price could further enhance the growth of tech industry in NYC and keep the startups within the ecosystem as opposed to them moving to other locations.

Moreover, incubators are crucial in preparing and educating potential tech talent. The City sponsored incubators and working spaces at various innovation districts could set mandates for a minimum number of workshops and educational seminars to be dedicated to local residents and students at the community. Partnerships with related community boards could further enhance the link between the communities and the innovation districts that spur around the city.

*Utilize the Tech Talent:* While there are, financial services provided by Office of Small Businesses I have learned through this study that smaller startups are looking for local banks and credit unions to provide better small business services. However, most local businesses end up using large national fee-heavy banks due to their better online services. Assisting smaller credit unions with better online services by utilizing the tech talent that already exists in the city could therefore support NYC's small financial-services companies. This task could be the theme at one of City's many events related to the tech industry.

*More Affordable Housing:* Mayor de Blasio's Mandatory Inclusionary Housing and Zoning for Quality and Affordability (MIH and ZQA) are examples of indirect policies, expressed by individuals in the tech industry, in which the City is supporting and sustaining the innovation ecosystem. The new zoning is indeed one of the most progressive affordable housing policies in the US. Providing further affordability zoning at areas where the innovation districts are spurring in the city could help mitigate some of the displacement that is caused by the innovation districts and the tech takeover in the communities. Moreover, according to the Center for Urban Future's report in 2015, half of the individuals employed in the tech industry are under 35 years old; these individuals would essentially, if they have not already, create their own families and would need the amenities that the city has to offer in terms of access to adequate housing and schools. It is for this reason that the indirect policies such as MIH and ZQA are crucial in order

to have a sustainable innovation ecosystem. Consequently, providing more affordable housing is one of the recommendations directed toward the city.

### **Recommendations for Innovation Districts**

Following the Brookings Institute's 'Triple Helix Model' it is evident in the case of Brooklyn Tech Triangle that a direct relationship with the government through a partnership with Downtown Brooklyn Partnership has helped them with advancing their goals and objectives. Without such public-private partnerships tech and innovation hubs would not be able to succeed. Over the past two decades and especially since Mayor de Blasio has taken office, it seems that such initiatives have taken momentum. Moreover, activists and individuals who seek to attract tech industry to their communities, e.g. Clayton Banks of Silicon Harlem, have worked closely with Borough President Gale Brewer, to further advance their efforts. This type of relationship between the private entities and the government is quintessential for innovation districts to flourish. It is recommended for Silicon Harlem to continue its close relationship with the City in order to further advance their goal in making Harlem the next tech and innovation destination. Moreover, what makes Brooklyn Tech Triangle a defined innovation district is its success to bring key entities together as a strong managing entity in a explicitly defines area. Today, Silicon Harlem is the only grassroots entity (with support of Greater Harlem Chamber of Commerce and West Harlem Community Corp) pushing for a tech agenda in the neighborhood. Further partnerships with other influential organizations in the neighborhood as well as key educational institutions such as Columbia University's campuses and City College of New York City could have further anchoring effect. To that point, it is crucial for Silicon Harlem to define boundaries of the Harlem's innovation district in order to showcase a cohesive message and agenda. Such designation, yet again, would not be possible without a strong partnership with other local entities in the neighborhood and the City.



## Bibliography:

Clark, Greg, Tim Moonen, and Gert-Joost Peek. "Building the Innovation Economy: City-Level Strategies for Planning, Placemaking and Promotion." Urban Land Institute, October 2016.

Florida, Richard L. *The Rise of the Creative Class: Revisited*. New York: Basic Books, 2012.

Florida, Richard L. *The Great Reset: How New Ways of Living and Working Drive Post-Crash Prosperity*. 1st ed. New York: Harper, 2010.

Jaffe, Eric. "Cities Are Innovative Because They Contain More Ideas to Steal." CityLab. Accessed October 9, 2016. <http://www.theatlanticcities.com/jobs-and-economy/2013/06/cities-are-innovative-because-they-have-more-ideas-steal/5883/>.

Badger, Emily. "The Real Reason Cities Are Centers of Innovation." CityLab. Accessed October 9, 2016. <http://www.theatlanticcities.com/jobs-and-economy/2013/06/secret-why-cities-are-centers-innovation/5819/>.

Pan, Wei, Gourab Ghoshal, Coco Krumme, Manuel Cebrian, and Alex Pentland. "Urban Characteristics Attributable to Density-Driven Tie Formation." *Nature Communications* 4 (June 4, 2013). doi:10.1038/ncomms2961.

Nam, Taewoo, and Theresa A. Pardo. "Smart City as Urban Innovation: Focusing on Management, Policy, and Context," 185. ACM Press, 2011. doi:10.1145/2072069.2072100.

Dameri, Renata Paola, and Camille Rosenthal-Sabroux, eds. *Smart City: How to Create Public and Economic Value with High Technology in Urban Space* (Progress in IS. Progress in IS. Cham: Springer International Publishing, 2014. <http://link.springer.com/10.1007/978-3-319-06160-3>.

Harlem/Morningside Heights Transportation Study: 2015 Future Conditions and Recommendations (Final Report) <http://www.nyc.gov/html/dot/downloads/pdf/2012-03-harlem-morningside-report.pdf>

Center for an Urban Future: New Tech City [https://nycfuture.org/pdf/New\\_Tech\\_City.pdf](https://nycfuture.org/pdf/New_Tech_City.pdf)

"Mark Levine Launches Petition to Bring 125th Street Bus Lanes West of Lenox" <http://www.streetsblog.org/2015/03/03/mark-levine-launches-petition-to-bring-125th-street-bus-lanes-west-of-lenox/>

The NYC Tech Ecosystem: Generating Economic Opportunities for All New Yorkers [http://www.hraadvisors.com/wp-content/uploads/2014/03/NYC\\_Tech\\_Ecosystem\\_032614\\_WEB.pdf](http://www.hraadvisors.com/wp-content/uploads/2014/03/NYC_Tech_Ecosystem_032614_WEB.pdf)

Providence Innovation and Design District <http://commerceri.com/wp-content/uploads/2016/01/2016.1.11-I-195-Final-Report.pdf>

Roose, Kevin. "Is Mayor Bloomberg's New York Really a Tech Town?" Daily Intelligencer, October 4, 2013. <http://nymag.com/daily/intelligencer/2013/09/bloombergs-new-york-really-a-tech-town.html>.

Dr. Mandel, Michael. "Building A Digital City: The Growth and Impact Of New York City's Tech/Information Sector." New York City, September 30, 2013. Prepared for the Bloomberg Technology Summit. <https://southmountaineconomics.files.wordpress.com/2013/09/building-a-digital-city1.pdf>.

"New Tech City | Center for an Urban Future (CUF)." *Center for an Urban Future (CUF)*. Accessed October 26, 2016. <https://nycfuture.org/research/new-tech-city>.

"Richard Florida: The Urban Tech Revolution." *Urban Land Magazine*, October 7, 2013. <http://urbanland.uli.org/economy-markets-trends/the-urban-tech-revolution/>.

Florida, Richard. "The Joys of Urban Tech." *Wall Street Journal*, September 1, 2012, sec. Life and Style. <http://www.wsj.com/articles/SB10000872396390444914904577619441778073340>.

Stone, Madeline. "Michael Bloomberg Has Donated \$100 Million to Turn New York City into a Tech Hub." *Business Insider*. Accessed October 9, 2016. <http://www.businessinsider.com/michael-bloomberg-has-donated-100-million-to-cornell-tech-2015-6>.

"New York City Is Becoming the Latest Tech Hub." *TEKConn*, March 22, 2013. <http://www.tekconn.com/news/it-consulting/new-york-city-is-becoming-the-latest-tech-hub/>.

Kokalitcheva, Kia. "New York Tech Companies Are Getting a New Lobby Organization." *Fortune*, May 2, 2016. <http://fortune.com/2016/05/02/nyc-tech-advocacy-organization/>.

Gayles, Contessa. "Harlem: New York's New Tech Hub?" *CNNMoney*, July 21, 2014. <http://money.cnn.com/2014/07/21/technology/innovation/harlem-economy-tech/index.html>.

Rose, David S. "Silicon Alley Closes 2015 On Top In A Boom Year For Startups." *Forbes*. Accessed December 1, 2016. <http://www.forbes.com/sites/grouphink/2016/02/11/silicon-alley-closes-2015-on-top-in-a-boom-year-for-startups/>.

Gallagher, Fergal. "The Mysterious Origins of the Term Silicon Alley Revealed." *Built In NYC*. Accessed December 7, 2016. <http://www.builtinnyc.com/2015/10/12/where-exactly-or-was-silicon-alley>.

Reed, Tucker. "The Ripple Effect of Applied Sciences in NYC." *Huffington Post*, November 3, 2011. [http://www.huffingtonpost.com/tucker-reed/new-york-tech-campus\\_b\\_1071887.html](http://www.huffingtonpost.com/tucker-reed/new-york-tech-campus_b_1071887.html).

Dameri, Renata Paola, and Camille Rosenthal-Sabroux, eds. *Smart City: How to Create Public and Economic Value with High Technology in Urban Space*. Progress in IS. Cham: Springer International Publishing, 2014. <http://link.springer.com/10.1007/978-3-319-06160-3>.

Florida, Richard. *The Rise of the Creative Class: And How It's Transforming Work, Leisure, Community and Everyday Life*. Nachdr. New York, NY: Basic Books, 2006.

European Commission, and Directorate General for Mobility and Transport. *Innovation in Urban Mobility: Policy Making and Planning*. Luxembourg: Publications Office, 2013. <https://www.kowi.de/Portaldata/2/Resources/fp/trip-urban-mobility.pdf>.

<http://brooklyntechtriangle.com/about/>

AM, Diana Budds 08 18 15 7:00. "Can You Design Innovation?" *Co.Design*, August 18, 2015. <https://www.fastcodesign.com/3047888/slicker-city/can-you-design-innovation>.

Katz, Bruce, and Jennifer Bradley. *The Metropolitan Revolution: How Cities and Metros Are Fixing Our Broken Politics and Fragile Economy*, 2015.

Katz, Bruce, and Julie Wagner. "The Rise of Innovation Districts | Brookings Institution." *Brookings*, June 9, 2014. <https://www.brookings.edu/essay/rise-of-innovation-districts/>.

Ivanova, Inga A., and Loet Leydesdorff. "Rotational Symmetry and the Transformation of Innovation Systems in a Triple Helix of University–industry–government Relations." *Technological Forecasting and Social Change* 86 (July 2014): 143–56. doi:10.1016/j.techfore.2013.08.022.

"NYCEDC Launches Urbantech NYC to Support Companies Building Smart And Sustainable Cities | NYCEDC." Accessed February 15, 2017. <https://www.nycedc.com/press-release/nycedc-launches-urban-tech-nyc-support-companies-building-smart-and-sustainable-cities>.

Simpson, Connor. "Yahoo! Just Bought Tumblr for \$1.1 Billion." *The Atlantic*, May 19, 2013. <https://www.theatlantic.com/technology/archive/2013/05/yahoos-messy-tumblr-acquisition-going-fall-apart/315114/>.

Leon, Alexandra. "2 New Tech Hubs Coming to Brooklyn Navy Yard and Midtown." *DNAinfo New York*, February 16, 2016. <https://www.dnainfo.com/new-york/20160216/navy-yard/2-new-tech-hubs-coming-brooklyn-navy-yard-midtown>.

"Onramps of Opportunity: Building A Creative + Inclusive New York." NYU School of Professional Studies, July 16, 2014. [http://www.scps.nyu.edu/content/dam/scps/pdf/200/200-4/NYU-SCPS-Creative-Cities-Onramps-of-Opportunity-Program.pdf?utm\\_source=GTO&utm\\_medium=email&utm\\_campaign=dm-ce-e1314-0083\\_R2](http://www.scps.nyu.edu/content/dam/scps/pdf/200/200-4/NYU-SCPS-Creative-Cities-Onramps-of-Opportunity-Program.pdf?utm_source=GTO&utm_medium=email&utm_campaign=dm-ce-e1314-0083_R2).

Wojcik, Natalia. "'Silicon' Dreams: One NYC Neighborhood's Mission to Boost High-Tech Innovation." *CNBC*, October 30, 2016. <http://www.cnbc.com/2016/10/28/silicon-harlem-aiming-to-bring-tech-innovation-to-upper-manhattan.html>.

"NYC's Tech Profile | Center for an Urban Future (CUF)." *Center for an Urban Future (CUF)*. Accessed January 23, 2017. <https://nycfuture.org/data/nycs-tech-profile>.

Bussanich, Marc. "Why Is New York City's Growing Technology Sector so White?" *City Limits*. Accessed February 23, 2017. <http://citylimits.org/2015/09/15/why-is-new-york-citys-growing-technology-sector-so-white/>.

Stitt, Robert. "Could Harlem Become the 'Silicon Valley' of New York?" *Financial Juneteenth*, September 29, 2015. <http://financialjuneteenth.com/harlem-become-silicon-valley-new-york/>.

Marr, Spencer, Charles G. Goulding, and Charles R. Goulding. "Manhattan's Silicon Alley federal & state R&D tax credit opportunity." *Corporate Business Taxation Monthly* May 2012:



9+. Business Insights: Essentials.

<http://bi.galegroup.com.ezproxy.cul.columbia.edu/essentials/article/GALE%7CA331490124?u=columbia&sid=summon#>

Messina, Judith. "Tech mavens wary of de Blasio; After a billionaire booster, Silicon Alley preps for new era." *Crain's New York Business* 25 Nov. 2013: 0003

Robinson, Melia. "Bill de Blasio Just Laid out an Ambitious Plan to Help New York Outpace Silicon Valley." *Business Insider*, May 4, 2015. <http://www.businessinsider.com/bill-de-blasio-on-new-york-tech-industry-2015-5>.

Putzier, Konrad. "The Long View: Why a Tech Crash Could Rattle NYC's RE Market." *The Real Deal New York*, January 4, 2017. <https://therealdeal.com/2017/01/04/the-long-view-why-a-tech-crash-could-rattle-nycs-real-estate-market/>.

Tantoco, Minerva. "Mid-Year Update from the Mayor's Office of Tech and Innovation." *Medium*, July 6, 2016. <https://medium.com/cityofny/mid-year-update-from-the-mayors-office-of-tech-and-innovation-842fe9a265e4>.

Wink, Christopher. "How Brooklyn Can Deal with Tech Business Gentrification: Eric Adams." *Technical.ly Brooklyn*, April 24, 2014. <http://technical.ly/brooklyn/2014/04/24/tech-business-gentrification-eric-adams/>.

Brooklyn Daily Eagle. "Report: Impact of Brooklyn Tech Triangle's Innovation Economy to Reach \$15.5 Billion by 2025," November 2015. <http://www.brooklyneagle.com/articles/2015/11/9/report-impact-brooklyn-tech-triangles-innovation-economy-reach-155-billion-2025>.

Mandell, David. "Manhattan CRE Prices Spark a Mass Exodus of Startups to Brooklyn." *TechCrunch*. June 4, 2016. <http://social.techcrunch.com/2016/06/04/manhattan-cre-prices-spark-a-mass-exodus-of-startups-to-brooklyn/>.

Lee, Neil, and Andrés Rodríguez-Pose. "Is There Trickle-Down from Tech? Poverty, Employment, and the High-Technology Multiplier in U.S. Cities." *Annals of the American Association of Geographers* 106, no. 5 (September 2, 2016): 1114–34. doi:10.1080/24694452.2016.1184081.

"NYCEDC and CUNY Launch IN2NYC Program For International Entrepreneurs | NYCEDC," February 18, 2016. <https://www.nycedc.com/press-release/nycedc-and-cuny-launch-in2nyc-program-international-entrepreneurs>.

Moretti, Enrico. *The New Geography of Jobs*. Boston: Houghton Mifflin Harcourt, 2012.

"\$20 Million In Private Donations Raised For Mayor de Blasio's Computer Science For All Initiative." *The Official Website of the City of New York*, September 22, 2016. <http://www1.nyc.gov/office-of-the-mayor/news/763-16/-20-million-private-donations-raised-mayor-de-blasio-s-computer-science-all-initiative>.

"About NYC Forward." Accessed May 5, 2017. <http://www1.nyc.gov/site/forward/about/about.page>.

“Applied Sciences NYC.” *NYCEDC*. Accessed May 5, 2017. <https://www.nycedc.com/project/applied-sciences-nyc>.

“DIGITAL.NYC to Kick off Five-Borough Tour.” *The Official Website of the City of New York*, February 2, 2015. <http://www1.nyc.gov/office-of-the-mayor/news/083-15/digital-nyc-kick-off-five-borough-tour>.

“DoITT - Broadband Deployment.” Accessed May 5, 2017. <https://www1.nyc.gov/site/doitt/initiatives/broadband-deployment.page>.

“DoITT - LinkNYC Franchises.” Accessed May 5, 2017. <https://www1.nyc.gov/site/doitt/business/linknyc-franchises.page>.

“Empire Zone Tax Incentives.” *NYC 311*. Accessed May 5, 2017. <http://www1.nyc.gov/nyc-resources/service/2904/empire-zone-tax-incentives>.

“High School Students Code4Tomorrow At NYC GenTech’s First Hackathon.” *NYCEDC*. Accessed May 5, 2017. <https://www.nycedc.com/blog-entry/high-school-students-code4tomorrow-nyc-gentechs-first-hackathon>.

“Incubators & Workspace Resources.” *NYCEDC*. Accessed May 5, 2017. <https://www.nycedc.com/service/incubators-workspace-resources>.

“Mandatory Inclusionary Housing.” Accessed May 5, 2017. <http://www1.nyc.gov/site/planning/plans/mih/mandatory-inclusionary-housing.page>.

“Mayor Bill de Blasio Announces NYC Tech Talent Pipeline Industry Partners.” *The Official Website of the City of New York*, February 12, 2015. <http://www1.nyc.gov/office-of-the-mayor/news/114-15/mayor-bill-de-blasio-nyc-tech-talent-pipeline-industry-partners-commitments-to>.

“New York Empowerment Zone Program | Empire State Development,” January 9, 2017. <https://esd.ny.gov/new-york-empowerment-zone-program>.

“NYC BioTech Tax Credit - NYC Business.” Accessed May 5, 2017. <https://www1.nyc.gov/nycbusiness/description/nyc-biotech-tax-credit>.

“NYC Early-Stage Life Sciences Funding Initiative.” *NYCEDC*. Accessed May 5, 2017. <https://www.nycedc.com/LifeSciencesFund>.

“NYCEDC And CUNY Launch IN2NYC Program For International Entrepreneurs.” *NYCEDC*. Accessed May 5, 2017. <https://www.nycedc.com/press-release/nycedc-and-cuny-launch-in2nyc-program-international-entrepreneurs>.

“NYCEDC Announces The Launch of Connect IBZ: Broadband Expansion in Industrial Business Zones.” *NYCEDC*. Accessed May 5, 2017. <https://www.nycedc.com/press-release/nycedc-announces-launch-connect-ibz-broadband-expansion-industrial-business-zones>.

“NYCEDC Hosts Research And Development Grant Workshop For Applied Science Companies.” *NYCEDC*. Accessed May 5, 2017. <https://www.nycedc.com/press-release/nycedc-hosts-research-and-development-grant-workshop-applied-science-companies>.

“NYCEDC Launches Urbantech NYC to Support Companies Building Smart And Sustainable Cities.” *NYCEDC*. Accessed May 5, 2017. <https://www.nycedc.com/press-release/nycedc-launches-urban-tech-nyc-support-companies-building-smart-and-sustainable-cities>.

“QETC Capital Tax Credit.” Accessed May 5, 2017. [https://www.tax.ny.gov/pit/credits/qetc\\_capital.htm](https://www.tax.ny.gov/pit/credits/qetc_capital.htm).

“Research and Development - Manufacturing Tax Tips.” Accessed May 5, 2017. <https://www.irs.gov/businesses/small-businesses-self-employed/research-and-development-manufacturing-tax-tips>.

“Take the HELM: Hire + Expand in Lower Manhattan.” *NYCEDC*. Accessed May 5, 2017. <https://www.nycedc.com/blog-entry/take-helm-hire-expand-lower-manhattan>.

“Welcome to Empire State Development,” October 24, 2016. <https://esd.ny.gov/businessprograms/empirezones.html>.

## Appendices:

Entity	Organization	Details
Alan Washington	Managing Director of Real Estate + Economic Development, Downtown Brooklyn Partnership	a not-for-profit local development corporation that serves as the primary champion for Downtown Brooklyn
Erik Grimmelmann	President of NYC Tech Alliance	a nonprofit organization focused on improving the NYC tech scene (15 years)
Clayton Banks	CEO, Founder of Silicon Harlem	to transform Harlem and other urban markets into Innovation and Technology Hubs
Kate Wittels	Principal at HR & A	an industry-leading urban development consulting firm
Matt Chaban	Policy Director at Center for an Urban Future	a catalyst for smart and sustainable policies that reduce inequality, increase economic mobility, and grow the economy in NYC
Jarrett Hova*	Director of Policy at Tech:NYC	a nonprofit member organization that represents New York City's growing technology sector.
Ryan Birchmeier	Associate, Public Affairs at NYCEDC	Initiatives Team
Sarah Appleton	Senior Project Manager on our Initiatives team. NYCEDC	Initiatives Team

Table 3 Entities who participated in interviews, meetings and conversations for the purpose of this thesis

## Sample: Interview Questions\*

Erik K. Grimmelmann

President

NY Tech Alliance (NY Tech Council + NYC Tech Meetup)

1. How would you describe the tech scene in NYC?
2. How has it evolved over the years?
3. What did NY Tech Council hoped to achieve by merging with NYC Tech Meetup?
4. What are some of the pressing matters that NYTA is currently addressing? OR What is currently on NYTA's agenda?
5. How has the City influenced the NYC tech scene? How has it influenced your company?
6. What are some of the challenges that the NYTA is facing in regards to City policies?
7. How can the City or the private sector address these challenges?
8. Where, in your opinion, is the next tech hub / innovative community in NYC? How so?

Matt Chaban

Policy Director

Center for Urban Future

1. How would you describe the tech scene in NYC?
2. How has it evolved over the years?
3. What is the relationship between a tech hub and an intelligent community?
4. What are some of the pressing matters that IC is currently addressing? OR What is currently on IC's agenda?
5. How has the City influenced the NYC tech scene? How has it influenced your initiative?
6. What are some of the challenges that the IC is facing in regards to City policies?
7. How can the City or the private sector address these challenges?
8. Where, in your opinion, is the next tech hub / innovative community in NYC? How so?
9. Discuss your involvement with Silicon Harlem.

Ryan Birchmeier

Associate of Public Affairs

NYCEDC

1. How would you describe the tech scene in NYC?
2. How has it evolved over the years?
3. In what ways is the EDC involved with the tech scene? Why?
4. What is currently on EDC's agenda in regarding to tech scene? How has it change over the years?
5. What are some of the challenges that the EDC is facing regards to the above initiatives? What is being done to overcome them?
6. Discuss your involvement with Silicon Harlem.

---

\* The questions were modified during the interviews based on the nature of the conversation and course of the interview.

