N^2 Innovation Corridor

ECONOMIC DEVELOPMENT & MARKETING STRATEGY

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Prepared for:

Newton-Needham Regional Chamber
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About Camoin Associates

Camoin Associates has provided economic development consulting services to municipalities, economic development agencies, and private enterprises since 1999. Through the services offered, Camoin Associates has had the opportunity to serve EDOs and local and state governments from Maine to California; corporations and organizations that include Lowes Home Improvement, FedEx, Volvo (Nova Bus) and the New York Islanders; as well as private developers proposing projects in excess of $600 million. Our reputation for detailed, place-specific, and accurate analysis has led to projects in 27 states and garnered attention from national media outlets including *Marketplace* (NPR), *Forbes* magazine, and *The Wall Street Journal*. Additionally, our marketing strategies have helped our clients gain both national and local media coverage for their projects in order to build public support and leverage additional funding. The firm currently has offices in Saratoga Springs, NY, Portland, ME, and Brattleboro, VT. To learn more about our experience and projects in all of our service lines, please visit our website at www.camoinassociates.com. You can also find us on Twitter @camoinassociate and on Facebook.

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The Newton-Needham Regional Chamber is a not-for-profit organization dedicated to championing economic and cultural vitality through advocacy, education, and networking. The chamber is not affiliated with the U.S. Chamber of Commerce or any other national organization. More information available at www.nnchamber.com.

Executive Summary

The Newton-Needham Regional Chamber, along with the City of Newton and the Town of Needham, has designated a 500-acre area along I-95/Route 128 as the N^2 Innovation Corridor. Straddling the Newton-Needham border, it is principally comprised of two business parks, Needham Crossing in Needham and Wells Avenue Office Park in Newton, as well as the Highland Avenue/Needham Street commercial corridor. Home to roughly 150 technology companies, including TripAdvisor whose new facility opened in 2015, software company PTC, and Karyopharm Therapeutics, a NASDAQ-listed life sciences company, the N^2 Corridor is well positioned for more innovation-related development.

This is an economic development and marketing strategy for the N^2 Corridor, addressing the desire of the stakeholders to be recognized as an innovation district. Using data-driven analysis, augmented by extensive interviews of local government, business, and nonprofit leaders, the N^2 Corridor Task Force, supported by Camoin, has identified the opportunity for this area to become more than just a redeveloped office park or series of business properties, but rather to achieve the vision of an innovation district where talent, innovation, and community converge to support a vibrant, entrepreneurial economy, a model for the integration of economic development, place-making and social networks. The innovation district is in itself an indication of the changing preferences for the density and diversity of urban areas over suburban regions, and for transit-accessible, wired, and mixed-used communities among the emerging workforce. The challenge for Newton and Needham is to adapt this model for an area that has historically supported traditional suburban office parks and retail.

What does this mean for the N^2 Corridor?

While the N^2 Corridor has some ingredients of what it takes to compete and participate in the regional innovation ecosystem, more needs to be done. Transformative thinking, approaches, process, and actions are needed. Specifically:

- The Greater Boston area has experienced strong growth for several decades, and as a result, its economic development infrastructure is less mature than in regions that are more competitive by necessity. Some **basic building blocks for economic development attraction and retention need to be put into place**.
- Since the Greater Boston area already has an innovation image, and other suburbs are better known as places for innovative companies to locate, a major challenge for the N^2 Corridor is to **elevate its visibility as an innovation district**—however, this must be authentic, not just an image. If N^2 wants to be an innovation district, rather than just a place where older technology companies move, then it needs to **fill in the gaps with the elements commonly associated with such a district, namely innovators, entrepreneurs, and research entities**. Fortunately, N^2 can borrow from and build upon the existing assets nearby.
- A huge asset for the N^2 Corridor is the high educational attainment of the Newton-Needham population, the high proportion of foreign-born residents, and the high levels of innovation as evidenced by patents. Although this population is older, these residents currently work for many of the companies the N^2 Corridor would likely target to attract. And, the residents appear to be quite entrepreneurial, although they currently don't stay in the

area when they gain scale in their companies. This is therefore an opportunity to **keep these entrepreneurial residents closer to home** rather than having them commute away every day.

- Talent is a prerequisite for attracting, retaining and creating companies in the N^2 Corridor, but Newton and Needham's aging population means that companies need to be able to attract younger workers. However, high housing prices and lack of direct rapid transit service to the N^2 Corridor means that companies that want to attract Millennial workers to the area are having difficulty. There is a definite trend for young, highly educated professionals to opt to live in more urban areas such as Cambridge and Somerville, not suburban areas like Newton and Needham. The trend towards urbanization is due to both the greater number of cultural and recreational amenities in cities, and tighter networks. So, to be competitive, the **N^2 Corridor will need to develop its networks, and add to its amenities, in addition to tackling its housing and transportation challenges**.
- These challenges are regional, not confined to a single city or town, partially because the N^2 Corridor straddles the border of Newton and Needham, and because it's a relatively small area. There is not currently an entity or organization whose charter is to promote and develop the N^2 Corridor. In order to make this plan work, **all concerned need to come together to contribute to its success**.

To guide policies and actions, the Task Force adopted this vision statement for the N^2 Corridor:

> *The N^2 Corridor is home to an increasing number of innovative businesses—new and established, large and small. It features a mixed-use community with retail, office space and open space integrated with housing and nearby transit, providing an affordable and desirable place to create, prosper, and adapt to an evolving business climate. The N^2 Corridor will become increasingly recognized as a destination for investment by innovation-driven industries and will enhance the quality of life in the Newton-Needham region by providing employment, tax revenues, and educational, entertainment, recreational, and cultural amenities.*

To achieve the vision the Task Force adopted six goals:

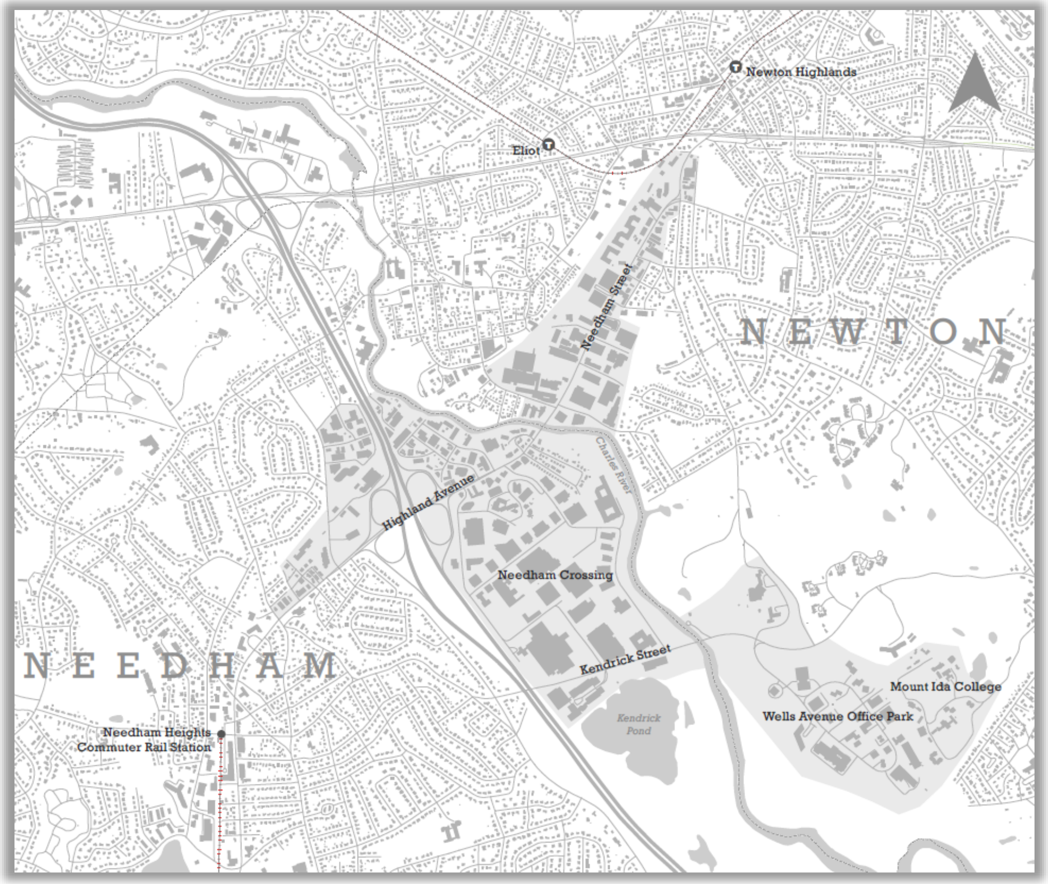
Goal	Motivation
Goal 1: Attract and retain innovative and growing companies in priority industries.	An essential goal is to attract new innovative and growing companies to the office parks in the N^2 Corridor. It makes sense to target the priority industries that are already present in order to build up the networks and interconnections that come from denser clusters of businesses that share workforce, infrastructure and other needs. However, this should not be done at the expense of existing companies, so actions to retain the companies already here are also needed.
Goal 2: Encourage entrepreneurship within the N^2 Corridor.	Entrepreneurship is a key part of being an innovation district, so encouraging entrepreneurs to start their companies here, especially in the priority industries, will support the networks, increase the vibrancy of the area, and ultimately will grow companies that can fill the office parks. There is an opportunity to build upon the innovative workforce in Newton and Needham and also the local students who are interested in entrepreneurship.
Goal 3: Attract, create, or partner with nearby research entities to serve as an anchor for the N^2 Corridor.	To be a true innovation district requires an anchor to spur the development of new ideas, support the acceleration of a priority industry, attract an educated workforce, and act as a focal point for innovation. The anchor could be a research institute associated with a Boston-based institution of higher education or teaching hospital, an international university looking for a Boston base, or an industry-based research entity.
Goal 4: Create a mixed-use community with infrastructure and amenities that attract diverse groups of people.	Since the Newton-Needham area has small numbers of younger workers and local priority industry companies report difficulties recruiting these workers to the N^2 Corridor, it is essential to create the community that responds to the emerging desires to live, work, and play in the same place.
Goal 5: Forge an innovation identity.	The N^2 Corridor needs to create its own identity as an innovation district within an innovative region, and rise above the noise created by the Greater Boston area in general and other suburbs in particular. The district is not isolated from the communities that encompass it—it is an innovation corridor within an innovative community.
Goal 6: Build capacity to accomplish the vision and goals.	In order to accomplish these goals, the capacity to act must be developed, with the people, funding, and determination to make the vision happen.

Introduction

In partnership with the City of Newton and the Town of Needham, the Newton-Needham Regional Chamber has developed an economic development and marketing strategy for the N^2 Corridor. Straddling the Newton-Needham border along I-95/Route 128, the N^2 Innovation Corridor is principally comprised of two business parks, Needham Crossing in Needham and Wells Avenue Office Park in Newton, as well as the Highland Avenue/Needham Street commercial corridor. Home to roughly 150 technology companies, including TripAdvisor whose new facility opened in 2015, software company PTC, and Karyopharm Therapeutics, a NASDAQ-listed life sciences company, the Corridor is well positioned for more innovation-related development.

Many initiatives are already underway, including transportation infrastructure improvements such as the Kendrick St. interchange with I-95 and the Needham Street/Highland Avenue upgrade recently funded. In addition, private developers are envisioning redevelopment of existing office parks, including Center 128, focused on the former General Dynamics site. The Wells Avenue Office Park in Newton was also the subject of a recent study, with transportation improvements and redevelopment as the primary recommendations. MassChallenge's new satellite operation in Newton Corner adds to this momentum.

This plan is the result of six months of collaboration among the N^2 Corridor Task Force, made up of representatives from the Newton-Needham Regional Chamber, the City of Newton, Town of Needham, and a task force of stakeholders, all facilitated by Camoin Associates. The plan includes our methodology, a summary of our findings (with details included in the appendices), our conclusions, and our recommendations. The recommendations include a vision statement for the N^2 Corridor, a mission statement for the N^2 Corridor Initiative, six goals for the Initiative, an Action Matrix listing the specific actions for each of the goals, and a marketing strategy.



Methodology

Camoin Associates strongly believes in strategic decision-making grounded in data and analysis. For this strategy, Camoin used Economic Modeling Specialists Intl. (EMSI) data for its high-quality labor market data, economic analysis, and projections; IBISWorld for its leading global market research; and demographic and socioeconomic data from Esri and the U.S. Census Bureau. These data gave us very robust, highly useful, and comprehensive information on the historical and emerging trends of the industries in the N^2 Corridor, and beyond.

As the Newton-Needham Regional Chamber had already focused on the idea of the N^2 Corridor being an innovation district, Camoin also performed an analysis of existing sources of innovation and culture. Our intent was to distinguish between two alternative strategies: one being an integrated innovation district, and the other merely a place where innovative companies move to as an alternative to the high costs and commutes associated with a denser urban center.

Another dynamic we looked at is the impact of Millennials on the N^2 Corridor. While in their 20s, many Millennials have moved to downtowns and cities, and no doubt contributed to the recent successes in Kendall Square in Cambridge and the Boston Innovation District on the South Boston waterfront. However, new data suggests that as Millennials marry and start families, "inner suburbs" such as Newton and Needham are becoming more attractive if the right amenities and culture exist.

Our approach included substantial attention to interviews with local business and government leaders, as well as a community outreach session and the opportunity for the Chamber membership to provide input via a web-based survey. Using these data collection techniques in addition to traditional and innovation-focused economic data analysis enabled Camoin to provide the Chamber and the N^2 stakeholders with the foundational evidence on which to base their visioning and strategic planning.

At each stage of the process, Camoin reviewed its work with the Newton-Needham Regional Chamber and the N^2 Corridor Task Force. The members of the Task Force and the Chamber provided substantive input and reviewed all documents prepared for this report.

Findings

As part of its work, Camoin Associates completed a number of analyses of data associated with the N^2 Corridor, including:

- Situation Assessment
- Innovation Assessment
- Economic Base Analysis
- Priority Industry Analysis
- Real Estate Analysis
- Peer Set Analysis

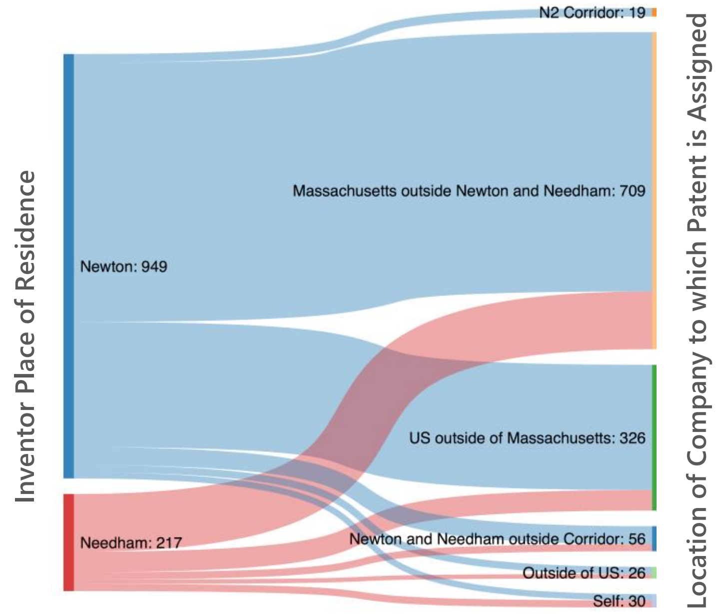
Each of these analyses are included in the Appendices which follow. Below is a summary of the findings contained in these analyses.

N^2 Corridor as an Innovation District

The data and analysis are not useful unless they are taken in a context that allows us to answer the “So What?” question. We analyzed the N^2 Corridor in the context of innovation districts, which have been thoroughly researched by the Brookings Institution. Brookings suggests that there are several components of an innovation district: sources of innovation, whether from anchor institutions such as universities, large companies, or entrepreneurs—as well as a skilled workforce, vibrant communities, and adequate physical infrastructure, including telecommunications, appropriate roads, and alternative transportation.[1] The literature also suggests that an innovative culture—one that is diverse, supportive of creativity and failure, and highly collaborative—is also required for success. Therefore, we organize our summary of the analyses into these elements of an Innovation District.

Sources of Innovation

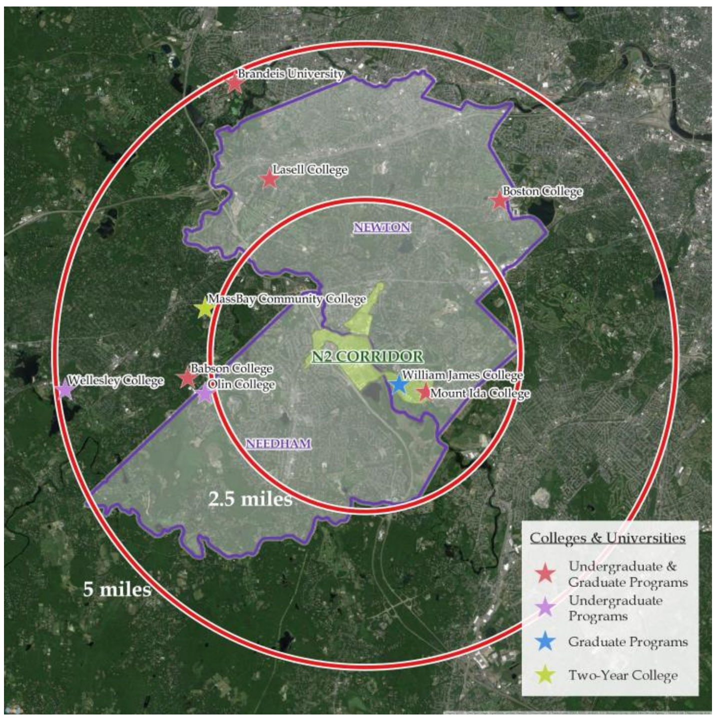
The single most striking finding from our analysis of sources of innovation in the N^2 Corridor and in the City of Newton and the Town of Needham is how creative and inventive the residents are. We looked at patents issued in 2015 where at least one inventor listed their home address as either Newton or Needham. There were 1,166 unique patents in this category, or 8.98 per 1,000 residents. To put this in context, Massachusetts has a patenting rate of 1.52 per 1,000 residents, and the U.S. rate is 1.02.



[1] Katz, Bruce and Wagner, Julie. 2012. *The Rise of the Innovation District: A New Geography of Innovation in America*. Washington, DC: The Brookings Institution. http://www.brookings.edu/about/programs/metro/innovation-districts.

However, only 19 of these patents were assigned to companies located in the N^2 Corridor; 56 were assigned to companies in Newton or Needham but outside the N^2 Corridor, and 30 were assigned back to the inventors. The rest went to Massachusetts companies outside of Newton or Needham (709), U.S. companies headquartered outside Massachusetts (326) and foreign-headquartered companies (26).

Only 6 of the patents were assigned to colleges or universities in Newton or Needham, all of which to Boston College. The other institutions of higher education in the area are primarily known for their entrepreneurship focus and undergraduate or professional education programs. This is significant because most innovation districts have research universities and/or medical schools ("Meds and Eds") as anchor tenants.



Companies, Large and Small

There are some innovative companies in Newton and Needham, but few in the N^2 Corridor itself. Those that currently exist in the N^2 Corridor are generally later-stage companies that have passed the startup stage, have raised significant venture capital, and have patent portfolios. On the other hand, startup and early stage entrepreneurial companies started by Newton and Needham residents appear to generally move to Cambridge or Boston, the perceived center for entrepreneurship in the Greater Boston area.

Newton and Needham have experienced strong growth in jobs over the past ten years, showing 6% growth in employment from 2005 to 2015. Employment is concentrated in these five sectors:

- Biotechnology and Life Sciences
- Educational Services
- Information Technology
- Professional, Scientific and Technical Services
- Real Estate

Some of the innovative companies located in the N^2 Corridor itself include:

TripAdvisor

Founded in 2000 by Stephen Kaufer and Langley Steinert, TripAdvisor is a travel website that provides reviews and other information for consumers about travel destinations around the world. The company is now pervasive, with 65 million unique visitors each month scouring the site for reviews of hotels, restaurants, and sites around the globe. TripAdvisor is traded on the NASDAQ with a $4.8 billion market capitalization as of this writing.

PTC

PTC was founded in 1985 and went public in 1988. Since then, the company has acquired 24 other software companies, including Prime Computer and Computervision, relics of Boston's early minicomputer industry. Today, PTC transforms the way customers create, connect, operate, and service smart things and systems through the combination of process know-how and best of breed capabilities, all delivered through a flexible platform. The combination delivers a disruptive suite of technology that enables companies to securely connect smart things, quickly create applications, and ultimately transform the value chain, and is well-known in the emerging Internet of Things market.

Turbine

Turbine is a pioneering developer and operator of online entertainment, with breakthroughs in the free-to-play model and successful long-running titles like The Lord of the Rings Online™ and Dungeons & Dragons Online™. Founded in 1994, Turbine has been developing acclaimed online games for over 20 years. Turbine recently expanded its 45,000-square-foot facility to incorporate a 24,000-square-foot addition. The studio employs more than 350 people.

SharkNinja (formerly Euro-Pro)

Founded in 1993, this company has two major brands, Shark vacuums and Ninja food processors/blenders. The company has been on the INC 500 for five of the last six years and is experiencing rapid growth. With more than $1.6 billion in annual revenue, the company has the top-selling and highest consumer-rated vacuum cleaner in the U.S., and #1 market share across the motorized kitchen appliances space.

SharkNinja has also implemented an aggressive real estate strategy, announcing its signing of a lease for a new 150,000-square-foot world-class corporate headquarters in Needham.

Verastem

Verastem, Inc. (NASDAQ: VSTM) is a clinical-stage biopharmaceutical company focused on discovering and developing drugs to treat cancer by the targeted killing of cancer stem cells. Cancer stem cells are an underlying cause of tumor recurrence and metastasis. Verastem is developing small molecule inhibitors of signaling pathways that are critical to cancer stem cell survival and proliferation. In October 2015, the company announced a reduction of its workforce by approximately 50% to twenty full time employees. This was likely related to the announcement only a week before of disappointing results from a clinical study of a mesothelioma drug, and that the drug was pulled from further research.

In 2015, the company moved to Needham from Cambridge amid much fanfare. It signed a lease for a 15,000-square-foot space on Kendrick Street in Needham.

CyberArk

CyberArk touts itself as the only security company laser-focused on striking down targeted cyber threats, those that make their way inside to attack the heart of an enterprise. Dedicated to stopping attacks before they stop business, CyberArk's clients include some of the world's leading companies—in fact, 40% of Fortune 100 companies—who entrust CyberArk to protect their highest-value information assets, infrastructure, and applications. The company started in 1999 and in 2011 raised $40 million in investment led by Goldman Sachs and Jerusalem Venture Partners. The deal included the purchase of stock from existing shareholders as well as growth capital. CyberArk had previously raised $25 million in venture and angel capital. In September 2014, CyberArk raised $92.5 million in its IPO. As of 2011, the company had 170 employees worldwide.

Bigbelly Solar

Trash-can maker Bigbelly Solar Inc. more than doubled the size of its headquarters when it moved to Needham in June 2015, leaving its home in Newton behind.

Bigbelly was founded in 2003 with the goal of transforming one of the least efficient and resource-intensive industries on the planet—waste collection. Cities typically either collect too often and waste fuel and labor while creating CO_2 emissions, or are not able to keep up with the demands and overflowing trash cans and the associated litter, creating health and safety issues.

Karyopharm Therapeutics

Karyopharm Therapeutics Inc. is a clinical-stage pharmaceutical company focused on discovery and development of novel first-in-class drugs directed against nuclear transport targets for the treatment of cancer and other major diseases. In May 2015, Karyopharm expanded its presence in the its Wells Street building in Newton by 16,000 square feet, bringing its total footprint to 46,000 square feet of office and laboratory space on the second and third floors. Karyopharm selected the location in May 2014 after outgrowing its Natick facility.

Highly-skilled Workforce

The workforce in the N^2 Corridor as well as Newton and Needham is extraordinarily well-educated. Almost half of residents over 25 have a graduate or professional degree, and as a result, have relatively high incomes. Median household income stands at $118,000 in Newton and $131,000 in Needham, compared to $75,000 in the Boston MSA. This points to the high desirability of the two communities and the demand for amenities sought by high-income, highly educated residents.

There is also a significant percentage of residents who were born in other countries (21%) which contributes to the vibrancy and cultural diversity of the area. Newton and Needham have proportionately more white and Asian residents, and fewer black and Hispanic residents, when compared to the Boston MSA, Massachusetts, and the nation.

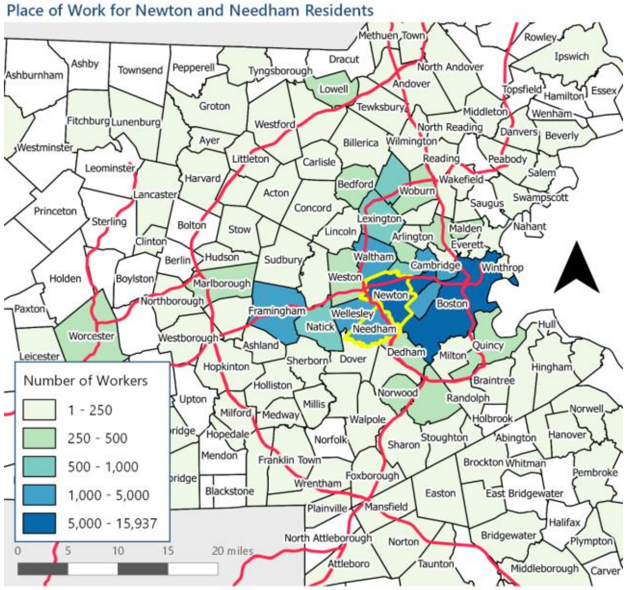
Top 10 Countries of Origin of the Foreign-Born Population, Newton and Needham

Place of Birth	Foreign-Born Population	Pct. of All Foreign-Born
China	4,382	20.0%
Russia	1,809	8.2%
India	1,318	6.0%
Korea	1,317	6.0%
Ukraine	951	4.3%
U.K.	834	3.8%
Iran	711	3.2%
Canada	650	3.0%
Germany	568	2.6%
Israel	542	2.5%
Total (Top 10)	13,082	59.6%
Total (All Foreign-Born)	21,953	100%

Source: 2014 ACS 5-Year Estimates

However, population growth has been relatively flat, with a slight uptick in recent years, and a bimodal age distribution: there is a high share of population within the adolescent/young adult and later middle-age cohorts. Both communities have a significant lack of young adults (25- to 40-year-olds) relative to the MSA and state overall. This bimodal age distribution is, in part, a function of the communities' housing market, which is skewed toward single-family homes and has limited affordable options for young adults.

Place of Work for Newton and Needham Residents



Source: ACS 2009-2013 MCD Commuting Flows

Most residents commute elsewhere to work: only 29% of Newton and Needham residents also work in the two municipalities. This means that 71% of residents are commuting to other cities and towns for work. Conversely, 78% of people working in Newton and Needham in-commute, meaning they live outside of the two communities. This highlights the crucial role of efficient transportation connections between Newton and Needham and the surrounding region. In order for innovative businesses to be successful in these communities, they must be accessible to the skilled workforce they employ.

Science, Technology, Engineering and Math (STEM) Workforce

Newton and Needham show a significantly higher concentration of STEM occupations than the nation: 9.3% of their jobs are in STEM occupations compared to 5.5% nationally. There are strong concentrations of computer engineers, psychologists, and medical scientists.

Infrastructure

Innovation Infrastructure

While traditional elements of infrastructure are critical for an innovation district, there are also elements that are unique. Fortunately, the N^2 Corridor is rich in these assets. First, an innovation district requires fast and ubiquitous broadband availability. In the case of the N^2 Corridor, broadband availability is very high, with Middlesex and Norfolk counties topping the list of highest available speeds in the state.[2]

Second, the entire Boston area has the second highest concentration of venture capital investment in the U.S. Third, the Greater Boston area enjoys the protection of the U.S. Patent regulations, and a significant professional services sector dedicated to supporting innovation-based companies.

Housing and Transportation

Housing prices are extraordinarily high in Newton and Needham, with Newton's median housing price exceeding $1 million. Most housing is single-family and is bifurcated between large new homes

[2] National Broadband Map. http://www.broadbandmap.gov.

and those that are older and require significant upkeep. A lack of affordable workforce housing in the municipalities is a major feature of the local real estate market and looms as a negative factor in potential business relocation and growth decisions.

There has, however, been considerable movement on the affordable housing front, with several recent and planned housing developments incorporating affordable components (e.g. Charles River Landing, a 136-unit project on Greendale Avenue in Needham, 28 Austin Street in Newtonville, and a 390-unit Normandy project in Needham Crossing that is in the approval process).

This represents real momentum on the sometimes-divisive idea of adding a significant volume of affordable, denser housing suitable for seniors, students, and younger workers—a necessity for attracting Millennials and building a culture of diversity and innovation. This is a regional challenge as well as a local one, and the local municipal leaders recognize it: a major housing study is underway in Newton.

Of note, Needham recently passed the threshold of the state-mandated level of affordable housing, meaning it will now be exempt from Massachusetts' 40B law that allows developers to bypass local zoning laws if they are offering enough affordable units. However, in May of 2016, even after reaching the 40B requirement, Needham Town Meeting approved a mixed-use residential overlay for up to 250 units in the Wexford Ave section of the N^2 Corridor.

Heavy traffic and a lack of sufficient public transit to the N^2 Corridor are significant constraints on the area's attractiveness to younger and senior residents and new and expanding businesses. Talent recruitment and livability stand to be significantly improved if new transit options become available. Examples of solutions that have been explored include shared bicycle services, additional bus service, such as a line from the Wells Avenue Office Park to a T stop, and the potential for transit service and/or paths along an unused rail right-of-way. A 2013 MAPC concept plan showed that the unused MBTA right of way running parallel to Needham Street and Highland Avenue could accommodate a rapid transit bus together with bicycle and pedestrian amenities. In the meantime, shuttle buses are proving to be an important way to move workers and students from transit stops to key employers, office parks, and colleges, and there may be potential to better coordinate these services. Newton and Needham have good, wide roads and have invested in roadway improvements that are currently or will soon be under construction. The new dedicated exit ramp off of Route 128/I-95 at Kendrick Street represents a watershed improvement to the Corridor's accessibility and driveability. The changes to be implemented on Highland Avenue/Needham Street are also promising, but access and egress in the Wells Avenue Office Park is particularly problematic, and the reality of its single-access-point roadway is a barrier to redeveloping it in ways that are aligned with the preferences of 21st century companies and their workforces.

Real Estate

Key developable parcels are concentrated in the Needham Crossing area of the N^2 Corridor, where the new state-of-the-art TripAdvisor headquarters is located and where additional commercial office and mixed-use developments have been approved. The communities face opportunities for redevelopment at key sites as tenants relocate, in order to keep properties relevant to current and future work and living preferences. The facility that Clarks Americas currently occupies and will vacate in 2016 is a key example. Many structures in the Wells Avenue Office Park are considered ripe for updating (and in some cases updates and expansions are underway), and the park requires other improvements—especially a second road access and dining, retail, or other amenities—to maintain existing tenants and compete successfully for new tenants going forward. This is part of a national trend of suburban commercial landlords facing the need to reimagine existing office parks and to adopt mixed-used and smaller-tenant leasing strategies.

Business Climate

Newton and Needham have recently forged a strong and effective working relationship between the executive branches of their municipalities. This has included regular meetings that have produced real benefits around the funding of infrastructure investments throughout the core of the Corridor.

Needham has a reputation for being quick, flexible, and cordial in its interactions with developers and the business community, and is widely considered to have been far-sighted in putting new zoning rules five years ago and tax incentives in place a decade ago that allowed the town to easily accommodate the TripAdvisor location decision.

A political divide between smart growth and affordable housing supporters and those who feel Newton is already too built out was the central issue of a 2015 municipal election, with the results decisively favoring the pro-smart growth/affordable housing candidates. Also in 2015, a contentious proposed mixed-use project at 28 Austin Street narrowly met the two-thirds supermajority necessary for approval by the city's aldermen (now city council).

Both events have given pro-growth advocates reason for cautious optimism that the city may be reversing a long-held perception of opposition to new development at a time when the city's zoning code is undergoing review and a Charter Commission could potentially alter the land use decision-making process.

Meanwhile, Newton's mayor is enthusiastically championing an innovation-focused economic development vision, has traveled to Israel to champion the N^2 Corridor and recruited the world renowned MassChallenge to open a satellite office at Newton Corner.

Business and property taxes are high in the N^2 Corridor, but not higher than elsewhere in Metro Boston, so this is not an issue to the extent that competition is within the Bay State.

Entrepreneurial Ecosystem

In terms of the traditional elements of an entrepreneurial ecosystem, Newton and Needham are thinly served. Although the Cambridge Innovation Center and MassChallenge have opened the Newton

Innovation Center in Newton Corner, there are no such facilities in the N^2 Corridor.

These elements of an innovation district are summarized below:

Elements of an Innovation Economy	N^2 Corridor	Newton and Needham	Greater Boston
Source of innovation	Few	Many	Many
Companies, large and small	Some, mostly larger	Some, mostly larger	Many, both
Skilled STEM knowledge workers	Many, skewed older	Many, skewed older	Many
Innovation infrastructure	Good	Good	Excellent
Entrepreneurial community	Thin	Emerging	Very Strong

Priority Industry Analysis

The priority industry areas include:

- Information technology
- Professional, scientific, and technical services
- Biotech and life sciences

These sectors were identified as having potential for the N^2 Corridor, either for their component industries' concentration in employment (e.g. software publishing, with a location quotient of 6.39); growth over the last decade (e.g. management consulting added over 300 jobs); or recent national trends that show increasing demand (e.g. biotechnology). It should be noted that these are highly aligned with the MassTLC 2015 State of Technology Report that names the Internet of things, security, and health care/life sciences information technologies as three emerging technology areas that Massachusetts has the potential to dominate.

Our research of Newton and Needham's economic base and national trends for these industries has further affirmed that the N^2 Corridor should prioritize these areas as industries to monitor, cultivate, and target in marketing efforts.

Of the industries studied, Newton and Needham have performed particularly strongly in the past five years in internet publishing; custom computer programming; marketing consulting; process, physical distribution, and logistics consulting; R&D in the physical, engineering, and life sciences; and other scientific and technical consulting services. Computer facilities maintenance services also grew significantly, albeit at a lower overall employment level.

Most of the industries of highest relevance to the N^2 Innovation Corridor vision are in the growth stage of the business life cycle, that is, they are increasing in their importance to the overall economy. All the industries studied are projected to outpace gross domestic product growth over the next five years, with the exception of R&D in the social sciences and humanities, as shown in the table here. Biotechnology's growth is expected to be nearly quadruple that of GDP, and robust growth rates are also projected for pharmaceutical manufacturing, internet publishing, and medical equipment and supplies manufacturing.

Projected Growth for Priority Industries (Nationally)

Industry	Projected Annualized Growth Rate for 2015-2020
Biotechnology	8.3%
Pharmaceutical manufacturing (brand name)	6.2%
Internet publishing and broadcasting	5.6%
Medical equipment and supplies manufacturing	5.3%
Scientific and economic consulting	3.8%
Management consulting (inclusive of marketing consulting)	3.6%
IT consulting	3.2%
HR consulting	3.2%
Software publishing	3.0%
R&D in the physical, engineering, and life sciences	2.8%
R&D in the social sciences & humanities	1.2%
GDP	2.2%

Source: IBISWorld reports.

Peer Set Analysis

Camoin Associate's peer set analysis compared Newton and Needham with other high-end suburbs of metropolitan areas with strong innovation centers. Our findings are summarized below and in the table on the following page:

- Newton and particularly Needham are less racially diverse than the peers.
- Newton and Needham's population is older than that of the peers.
- Newton and Needham have dramatically higher education attainment than the peers do on average.
- Home prices are much higher in Newton and Needham than in the peer communities, again with the exception of Bethesda. The same is true of median household income. When comparing home values to income, however, the ratios in Newton and Needham are roughly comparable to the peer set.
- Median household income is much higher in Newton and Needham than in the peer communities, again with the exception of Bethesda.
- Newton and Needham have very strong relative patent intensities. The peers, on average, have a rate of 5.28 patents per 1,000 residents, while Newton's figure is 10.91 and Needham's is 7.35.
- Newton performs very highly in comparison to the peers in terms of number of venture capital deals and the average size of those deals. Only Boulder, CO, had a larger value of deals than Newton, while the next most competitive peer had less than half that value. Needham only had two deals and a very low average deal size; in this respect, Needham is more comparable to Ellicott City, MD, and Alexandria, VA, where venture capital activity is also quite low.
- The Boston metro area compares well to the other metros in terms of concentration of STEM (science, technology, engineering, and math) occupations and the number of STEM-related education program completions. Only the Washington, DC metro area has a comparable number of STEM related completions.
- Newton and Needham's 8% employment growth over the past 5 years is a slightly lower rate of growth than the peer average of 10%.
- When looking at employment in the priority industries studied for the N^2 Corridor,[3] Newton and Needham have a solid national location quotient of 3.20. But six of the eight comparison geographies had even higher location quotients, with Burlington, MA and Bellevue, WA both exceeding an LQ of 6.
- Commercial real estate inventory in Boston's downtown is comparable to the average for the corresponding central business districts of the peer suburbs. However, in comparing inventory for these metros' suburbs, the Boston suburban market (about 113 million square feet) is somewhat tighter than the peer average (about 142 million square feet).

[3] The priority industries studied included relevant industries within the Information Technology sector; the Professional, Scientific, and Technical Services sector; and the Biotech and Life Sciences sector. See Appendix D: Priority Industry Analysis.

- Commercial real estate prices for the Boston area exceed those of the peers for almost every category of office space. However, the gap is much less pronounced when comparing only suburban commercial space. Suburban Boston commercial space prices are competitive with prices in the suburbs of Seattle and Washington, DC.

Peer Analysis: Socio-Demographics

Location	Population	White & Nonhispanic Population	% Nonwhite and/or Hispanic	Median Age	Working Age Population Growth (Ages 20-64, 2010-2014)	% of 25+ Popn. With Bachelors or Higher	Median Value of Owner-occupied Units	Median Household Income	Ratio of Median Home Value to Median Income
Newton, MA	86,945	65,327	25%	40.2	0.4%	75.9%	$715,000	$118,639	6.03
Needham, MA	29,540	25,559	13%	42.9	1.4%	74.1%	$668,900	$129,154	5.18
Burlington, MA	25,190	19,670	22%	41.8	2.1%	47.3%	$419,000	$95,465	4.39
Boulder, CO	102,002	84,317	17%	28.3	2.7%	71.5%	$499,200	$58,062	8.60
Cary, NC	146,041	96,737	34%	36.9	8.3%	61.8%	$301,600	$91,481	3.30
Bellevue, WA	132,268	75,179	43%	37.9	9.4%	62.1%	$538,300	$92,524	5.82
Alexandria, VA	146,422	77,220	47%	35.8	4.0%	61.5%	$494,400	$87,319	5.66
Bethesda, MD	62,024	47,606	23%	43.2	0.0%	82.2%	$821,000	$145,288	5.65
Aurora, CO	339,480	157,084	54%	33.4	3.1%	27.1%	$179,300	$52,275	3.43
Ellicott City, MD	68,507	41,060	40%	40.7	1.7%	65.3%	$507,300	$114,694	4.42

Demographics source: 2014 ACS 5-yr estimates, 2010 ACS

Strength, Weaknesses, Opportunities, Threats

The analyses presented here can also be categorized as strengths, weaknesses, opportunities, and threats (SWOT). Strengths and weaknesses are characteristics of the N^2 Corridor and Newton and Needham that either help or hinder their ability to achieve the vision for the N^2 Corridor. Opportunities and threats are environmental—they denote trends that are ongoing in the broader economy that can impact the vision. The SWOT analysis for the N^2 Corridor is summarized on the following page.

N^2 Corridor: Strengths, Weaknesses, Opportunities, & Threats

Strengths

- Highly educated population (50% with professional or graduate degrees).
- Very innovative (8.98 patents per 1000 residents).
- Eight institutions of higher education within 5 miles, several very entrepreneurial.
- Later stage innovative companies located in Corridor.
- Six percent job growth 2005-15 in educational services, real estate, information, professional, scientific and technical services; biotechnology and life sciences.
- Incomes very high.
- Culturally diverse (21% foreign born).
- 9.3% of local jobs are in STEM occupations. Strong concentrations of computer engineers, medical scientists. Higher than the nation (5.5%).
- Broadband availability high.
- Boston area has high concentration of venture capital and investment.
- Strong intellectual property protections and professional services.
- Workforce housing projects coming on line.
- Road improvements in progress and coming in 2017.
- Multiple shuttle bus options running.
- Boston Logan Airport easily accessible.
- Corridor is significantly built out, but redevelopment opportunities abound.
- Big price advantage over Boston/Cambridge for office space.
- Needham government perceived as quick, flexible, cordial.
- Political leadership in both towns very supportive.
- All priority industries are experiencing high growth.
- Adjacent to the Charles River, Cutler Lake, trails, and other natural amenities.

Weaknesses

- No research institutions within Corridor or 2.5-mile radius.
- Early stage entrepreneurial companies started by local residents move to Boston/Cambridge.
- Entrepreneurial support system thin.
- Relatively flat population with bimodal age distribution – few 25-40 year olds.
- Not racially diverse.
- Seventy-eight percent of workers commute in.
- Housing prices high.
- Traffic is heavy.
- Direct rapid transit access limited.
- Few amenities in the office parks, especially restaurants/meeting spaces
- Small spaces for startups hard to find, and generally less desirable.
- Newton's current zoning process is long and unpredictable, but Charter Commission is underway and may help.
- Taxes equally high throughout Commonwealth.
- Natural resources often overlooked, e.g. Charles River difficult to access.

Opportunities

- Attract growing companies in priority industries (information technology; professional, scientific and technical services; biotechnology and life sciences).
- Provide a growth path for entrepreneurs, including keeping locals local.
- Attract/create research entity.
- Leverage local institutions of higher education.
- Broaden workforce in 25-40 demographic.
- Work collaboratively with local stakeholders, property owners for development and redevelopment.
- Leverage cultural diversity.
- Build, engage and energize community.
- Municpal partnership to leverage state/federal support.

Threats

- National trend of urbanization, especially for 25-40 demographic. Due to housing costs, shorter commutes, amenities.
- Other Boston suburbs (e.g. Waltham, Burlington, other parts of Newton) and better known as locations for technology businesses.
- Strong research entities are usually anchors for innovation districts, as are entrepreneurs and support organizations.
- Funding for transportation infrastructure improvements, especially for rapid transit is extremely hard to come by; MBTA is highly strained, as is federal funding dependent upon gas tax.

Conclusions

In the last ten years, the economy has transformed rapidly. Digital technologies, talent-driven development, global markets/local and regional ecosystems, changing demographics (especially the impact of Millennials) and blending of industry sectors (IT and bio, manufacturing/bio/materials, etc.) have all impacted the elements of success that must be considered in developing an economic plan. A growing economy now demands talent, innovation, connections and networks, infrastructure and services, culture, governance, housing, development, and amenities that are different from what has been offered in the past.

In particular, the concept of an innovation district where talent, technology, and community converge to support a vibrant, entrepreneurial ecosystem, has emerged as a model for the integration of economic development, place-making, and social networks. The innovation district is in itself an indication of the changing preferences for urban areas over suburban regions, and for compact, transit-accessible, wired, and mixed-used communities among the emerging workforce. The challenge for Newton and Needham is to adapt this model for an area that has historically supported traditional suburban office parks.

The Greater Boston region has many assets to compete well in this transforming environment (talent, education, innovation, urban/suburban centers, diversity, infrastructure, leading companies and entrepreneurs, and venture capital) and is a known brand globally for the innovation economy. Kendall Square in Cambridge and the Boston Innovation District on the South Boston waterfront are examples of urban innovation districts. And, within the Greater Boston Region, there is a lot of competition among suburban regions, communities and districts for investment, with Waltham and Burlington taking the lead.

What does this mean for the N^2 Corridor?

While the N^2 Corridor has some ingredients of what it takes to compete and participate in the regional ecosystem (e.g., educated population, leading companies, proximity), more needs to be done. Transformative thinking, approaches, process, and actions are needed. Specifically:

- The Greater Boston area has experienced strong growth for several decades, and as a result, its economic development infrastructure is less mature than in regions that are struggling to compete. In addition, there is little coordination among the cities and towns and state government with regard to attracting and retaining companies, innovative or otherwise. Some **basic building blocks for economic development attraction and retention need to be put into place**.
- Since the Greater Boston area already has an innovation image, and other suburbs are better known as places for innovative companies to locate, a major challenge for the N^2 Corridor is to **elevate its visibility as an innovation district**—however, this must be authentic, not just an image. If N^2 wants to be an innovation district, rather than just a place where older technology companies move, then it needs to **fill in the gaps with the elements commonly associated with such a district, namely innovators, entrepreneurs, and research entities**. Fortunately, N^2 can borrow from and build upon existing assets nearby.
- A huge asset for the N^2 Corridor is the high educational attainment of the Newton-Needham population, the high proportion of foreign-born residents, and the high levels of innovation as evidenced by patents. Although this population is older, these residents currently work for many of the companies the N^2 Corridor would likely target to

attract. And, the residents appear to be quite entrepreneurial, although they currently don't stay in the area when they gain scale in their companies. This is therefore an opportunity to **keep these entrepreneurial residents closer to home** rather than having them commute away every day.

- Talent is a prerequisite for attracting, retaining, and creating companies in the N^2 Corridor, but Newton and Needham's aging population means that companies need to be able to attract younger workers. However, high housing prices and lack of direct rapid transit service to N^2 Corridor means that companies that want to attract Millennial workers to the area are having difficulty. There is a definite trend for young, highly educated professionals to opt to live in more urban areas such as Cambridge and Somerville, not suburban areas like Newton and Needham. The trend towards urbanization is due to both the greater number of cultural and recreational amenities in cities, and tighter networks. So, to be competitive, the **N^2 Corridor will need to develop its networks, and add to its amenities, in addition to tackling the housing and transportation challenges**.
- These challenges are regional, not confined to a single city or town, partially because the N^2 Corridor straddles the border of Newton and Needham, and because it's a relatively small area. There is not currently an entity or organization whose charter is to promote and develop the N^2 Corridor. In order to make this plan work, **all concerned need to come together to contribute to its success**.

Principles

There are a number of key principles that should govern how Newton and Needham should react:

- Because economies are regional, success requires leveraging regional assets. Since the Greater Boston area has many assets and a good brand for success in the innovation economy, it's critical to work *with*, and not *against* the region. However, developing the N^2 Corridor 's competitive position within the regional economy as a local innovation ecosystem is required.
- Ecosystems are based on relationships and trust. Trust is the currency that builds success. Therefore, the ecosystem must foster relationships, networks, and trust through cultural and recreational amenities, infrastructure, programs, services, and operations.
- The organization(s) that manage this process and projects (Chamber, municipalities, institutions) must themselves be innovative to build trust and to design and implement transformative offerings for the market.
- This includes innovatively addressing issues that contain or support entrepreneurial/innovation ecosystems:
  - Quality, connected places – transportation, infrastructure, housing, mixed-use development, cultural and recreational amenities, open spaces, pedestrian connections, interesting gathering places.
  - Governance processes – land/use and permitting, working together seamlessly (municipalities, Chamber, institutions, stakeholders), thinking regionally.
  - Marketing and communications for an innovation identity.
  - Connecting and supporting entrepreneurs and businesses.

Recommendations

Vision

The Task Force adopted this vision statement for the N^2 Innovation Corridor:

> *The N^2 Innovation Corridor is home to an increasing number of innovative businesses—new and established, large and small. It features a mixed-use community with retail, office space and open space integrated with housing and nearby transit, providing an affordable and desirable place to create, prosper, and adapt to an evolving business climate. The N^2 Corridor will become increasingly recognized as a destination for investment by innovation-driven industries and will enhance the quality of life in the Newton-Needham region by providing nearby employment, tax revenues, and educational, entertainment, recreational, and cultural amenities.*

Goals

The Task Force agreed that there needs to be an Initiative to achieve the vision, and its six goals should be:

1. Attract and retain innovative and growing companies in priority industries.

An essential goal is to attract new innovative and growing companies to the office parks in the N^2 Corridor. It makes sense to target the priority industries that are already present in order to build up the networks and interconnections that come from denser clusters of businesses that share workforce, infrastructure, and other needs. However, this should not be done at the expense of existing companies, so actions to retain the companies already here are also needed.

2. Encourage entrepreneurship within the N^2 Corridor.

Entrepreneurship is a key part of being an innovation district, so encouraging entrepreneurs to start their companies here, especially in the priority industries, will support the networks, increase the vibrancy of the area, and ultimately will grow companies that can fill the office parks. There is an opportunity to build upon the innovative workforce in Newton and Needham and also the local students who are interested in entrepreneurship.

3. Attract, create, or partner with nearby research entities to serve as an anchor for the N^2 Corridor.

To be a true innovation district requires an anchor to spur the development of new ideas, potentially support the acceleration of a priority industry, attract an educated workforce, and act as a focal point for innovation. That anchor could be a research institute associated with a Boston-based institution of higher education or teaching hospital, or related to an international university looking for a Boston base. It could also be an industry-based research entity, managed for a single company or for a consortium.

4. **Create a mixed-use community with infrastructure and amenities that attract diverse groups of people.**

   Since the Newton-Needham area has small numbers of younger workers, and local priority industry companies report difficulties recruiting these workers to the N^2 Corridor, it is essential to create a community that responds to the emerging desires to live, work and play in the same place.

5. **Forge an innovation identity.**

   The N^2 Corridor needs to create its own identity as an innovation district within an innovative region, and rise above the noise created by the Greater Boston area in general and other suburbs in particular. The district is not isolated from the communities that encompass it—it is an innovation corridor within an innovative community.

6. **Build capacity to accomplish the vision and goals.**

   In order to accomplish these goals, the capacity to act must be developed, with the people, funding and determination to make the vision happen.

Mission

This following is a mission statement for an N^2 Initiative to accomplish the above goals:

> *The mission of the N^2 Innovation Corridor Initiative is to promote targeted, sustainable, and well-planned development within the Corridor for the benefit of the Needham-Newton region and its residents, businesses, educational institutions, and community organizations.*

Action Plan Matrix

The Action Plan Matrix on the following pages lays out the detailed strategies and actions needed to accomplish each of the six goals for the N^2 Corridor. For each action, the key partners are listed, along with the priority level, timeframe, associated costs, and metrics for measuring the desired outcome. The matrix is organized by goal.

Goal 1: Attract and retain innovative and growing companies in priority industries.

	Strategy		Action	Key Partner(s)	Priority Level	Timeframe	Costs	Outcome Metric(s)
1.1	Design and implement a business attraction program targeting companies and entrepreneurs that are gaining capital and looking to grow, and fit with the targeted industry profile of N^2 and the Greater Boston Region	1.1.1	Develop an economic development–focused website that is separate from but linked to the Chamber, the City of Newton, and the Town of Needham. • Populate and keep the website up to date with focused information on events, opportunities, assets, and successes in the N^2 Corridor and within the two communities. • Provide information and data relevant to companies, entrepreneurs, developers, and the real estate community to consider investment in the N^2 Corridor including demographic, socioeconomic, and workforce data; infrastructure and utilities; taxes and incentives; zoning, land use regulation, and permitting policies and practices; local and regional innovation, quality of place assets; and available sites and buildings. *See Goal 5*.	N^2 Initiative	High	3-12 months	\$20-35K for initial development; plus operational \$ for ongoing updating and maintenance	Website created
		1.1.2	Develop an online database and integrate with website to highlight sites and buildings with the N^2 Corridor that are available for lease or sale. • Develop pilot database that highlights available sites and buildings within the corridor populated with a sampling of sites and buildings provided by willing real-estate partners. Start small in terms of information provided an include at a minimum: description, address/location, photos, for rent/lease or for sale, contact and web address for further information. • Partner with property owners and commercial brokers to populate and keep database up to date as well as for marketing sites. Form working group among partners to assess and maintain and expand as appropriate. • Market available sites and buildings highlighted on the website through newsletters and social media.	N^2 Initiative, real estate partners (brokers and owners)	Medium	6-18 months	\$10K for initial development and integration with website	Online database created and integrated with website, maintenance protocol and procedures in place among partners

		1.1.3	Utilize digital tools to support marketing for business attraction including social media and digital newsletters.	N^2 Initiative	Medium	Ongoing	4-6 hours per week of staff time	Social media posts; newsletters sent
		1.1.4	Produce marketing cut sheets promoting assets and opportunities that make the case for investment in the N^2 Corridor. Cut sheets will reside on the web but can also be printed and bundled within custom attraction packets.	N^2 Initiative	Medium	3-6 months then going update and maintenance	$10K for initial development	Cut sheets produced within common design portfolio
1.2	Market to national and international site selectors, developers, and companies to increase their awareness of opportunities in the N^2 Corridor	1.2.1	Secure a lead generation/attraction/site location firm to develop qualified business leads (companies and developers interested in expansion or relocation to Great Boston) and engagement strategy. Follow up on leads with a business attraction team N^2 staff.	N^2 Initiative	Medium	1 year	$30-50K for initial effort	Leads generated and followed up
		1.2.2	Network and build relationships with Greater Boston companies, entrepreneurs, and stakeholders that complement existing companies and assets within the N^2 Corridor (i.e. fit with priority industries and an innovation/entrepreneur focus). • Implement an outreach strategy that includes public relations, social media, etc. within the Boston region to inform about vision, assets, opportunities, happenings and success stories in the N^2 Corridor. • Become actively involved in Greater Boston economic development related networks. Attend and host events to develop and strengthen relationships and increase awareness of the N^2 Corridor's opportunities and strengths.	N^2 Initiative	Medium	Ongoing	Professional operating costs	
		1.2.3	Work with state and regional business attraction partners to target national companies in priority industries and fit with innovation/entrepreneur focus seeking to locate in Boston/U.S. Start by informing partners of the N^2 Initiative and work plan and development of protocol for business attraction process.	N^2 Initiative	Medium	Ongoing	Professional operating costs to work with and follow up on site location/lead generation plus funding for trade missions	Leads generated and followed up

		1.2.4	Work with state and regional business attraction partners, e.g. trade missions, to target international companies in priority industries and fit with the innovation/entrepreneur focus who are seeking to locate in Boston/U.S. Continue to leverage and strengthen Israeli connections and use as a model for engaging other global regions.	N^2 Initiative; Jewish Community Center	Medium	Ongoing	Professional operating costs to work with and follow up on site location/lead generation plus funding for trade missions	Leads generated and followed up
		1.2.5	Track connections, leads, and contacts developed and maintain a database for use in marketing, promotion, and follow-up, as well as evaluation of efforts.	N^2 Initiative	High	Ongoing	$5K for database development in year 1, professional operating costs to work with and follow up on site/lead generation	Database developed
1.3	Support the growth and retention of existing companies in the N^2 Corridor *Note: These strategies can be supported by the website and digital tools/methods outlined above.*	1.3.1	Lead the development, coordination, and support of a formal business visitation program for the ongoing identification of existing business and property owner needs and concerns. This should be a formalized business visitation process/program that focuses on obtaining strategic information, utilizing that information for business assistance and support services, tracking results, and improving the planning and delivery of economic development including revising the economic plan as needed. Since a formal program currently does not exist, the first year should focus on developing a framework and testing the implementation for full implementation.	N^2 Initiative, City of Newton, Town of Needham	High	1-year pilot, then ongoing	$5-10K for initial framework process and database development; professional operating costs to work with and follow up	Visits conducted, results tracked, and follow-up results
		1.3.2	Celebrate existing businesses, entrepreneurs, and stakeholders within the N^2 Corridor. Report through communications, marketing and promotion efforts on what businesses are doing. Results will shape further actions.	N^2 Initiative, Chamber	Medium	Ongoing	Professional operating costs	Number of businesses showcased

		1.3.3	Continue to improve the business climate with regard to interactions with businesses, property owners, and developers by working with municipalities to collectively understand and ensure that zoning, permitting, and approvals processes are streamlined and predictable. Utilize business visitations and ongoing communications with business and property owners to identify needs and concerns and actions for ongoing improvement.	N^2 Initiative, City of Newton, Town of Needham, Chamber	High	Ongoing	Professional operating costs and process costs;	
		1.3.4	Communicate regularly with targeted messages to businesses within the N^2 Corridor regarding improvements, plans, events, and opportunities.	N^2 Initiative, Chamber	High	Ongoing	Professional operating costs	

Goal 2: Encourage entrepreneurship within the N^2 Corridor.

	Strategy		Action	Key Partner(s)	Priority Level	Timeframe	Costs	Outcome Metric(s)
2.1	Engage Newton and Needham entrepreneurs	2.1.1	Host speaker series, lunch-and-learns, etc. in the N^2 Corridor focused on entrepreneurship through partnership with Olin, Babson, Mount Ida, Cambridge Innovation Center, MassChallenge, etc.	N^2 Initiative or partnership with entrepreneurial organization or local universities	Medium	Ongoing	Minimal	Number of attendees Number of joint events
		2.1.2	Hold startup weekends, hackathons, business plan competitions, pitch contests, meetups, etc. in the N^2 Corridor.	N^2 Initiative or partnership with entrepreneurial organization or local universities	Medium	Ongoing	Minimal	Number of attendees Number of joint events
		2.1.3	Celebrate entrepreneurial success by giving awards and recognition to fast-growing companies in the N^2 Corridor. Market these achievements.	N^2 Initiative	Medium -High	Annual event	$15,000	Number of attendees Number of nominations for awards
		2.1.4	Organize an N^2 Angel group or attract an existing group to the N^2 Corridor to make investments, leveraging high net worth in Newton and Needham.	N^2 Initiative	High	Ongoing	Minimal, space to meet	Investments made in Newton and Needham startups, both number and dollar value, by sector
		2.1.5	Hold weekly programming focused on educating, engaging, and connecting entrepreneurs in the N^2 Corridor, e.g. One Million Cups (visit www.1millioncups.com).	N^2 Initiative or partnership with entrepreneurial organization	Low	Ongoing	Minimal, space to meet	Number of attendees Number of joint events
		2.1.6	Build a mentor network in the N^2 Corridor to mentor local entrepreneurs, including student entrepreneurs.	N^2 Initiative or partnership with entrepreneurial organization N^2 Initiative	Medium	Ongoing	$0-$50,000 for staff to manage; could be lower if partnership	Number of mentors Number of companies with mentor relationships

		2.1.7	Engage the Israeli entrepreneur community to market to local entrepreneurs as well as entrepreneurs thinking about relocating to Greater Boston. Work with this population to help them tell their own stories better and reach broader audiences.	N^2 Initiative; Jewish Community Center	High	First six months	$0-$50,000 for staff to manage	Number of Israeli entrepreneurs attracted to the N^2 Corridor
		2.1.8	Engage existing large tech companies in the N^2 Corridor to partner with local entrepreneurs and students.	N^2 Initiative	Low	Ongoing	Staff time	Number of new partnerships
2.2	Leverage relationships with Olin, Babson, and Mount Ida	2.2.1	Host a student business plan competition in the N^2 Corridor.	N^2 Initiative	Medium	Annual	$0-$50,000 for staff to manage, $10,000 for cash prize	Number of student teams
		2.2.2	Develop an internship programs that connects students with local entrepreneurial companies.	N^2 Initiative	Medium	Annual	$0-$50,000 for staff to manage	Number of interns Number of companies participating Number of permanent jobs found afterwards
		2.2.3	Engage with the Babson College Entrepreneurial Ecosystem Project (BEEP).	N^2 Initiative	Low	Ongoing	Minimal	Advice given
2.3	Create a coworking or community space in the N^2 Corridor	2.3.1	Work with developers to open a coworking space and/or community space. In the short term, lease currently vacant space and/or recruit an existing coworking company to open a facility in the N^2 Corridor.	N^2 Initiative	High	ASAP – this would be the location for all the events, meetings suggested in 2.1 and 2.2	Staff cost to get this going; should pay for itself	Square footage of space available for co-working Number of co-workers Number of events held in space

Goal 3: Attract, create, or partner with nearby research entities to serve as an anchor for the N² Corridor.								
	Strategy		Action	Key Partner(s)	Priority Level	Timeframe	Costs	Outcome Metric(s)
3.1	Run a competition for the universities to bid on with a developer	3.1.1	Assemble a task force to accomplish this goal, as detailed in Action 6.2.2.	N² Initiative	High	First six months	Staff time	Task force created
		3.1.2	Open discussions with Harvard, MIT, Boston College, Olin, and other higher educational institutions in the region regarding research institutes that may be in planning stages and could be located off-campus.	N² Initiative	High	First year	Staff time	R&D in the N² Corridor Patents awarded Publications in peer-reviewed journals Number of spin-off companies Number of employees
		3.1.3	Open discussions with teaching hospitals, e.g. Longwood.	N² Initiative	High	First year	Staff time	
		3.1.4	Consider inviting an Israeli university that might be interested in a satellite campus.	N² Initiative	High	First year	Staff time	
		3.1.5	Initiate a marketing campaign promoting the importance of this goal.	N² Initiative	High	First year	Staff time, modest investment for paid ads	Earned and paid media, website hits, social media metrics

Goal 4: Create a mixed use community with infrastructure and amenities that attract diverse groups of people.								
	Strategy		**Action**	**Key Partner(s)**	**Priority Level**	**Timeframe**	**Costs**	**Outcome Metric(s)**
4.1	Create a physical "hub" for the Corridor	4.1.1	Work with developers, municipal departments, etc. to develop a physical hub for the N^2 Corridor that incorporates open spaces, a transportation plaza, coworking/community meeting space, restaurants, outdoor gathering places, and connections to the Charles River.	City of Newton, Town of Needham, development community	Medium	2-3 years	Staff time	Hub created
4.2	Improve availability of affordable housing options	4.2.1	Pursue affordable housing options in the N^2 Corridor that align with municipal plans.	City of Newton, Town of Needham	Medium	Ongoing	Staff time	Number of affordable units located in the Corridor
		4.2.2	Ensure land use regulatory environment accommodates and fosters innovative approaches to design of mixed-use spaces, (e.g. allow for development of "micro units," charge permit fees and other fees by size of units rather than number of units, allow for high design quality infill).	City of Newton, Town of Needham	Medium	Ongoing	Staff time	Number of total and affordable housing units
		4.2.3	Draw attention to housing projects through marketing and promotion of the N^2 Corridor and communities. Market that there is capacity for housing along the Needham Street corridor.	N^2 Initiative	Medium	Ongoing	Staff time	Number of residents living within the Corridor
		4.2.4	Support transit-oriented development (TOD) aligning commercial and residential projects with improved transportation options.	City of Newton, Town of Needham, development community	Medium	Ongoing	Staff time	Number of residents living within the Corridor

4.3	Improve transportation options	4.3.1	Merge shuttle services into a single natural gas- or electric-powered "circulator bus" that runs frequently and serves all office parks and retail centers. Consider subsidy so these are free to riders.	N^2 Corridor businesses, 128 Business Council, City of Newton, Town of Needham	High	First year	Cost of operations	Number of riders
		4.3.2	Create second entry into Wells Avenue Business Park to ease congestion.	City of Newton	Medium	1-2 years	Significant investment	Entrance completed
		4.3.3	Support walkability and bikeability through improved pedestrian and cycling connections with Eliot and Newton Highlands T stations, Needham Heights commuter rail station, and within the N^2 Corridor itself. Leverage the Upper Falls Greenway for use as a multi-modal right-of-way.	City of Newton, Town of Needham	Medium	Ongoing	Cost of infrastructure	Number of workers commuting on foot and by bicycle
		4.3.4	Create a unique solution for which the N^2 Corridor is a testbed. Reach out to Google, Uber, TransitX, the 128 Business Council, and others that are working on innovative transportation solutions to develop a new transit option. Work towards implementing the concept plan for Massachusetts Rapid Bus.	N^2 Initiative	Low	1-2 years	Staff time	Solution implemented
4.4	Expand dining/entertainment offerings and other amenities.	4.4.1	Expand dining options within Needham Crossing and Wells Avenue Office Park. Encourage food truck vending, especially during lunch hours.	City of Newton, Town of Needham, business community	Medium	Ongoing	Cost of attracting restaurants	Number of restaurants
		4.4.2	Create spaces and amenities throughout the N^2 Corridor where workers can gather and socialize outside of work, such as entertainment venues, pubs, etc.	City of Newton, Town of Needham, business community	Medium	1-2 years	Cost of attracting businesses	Number of amenity businesses
4.5	Leverage the natural features of the N^2 Corridor as a competitive advantage over urban locations.	4.5.1	Develop trail connections along the Charles River, Nahanton Park, and Cutler Park to create a "river walk." Repurpose the unused rail bridge across the river between Christina Street and the river walk for pedestrian access.	City of Newton, Town of Needham	Medium	3-5 years	Significant investment	River walk created
		4.5.2	Expand infrastructure for canoeing and kayaking in the Charles River, such as additional boat launches. Market these recreational opportunities to N^2 Corridor employees and residents.	City of Newton, Town of Needham	Low	3-5 years	Significant investment	Infrastructure expanded

4.6	Create a visible brand and identity for the N^2 Corridor through urban design improvements	4.6.1	Undertake streetscape improvements, including traffic calming measures, branded banners, consistent wayfinding signage, etc.	City of Newton, Town of Needham	High	First year	Significant investment	Streetscape improvements completed
		4.6.2	Draw attention to existing historic buildings and attractive streetscapes through urban design initiatives and interpretative signage.	City of Newton, Town of Needham	Low	Ongoing	Significant investment	
		4.6.3	Consider "out-of-the-box" ideas to give the N^2 Corridor an identity and further its culture of innovation, e.g. digital kiosks at transportation hubs and public spaces displaying local community art.	N^2 Initiative	Medium	Ongoing	Cost of installations (digital kiosks cost about $5K each)	

Goal 5: Forge an innovation identity.

	Strategy		Action	Key Partner(s)	Priority Level	Timeframe	Costs	Outcome Metric(s)
5.1	Build social infrastructure and channels for communication and engagement	5.1.1	Form a tech team to support efficient collaboration for digital marketing of the corridor. The team's goal should be to identify opportunities for automation and linking between websites and other digital marketing. Start with an IT asset mapping exercise and develop a strategy for collaboration.	IT and marketing leaders from Chamber, Newton, Needham	High	Immediate	Staff time	Team created and agreement on how to coordinate and meet moving forward
		5.1.2	Revamp the N^2 website into the go-to digital platform for innovation news and community engagement in order to create and curate ongoing buzz about innovation in the N^2 Corridor and its location within the Newton/Needham communities with all the amenities they offer. Website features may include available sites/properties, events calendar, transit locator, social media stream, blog, links to innovation resources, job opportunities, district map, etc.	N^2 Initiative	High	3-12 months	$20-35K for initial development; Staff time for ongoing management	Website created. Number of events listed in calendar, number of visitors to site, bounce rate
		5.1.3	Create innovation-specific email lists and develop newsletter-style templates for each email list with similar branding. Design the templates to provide short blurbs or brief high-level information with click-through to the website for more information and/or articles.	N^2 Initiative	High	First year, ongoing	Staff time	Templates created. Subscribers, open rate, click rate
		5.1.4	Create social media accounts dedicated to promoting, engaging, and learning about innovation in the N^2 Corridor and its location within the Newton/Needham communities with all of the amenities they offer.	N^2 Initiative	Medium	First year, ongoing	Staff time	Followers, engagement with posts
		5.1.5	Develop a news strategy. Strengthen relationships with conventional media to encourage coverage of the N^2 Corridor and its companies. Use Twitter to engage directly with local and regional traditional media outlets. Identify individual reporters who cover business / entrepreneurship / innovation and regularly engage with them online and in person.	N^2 Initiative	High	Ongoing	Staff time	Number of earned media articles

5.2	Clarify and confirm the identity and brand for the N^2 Corridor as a place known for innovation	5.2.1	Reach consensus on retaining N^2 as the brand for the innovation district, fitting with the message of an "innovation district within the Greater Boston innovation ecosystem." Consider the development of an iconic visual image.	Chamber, Town of Newton, City of Needham	High	3 months	Minimal cost for consensus process;	Consensus on the elements of the brand and strategy for implementing
		5.2.2	Once consensus on the N^2 brand is achieved, promote the communities as a whole as an innovation ecosystem within the Greater Boston ecosystem. Market the N^2 Corridor as the innovation hub within the fluid local and regional innovative environment.	Chamber, City of Newton, Town of Needham	High	1-2 years	$10-15K for design & marketing support	
5.3	Be innovative as an organization and foster an innovation culture	5.3.1	Physically embody innovation within the N^2 Corridor (e.g. use Big Belly solar products, Soofa benches).	City of Newton, Town of Needham	Medium	1-2 years	Cost of products or installations	Number of partnerships with innovative businesses
		5.3.2	Encourage all businesses and organizations to interact in innovative ways. Encourage creativity and challenge businesses to innovate. (e.g. host a competition that challenges real estate developers to submit out-of-the-box site plans for new development.)	N^2 Initiative	Medium	Ongoing	Staff time	
		5.3.3	Tell the innovation stories; become the spokesperson for innovation, not just business.	N^2 Initiative	Medium	Ongoing	Staff time	Stories told

Goal 6: Build capacity to achieve the vision and goals.

	Strategy		Action	Key Partner(s)	Priority Level	Timeframe	Costs	Outcome Metric(s)
6.1	Develop a collaborative partnership with the stakeholders for the N^2 Initiative to oversee and help implement the N^2 Corridor Vision	6.1.1	Finalize a stakeholder asset map that identifies each stakeholder, their interest in/relationship to the N^2 Corridor, and their key contact information. Maintain and update regularly for new/updated contacts.	Chamber, Needham, Newton	High	Immediate	Minimal	Stakeholder asset map created; contacts list kept and maintained
		6.1.2	Communicate results of the N^2 Corridor Plan and invite each stakeholder to continue involvement in the implementation of the plan and commit to keeping them informed on opportunities for engagement and progress.	Chamber, Needham, Newton	High	Immediate	Minimal	
6.2	Develop and maintain organizational/service delivery structure and capacity for the implementation and ongoing operation of the N^2 Initiative according to the vision and mission developed in this plan	6.2.1	Create a leadership team among the three founding entities (Chamber, City of Newton, Town of Needham) to lead the initial implementation of the organizational/service delivery structure and capacity. This team will work with advice from the N^2 Corridor Plan Committee to finalize the organizational framework and structure, initial operational work plan, and budget/funding model.	Chamber, Needham, Newton	High	3 months	Time for meetings and deliberations plus professional advisory services (e.g. legal, financial) as warranted	

		6.2.2	Define, clarify, and solidify core organizational component roles: • **Leadership Team** – Continuation of initial leadership team representatives (Chamber, Town of Needham, City of Newton) plus representative from any investing partner organization(s) and businesses. • **Advisory Team** – A balanced board of advisors representative of the major partners and stakeholders including businesses and property owners within the N^2 Corridor; entrepreneurs; the real estate and development community; service providers for entrepreneurship, innovation, and economic development; and residents within the N^2 Corridor. • **Working Groups/Task Forces** – Created as needed to advise on specific defined task areas/issues and can be drawn from advisory and leadership teams and supplemented with additional persons. This might include task areas such as marketing and communications, resource development, innovation/entrepreneurial support and development, business/investment attraction, and business visitation.	N^2 Initiative Leadership Team	High	3-6 months	Time for meetings and deliberations	
		6.2.3	Make an initial hire to lead the N^2 effort. Hire additional staff as warranted and funding becomes available.	N^2 Initiative Leadership Team	Medium	First year	Staff salaries and related costs	
6.3	Secure and maintain sufficient funding for initial start-up capacity building and for ongoing operations	6.3.1	Obtain initial investment from founding partners and stakeholders (Needham, Newton, Chamber, businesses within corridor, and willing stakeholders) to support start-up and capacity building for plan implementation and initial operations. Ideally funding should be secured for the first three months of start-up and operations.	N^2 Initiative Leadership Team	High	1-3 months	Time for deliberations	
		6.3.2	Assess and secure as possible funding for ongoing operations of the district to carry out the work plan seeking a sustainable mix among partner appropriations and businesses and property owners in the Corridor. Examine among options within the mix: appropriations from Needham and Newton, Business Improvement District (BID) assessments on businesses and property owners, fees for services/events, fundraising campaigns to support long-term plan implementation.	N^2 Initiative Leadership Team	High	First year though second year	Time for research and deliberations, plus professional time for outreach and fund raising	

Implementation Timeline

The following Gantt chart shows a quarterly schedule for implementing the actions presented in the Action Plan Matrix. Whereas the Action Plan Matrix organizes actions by goal area, this Gantt chart orders actions in terms of urgency and priority, with the most urgent, highest priority tasks presented first. Action numbers can be cross-referenced against the Action Plan Matrix for additional detail. The color of the boxes in the chart represents the priority level of the action, with darker shades indicating higher priority levels.

Implementation Timeline

Action Number (see Action Plan Matrix)	Action Description	Quarter							
		1	2	3	4	5	6	7	8
6.1.1	Finalize stakeholder asset map								
6.1.2	Communicate results of the N^2 Corridor Plan								
6.2.1	Create leadership team								
6.2.2	Define, clarify, and solidify organizational roles								
6.3.1	Obtain initial investment from founding partners and stakeholders								
3.1.1	Assemble a task force to attract a research entity								
5.1.1	Form tech team to support digital marketing								
5.2.1	Reach consensus around the N^2 brand								
6.2.3	Make an initial hire to lead the effort								
6.3.2	Assess and secure possible funding for ongoing operations								
1.1.1	Develop economic development-focused website								
1.2.5	Track leads in a database								
1.3.3	Work with municipalities to continously improve business climate								
1.3.4	Communicate regularly with targeted messages to businesses								
5.1.2	Revamp website as the go-to digital platform								
5.1.3	Create email lists and newsletter templates								
5.1.5	Develop a news strategy								
5.2.2	Promote the Corridor as an innovation hub								
1.3.2	Celebrate existing businesses through promotion efforts								
1.1.3	Utilize digital tools to support marketing for business attraction								
1.1.4	Produce marketing cutsheets								
4.2.4	Support transit-oriented development								
4.4.1	Expand dining options, attract food trucks								
5.1.4	Create social media accounts								
5.3.3	Tell innovation stories								

Implementation Timeline (continued)									
Action Number (see Action Plan Matrix)	Action Description	Quarter							
		1	2	3	4	5	6	7	8
1.3.1	Develop and implement a business visitation program								
2.1.4	Organize an angel investor group								
2.1.7	Engage Israeli entrepreneur community								
3.1.2	Open discussions with higher educational institutions								
3.1.3	Open discussions with teaching hospitals								
3.1.4	Consider inviting an Israeli university								
3.1.5	Initiate a marketing campaign promoting research entity attraction								
4.6.1	Undertake streetscape improvements, including signage								
2.1.1	Host speaker series, lunch-and-learns, etc.								
2.1.2	Hold startup weekends, hackathons, meetups, etc.								
1.1.2	Develop online site selection database								
4.3.1	Merge shuttle services								
5.3.2	Encourage creativity and challenge businesses to innovate								
1.2.1	Select a firm to develop qualified business leads								
1.2.2	Network with Greater Boston companies								
2.1.3	Hold annual awards event for entrepreneurs								
2.1.6	Build a mentor network serving local entrepreneurs								
2.2.2	Develop internship programs								
4.2.2	Ensure land use regulations foster innovative design								
4.6.3	Install unique features, e.g. digital kiosks, public art, etc.								
2.3.1	Open a coworking space								
1.2.3	Work with partners to target/attract national companies								
4.2.1	Pursue affordable housing options								
2.2.1	Host a student business plan competition								
4.3.2	Create second entry into Wells Avenue Business Park								
4.4.2	Create spaces and amenities for gathering and socializing								
5.3.1	Physically embody innovation within the Corridor								
2.1.5	Hold weekly programming focused on entrepreneurs								
2.1.8	Engage existing large tech companies to partner with entrepreneurs								
2.2.3	Engage with Babson College Entrepreneurial Ecosystem Project (BEEP)								
1.2.4	Work with partners to target/attract international companies								
4.2.3	Market residential projects								
4.5.1	Develop trail connections, including a "river walk"								
4.1.1	Create a physical hub for the Corridor								
4.3.3	Improve pedestrian and bicycle connections								
4.3.4	Use the Corridor to test a unique transportation solution								
4.5.2	Expand infrastructure for canoeing and kayaking								
4.6.2	Draw attention to existing historic buildings and streetscapes								

Additional Guidance

Starting a Business Visitation Program

Development of a business visitation program is listed in the Action Matrix as Action 1.3.1.

A business visitation program is about making connections with businesses within the community to understand their needs and further engage them in the economic development effort for business retention and expansion (BR&E) as well as networking and promotion. Through discussions with business leaders, this program should seek to understand constraints and opportunities of existing businesses, their plans for growth, and constraints on that growth. In particular, it should consider workforce needs, buildings and space, innovation goals and challenges, infrastructure needs (i.e. water, sewer, and power), regulations, taxes, and incentives. The program should seek to understand their supply chains and critical networks and ask what specific companies or types of businesses they would like to see have a local presence. Findings from the business visitation program can also be used as topics for future economic development newsletters and in social media posts.

Actions

1. Develop a business visitation team from within the economic development community to assist with getting this program started (team of about 6 to begin). This can be built upon as the program is tweaked and proving successful, but it is important to start small.
2. Identify businesses to visit. Resources will not be available to visit all businesses each year so an annual target list should be developed that represents a variety of types and sizes of businesses which can reasonably be visited given staff resources. This can then be supplemented by larger group meetings open to all businesses. Focus first on targeted industry sectors.
3. Develop visitation questions. Keep the questions simple and short, and focus on information that will be used. This can be provided electronically to the business prior to the visit,
4. Conduct business visits. Review questions, document answers, get to know the business and business owners.
5. Tabulate and analyze the results.
6. Act upon anything that can easily be addressed to meet businesses' needs.
7. Share results with stakeholders. Develop or adjust strategies to address issues or concerns and then implement new strategies.
8. Utilize as topics for future economic development newsletters and in social media posts.
9. Revise the program as warranted and repeat.

Suggestions

There is no one best method for conducting a business visitation program. Some common "best practice" themes include:

- Running the program through partnerships with multiple economic development-related entities to share the work, cost, and information, and avoid overlap.
- Using surveys that capture key information but are not overly burdensome to business.
- Conducting immediate follow-up to resolve any issues identified by the businesses.

- Integrating findings into ongoing strategic economic development planning and evaluation.
- Utilizing software to make the process more efficient and operationalize results.
- Training volunteers that become involved in the program.

Inspiration

- **Stafford Virginia –** Makes information available about the program and its purpose on the website, includes partners in visits, and has a pre-meeting questionnaire that is also available on the website. http://www.gostaffordva.com/existing-business-support/business-retention-expansion-bre/business-visitation-program/
- **Oak Forest, IL –** Lays out the case for the purpose of the program on website, using data to support businesses but also as part of economic development planning. http://www.oak-forest.org/201/Retention-Expansion
- **Colorado Springs** – Utilizes Synchronist software to support the effort. http://www.coloradospringsbusinessalliance.com/library/Economy_Weekly/Report_Copies/10-9-13_Issue3.pdf

Building Organizational Capacity to Achieve the Vision and Goals

The following strategies related to building organizational capacity appear in the Action Plan Matrix:

6.1 *Develop a collaborative partnership with the stakeholders for the N² Initiative to oversee and help implement the N² Corridor Vision*

6.2 *Develop and maintain organizational/service delivery structure and capacity for the implementation and ongoing operation of the N² Initiative according to the vision and mission developed in this plan*

6.3 *Secure and maintain sufficient funding for initial startup capacity building and for ongoing operations*

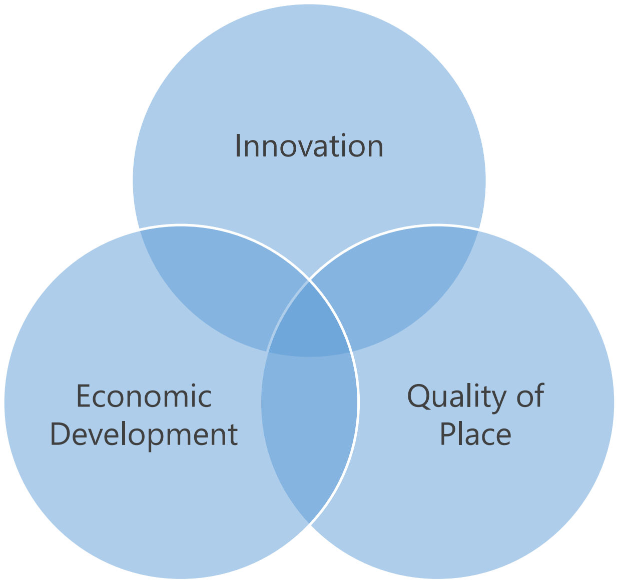
Organization of the Collaborative Partnership

The N² Initiative should be a collaborative partnership among the City of Newton, the Town of Needham, and the Chamber to promote, build, and support the N² Corridor as an innovation district and ecosystem within the Greater Boston Region, according to the vision and mission established in the plan.

The N² Initiative will be a unique organization that blends a place-based focus (a distinct area with design features, amenities, connections) with economic development (real estate, business, workforce development) to support entrepreneurs within an innovation ecosystem that it is, uniquely, adjacent to but not within the boundaries of an urban core.

Each partner would continue its own initiatives that support their core purposes such as community development (municipalities), overall business development and B2B (Chamber), etc.; but, the three partners should come together through a collaborative partnership for the propose of developing, supporting, and promoting the innovation district.

Achieving the Vision of an Innovative Place



The effort should have its own leadership team, advisory team, and also utilize working groups or task forces.

- **Leadership Team** – Continuation of initial leadership team representatives (Chamber, Town of Needham, City of Newton) plus representatives from any investing partner organization(s) and businesses
- **Advisory Team** – A balanced board of advisors representative of the major partners and stakeholders including businesses and property owners within the N² Corridor; entrepreneurs; the real estate and development community; service providers for entrepreneurship, innovation, and economic development; and residents within the N² Corridor
- **Working Groups/Task Forces** – Created as needed to advise on specific defined task areas/issues and can be

drawn from advisory and leadership teams and supplemented with additional persons. This might include task areas such as marketing and communications, resource development, innovation/entrepreneurial support and development, business/investment attraction, and business visitation

Each partner would have a role in funding and governance; but, would maintain a focus distinct from its regular operations so as not to get subsumed in its own day-to-day operations. The partners' collaborative efforts would be driven by the vision, goals, and strategies developed in the plan for the N^2 Corridor. This should incorporate support from stakeholders through open engagement and communications including:

- Businesses within the N^2 Corridor including lead anchor companies, as they benefit from a place-based innovation ecosystem through talent attraction and retention
- Property owners
- Entrepreneurs, innovators, and investors
- Real estate community including realtors and developers
- Innovation/tech support assets, e.g. MassChallenge
- Residents within N^2 Corridor

The Chamber can be the administration and management agent of the N^2 Initiative under contract subject to agreement/consensus from the partners; but, the functions and decision-making should be distinct from regular Chamber functions.

Over time and based on the success of the collaborative effort, the partners should consider extending the partnership to serve as the regional economic development initiative delivering economic development services that covers the Needham and Newton geographies and any others that become part of the Chamber service area.

Funding Mechanisms

Pursuing sustainable funding is listed in the Action Matrix as Strategy 6.3.

There are several funding programs and incentive mechanisms available that should be considered for funding the various initiatives laid out in this plan.

Business Improvement Districts

A Business Improvement District (BID) is a special assessment district in which property owners vote to initiate, manage, and finance supplemental services or enhancements above and beyond the baseline of services already provided by their local city or town governments. A special assessment, or common area fee, is levied only on property within the district. The assessments are collected and expended within the district for a range of services and/or programs, including marketing and public relations, improving the downtown marketplace or city/town center, capital improvements, public safety enhancements, and special events. A BID creates a stable local management structure that provides a sustainable funding source for the revitalization and long-term maintenance of downtowns and city/town centers. The goal of a BID is to improve a specific commercial area by attracting customers, clients, shoppers and other businesses.

Establishing A BID

Communities are authorized to establish BIDs under M.G.L. Chapter 40O. A BID must be a contiguous geographic area in which at least 75% of the land is zoned or used for commercial, retail, industrial or mixed uses. A BID is established through a local petition and public hearing process. The petition must be signed by the owners of at least 60% of the real property and at least 51% of the assessed valuation of the real property within the proposed BID. The petition must also include delineation of the BID boundaries, a proposed improvement plan, budget, and assessment/fee structure.

Eligible Activities

A BID is authorized to perform a wide variety of management, administrative, marketing and economic development activities, including:

- **District Management** – management entity with staff
- **Maintenance** – street cleaning, snow removal, litter & graffiti removal, washing sidewalks, tourist guides
- **Promotion and Marketing** – identification of market niche, special events, brochures, advertising, newsletters
- **Business Services** – business recruitment and retention, sign & façade programs
- **Capital/Physical Improvements** – streetscape improvements, management of parking garage, maintaining parking shelters, historic preservation

For more information on BIDs, consult http://www.mass.gov/envir/smart_growth_toolkit/pages/mod-bid.html.

District Increment Financing

The Commonwealth of Massachusetts offers the District Increment Financing Program (DIF), a public financing alternative available to all cities and towns in Massachusetts. DIF enables municipalities to fund infrastructure and development projects by allocating future, incremental property tax revenues collected from a predefined geographic area (DIF district) to pay project costs. Each district must have a unique development program,

A DIF district is established by a municipality through a public meeting process. The municipality funds the development program, either by using taxes as collected or by borrowing against incremental property taxes. No new taxes are levied because of the District, and DIF does not reduce or redirect baseline property revenues. In other words, the increase in property taxes paid (the increment) as a result of the infrastructure improvements being made, is used to fund the improvements, while the baseline property taxes (tax revenue before the DIF was implemented) continue to be used by the municipality for general purposes.

DIF could be a useful mechanism to fund a broad array of projects within the N^2 Corridor, including infrastructure improvements, land assembly, amenities, market-rate and affordable housing, and workforce training. Newton and Needham would each need to enact separate DIF districts.

Tax Increment Financing

Under Tax Increment Financing Program (TIF), landowners within a designated TIF Zone may be granted property tax exemptions of up to 100% of the tax increment. It provides a direct upfront benefit to a property developer in the form of tax relief, thereby defraying part of a project's construction costs. Depending on the size and location of a project, developers utilizing TIF benefits can also access other state financial incentives such as Investment Tax Credits, Abandoned Building Tax Deductions, and Research and Development Tax Credits.

There is an existing TIF agreement between the Town of Needham and Normandy for the Center 128 development (former General Dynamics site) within Needham Crossing. The agreement offers the developer a property tax exemption on a portion of the increment in exchange for the creation and retention of an agreed upon number of jobs as well as project investment amounts. This agreement could be used as a model for other redevelopment sites within the N^2 Corridor.

For more information on DIF and TIF, please consult the following resources:

- http://www.mass.gov/envir/smart_growth_toolkit/pages/mod-diftif.html
- http://www.massdevelopment.com/assets/pdfs/districtimprovementfinancing_brochure.pdf

Community Preservation Act

The Community Preservation Act (CPA) enables municipalities that have adopted it to generate funds for open space, historic preservation, and affordable housing. Both Newton and Needham have adopted the CPA. It imposes a surcharge of not more than 3% of the tax levy against real property. The revenues are held in a local Community Preservation Fund, which can be used for various projects. The CPA could be a potential source of revenue for various N^2 project initiatives. These funds are typically used for capital projects, rather than operations.

Factors for Economic Development Implementation Success

- **Trust** – internally and externally amongst the economic development partners
- **Process and procedures** to help build trust
- **Leadership qualities** – within the organization including among the board and stakeholders. These include: adaptability and strong leadership in periods of chaos or uncertainty
- **Engagement** – among the board, committees, and among the many stakeholders and networks; Building capacity for functioning within a system composed of many networks and building leadership capacity for economic and community development among multiple organizations and networks through partnerships, alliances, and initiatives
- **Open and active communications** among the partners
- **Ability to respond and adapt** to changes in the external environment
- **Building capacity and resources for business intelligence, working smarter** – data, research, digital technologies, and information resources
- **Incorporating new funding models** and reducing reliance on government entities
- **On-going assessment and evaluation** for continual improvement and effective/efficient use of funding

Appendices

Under separate cover are seven appendices containing the supporting research conducted to develop this Economic Development and Marketing Strategy.

- Appendix A: Situation Assessment
- Appendix B: Innovation Assessment
- Appendix C: Economic Base Analysis
- Appendix D: Priority Industry Analysis
- Appendix E: Real Estate and Land Use Analysis
- Appendix F: Peer Set Analysis
- Appendix G: Strategic Plan Survey Results

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N^2 Innovation Corridor

MARKETING STRATEGY

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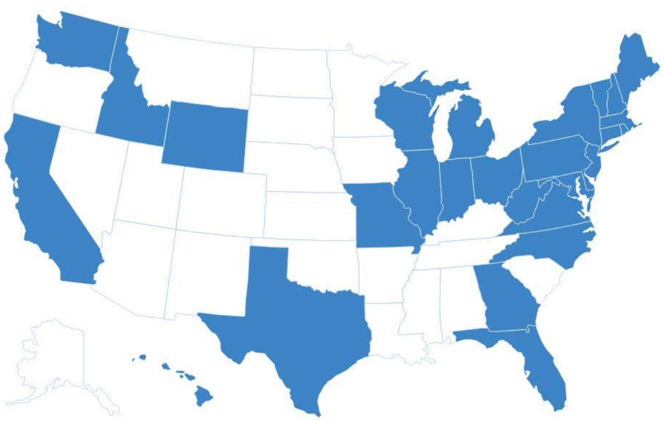
About Camoin Associates

Camoin Associates has provided economic development consulting services to municipalities, economic development agencies, and private enterprises since 1999. Through the services offered, Camoin Associates has had the opportunity to serve EDOs and local and state governments from Maine to California; corporations and organizations that include Lowes Home Improvement, FedEx, Volvo (Nova Bus) and the New York Islanders; as well as private developers proposing projects in excess of $600 million. Our reputation for detailed, place-specific, and accurate analysis has led to projects in 27 states and garnered attention from national media outlets including *Marketplace* (NPR), *Forbes* magazine, and *The Wall Street Journal*. Additionally, our marketing strategies have helped our clients gain both national and local media coverage for their projects in order to build public support and leverage additional funding. The firm currently has offices in Saratoga Springs, NY, Portland, ME, and Brattleboro, VT. To learn more about our experience and projects in all of our service lines, please visit our website at www.camoinassociates.com. You can also find us on Twitter @camoinassociate and on Facebook.



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Marketing Strategy

Many of the strategies and actions outlined within the Action Plan Matrix pertain to marketing, communications, and engagement. This section provides additional guidance and recommendations for implementing the marketing strategy.

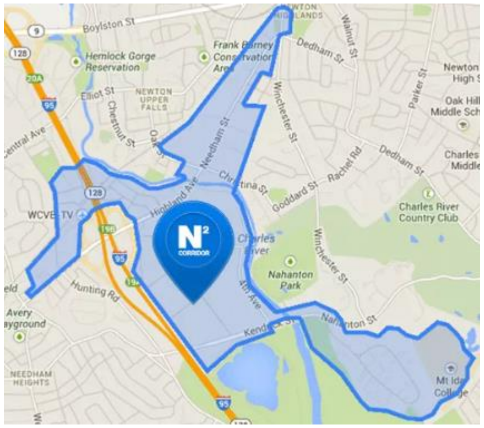
Brand & Identity

N^2 needs to create its own identity as an innovation district within an innovative region, and become part of the noise—part of the conversation—created by the Greater Boston area in general and other suburbs in particular. The district is not isolated from the communities that encompass it—it is an innovation hub within an innovative community within an innovative region. While the impetus for this project is to take actions focused on the core district area as defined, N^2 can only succeed as part of the regional innovation economy, and reflecting that in the brand is important.

Branding N^2

We recommend retaining the N^2 brand but adjusting the wording slightly to better reflect the character, geographic extent, and vision for the innovation district. Our recommendations are as follows:

- The N^2 or "N-Squared" name is well-recognized locally by community leaders and economic development stakeholders and is beginning to gain traction regionally as the media has used the term in a few earned pieces (i.e. publicity gained through unpaid efforts). We recognize that the use of superscript can be a challenge, especially for use on digital media, but the image it creates is a strong, necessary statement (see "Logo Modifications" section below). Occasionally writing out "Newton-Needham" and "N-Squared" within marketing campaigns, as is done currently, will help to overcome this challenge.
- The term "innovation" simply **MUST** be part of the brand. It cannot be assumed, it must be asserted, and it must give credence to the innovation assets that exist in the district (e.g. companies, entrepreneurs). It must distinguish itself apart from yet another commercial corridor focused on real estate development.
- Use of the word "corridor" implies a long narrow expanse with a single shared thoroughfare. This does not accurately reflect the geographic shape or characteristics of N^2—it does not fit the definition a corridor, and it is confusing to describe it as such. We recommend removing this misleading word from the name and replacing with a word that better reflects the geographic extent, such as "hub."



- Using the word "district" generally is okay, but not ideal within the title of the brand as this term embodies stiff borders separating regions or excluding areas outside of the district. The intent is to represent a more fluid, networked environment with a high density of innovation activity occurring within the N^2 core. Entrepreneurs, businesses, and other stakeholders that may exist within Newton-Needham or just beyond the municipal borders need to feel like they still benefit from and are a part of the local innovation ecosystem and the activity and momentum happening in the core is accessible to them.

- During the planning process there was considerable discussion about how the Charles River has largely been ignored and perhaps should be incorporated into the branding for the innovation district. While we agree that the river is a significant natural asset that should be featured both in marketing and physical development of the district moving forward, it is not an ideal icon for branding N^2 for the following reasons:
    - The boundaries of the district do not correspond with the river corridor. In fact, the river is the district boundary in many places, which means the district is only on one side of the river.
    - The Charles River meanders through several communities before ultimately reaching the ocean. There is not a well-defined "Charles River Valley" and even most locals do not know exactly where the Charles River flows through their own municipalities. Therefore, it does not make a strong geographic reference.
    - When people from outside the area hear of the Charles River, they think of Boston, not Newton and Needham.

Recommended name: N^2 Innovation Hub

Logo Modifications

The current logo evokes a chemical element from the periodic table that makes up part of a system, which is great symbolism for promoting N^2 as a critical hub of innovation activity within an innovative region.

Recommendation: Retain the look and feel of the existing logo. Replace the word "corridor" with "Innovation Hub."

Reach Consensus on the N^2 Brand

Just as important as the brand itself, it is critical that the Chamber, City of Newton, Town of Needham, and relevant stakeholders responsible for marketing various aspects of the municipalities for community and economic development quickly reach consensus on the ultimate brand for the innovation district (Action 5.2.1). This should be a top priority of the new Leadership Team and accomplished within the first quarter of implementation.

Once consensus on the N^2 brand is achieved, promote the communities as a whole as an innovation ecosystem within the Greater Boston ecosystem. Market N^2 as the innovation hub within the fluid local and regional innovative environment. (Action 5.2.2).

Each municipality and the Chamber are working on individual marketing efforts. There are many websites, eNewsletters, and social media campaigns all providing information about the communities. In order for this marketing strategy to be effective, the messages about N^2 and the Newton-Needham region as a whole must be clear and consistent. Before beginning any marketing campaign, spend the time to flesh out how different marketing efforts will be coordinated and can be used to complement other ongoing efforts.

Marketing Campaigns

When considering marketing for economic development, we stress the integration of internal (within the community and region) and external (outside the community and region) engagement and communications. Both are critical and strengthen each other.

As such, the following marketing campaigns are designed to inform, engage, build community, and create dialog and excitement around economic development initiatives among strategic internal audiences, which in turn strengthens subsequent marketing efforts designed to attract the attention of outside developers, investors, entrepreneurs, regional partners, institutions, site selectors, workers, and others. The campaigns support strategies and actions outlined in the Action Plan Matrix and are referenced by their number in the matrix as appropriate.

There is no silver bullet in economic development marketing. Instead, the marketing campaigns outline an integrated marketing approach with a focus on building momentum locally for the N^2 strategy itself, achieving and promoting an innovation identity, encouraging entrepreneurship locally, and attracting the attention of entrepreneurial-minded individuals and innovative companies.

Through the N^2 strategic planning survey (see Appendix G), we observed that support is lacking for initiatives around diversifying housing options and identifying a research institution partner. We interpret this as a lack of understanding of the importance of these efforts in supporting the development of a strong innovation district. As such, we recommend educational campaigns to support these strategies that inform the respective targeted audiences on the need for these efforts.

The goals and objectives of each marketing campaign are as follows:

Campaign 1: Create & Perpetuate a Buzz Around the N^2 Strategy

Successful innovation communities build momentum and generate a "buzz" that originates from community leaders, spreads within the community, and transcends its borders across many channels and networks. Frequent updates on activity, achievements, projects, and needs as the strategy is implemented will continue the conversation and help to maintain focus on this effort.

Campaign 2: Forge an Innovation Identity Throughout the District

N^2 needs to create its own identity as an innovation district within an innovative region. The approach to this campaign is to first encourage internal audiences (residents, business leaders, students, etc.) to be innovative in their own work. Creating a local innovation culture "on the street" will eventually change the visitor experience, but it must begin with the local community.

Campaign 3: Encourage Entrepreneurship

Entrepreneurship is a key part of being an innovation district, so encouraging entrepreneurs to start their companies here, especially in the priority industries, will support the networks, increase the vibrancy of the area, and ultimately will grow companies that can fill the office parks. There is an opportunity to build upon the innovative workforce in Newton and Needham and also engage local students who are interested in entrepreneurship.

Campaign 4: Educate on the Need for Affordable Housing Options & Mixed-Use Development

Talent is a prerequisite for attracting, retaining, and creating companies in the N^2 Corridor, but the aging local population means that companies need to be able to attract younger workers. High housing prices and lack of direct rapid transit service to the N^2

Corridor means that companies wanting to attract Millennial workers to the area are having difficulty. As identified in the Economic Development Strategy, there is an immediate need to communicate to the greater Newton-Needham community the need for diverse housing options and to market the investment opportunity to the real estate community.

Campaign 5: Marketing for Business Attraction

An essential goal is to attract new innovative and growing companies to the office parks in the N^2 Corridor. It makes sense to target the priority industries that are already present in order to build up the networks and interconnections that come from denser clusters of businesses that share workforce, infrastructure, and other needs. However, before marketing to regional, national, and international companies, the N^2 Initiative will need to strengthen relationships with the real estate/development community as well as state and regional business attraction partners.

Campaign 6: Coach on the Need for a Research Institution Partner

Goal 3 of the Action Plan Matrix states that to be truly an innovation district requires an anchor to spur the development of new ideas, potentially support the acceleration of a priority industry, attract an educated workforce, and act as a focal point for innovation.

From the survey (see Appendix G) we know there is less support for this initiative relative to others, which we have interpreted as a lack of understanding for the importance of anchor institutions in fostering innovation. As such, the first phase of this campaign should be focused on educating about the need for this initiative.

Marketing Campaign Tactics

The following tables provide a framework for the marketing strategy. They include a summary of the targeted **audience(s)** for each marketing campaign, **desired outcomes** we want for those audiences, key **messages** that drive decision-making and pique the interest of targeted audiences, and top **channels** to use for each campaign.

Additional information and recommendations for establishing strong marketing channels and understanding the targeted audiences is provided following the campaign summary tables.

Campaign 1: Create & Perpetuate a Buzz Around the N^2 Strategy

Audience	Desired Outcome	Message	Channels
Local Community Leaders Municipal staff and elected leaders	Express support for implementation of the strategy publically. Become advocates for the initiative	We're moving from planning to implementation and taking action to achieve real results. You can help us achieve our collective vision of becoming an innovation hub within an innovative region.	**Public Meetings** – Kick off implementation of the strategy with a public meeting (scheduled for June 2016) and continue to host an annual meeting to provide updates on progress. **Website** – Dedicate a section of the site specifically to this initiative and update at least monthly with status updates. Design as a scorecard. **eNewsletter** – Include monthly updates on implementation progress intended to drive traffic to the website for more information. **Social Media** – Posts featuring information about strategy, specific opportunities, information about why certain aspects are important, etc.
Founding Partners Needham, Newton, Chamber, businesses within corridor, and willing stakeholders	Make an initial investment. Become advocates for the initiative.		
Greater Newton-Needham Residents and businesses	Spark a real conversation about the opportunity of becoming an innovation district. Become advocates for the initiative.		

Campaign 2: Forge an Innovation Identity Throughout the District

<table>
<tr><th>Audience</th><th>Desired Outcome</th><th>Message</th><th>Channels</th></tr>
<tr><td>Internal Audiences
Greater Newton-Needham
Residents, workforce, and businesses</td><td>Increased internal sense of place, pride in the community, and a deepened culture of innovation.

Drive conversations about innovation happening in N^2.

They see others being innovative and are inspired to be innovative themselves.</td><td rowspan="2">We’re an innovation hub in an innovative region – and you’re in it!

Anyone can be innovative, find your inner entrepreneur.

Creativity and innovation – it’s what drives N^2.</td><td rowspan="2">Physical – Install consistent wayfinding signage with N^2 logo and branding throughout the corridor. Invest in digital kiosks and other connected public amenities and infrastructure.

Digital Marketing – Promote quality of life assets including Charles River, historic buildings, and other public spaces. Create a social media campaign asking residents to promote their favorite spots to meet with clients, access free Wi-Fi, etc. Promote transportation infrastructure investments and efforts to create a physical hub for the district. Work to uncover the innovation identity of individuals and businesses and tell their stories.

Competitions & Events – Designed to bring different ideas together and spark new ideas. Create opportunities for human interaction and connections.</td></tr>
<tr><td>External Audiences
Visitors from outside the area</td><td>Visitors have a different <u>experience</u> visiting the N^2 Corridor. They feel like they are in a place that is a destination for investment by innovation-driven industries. They find it exciting and inspiring.

Interest in the local innovation culture is piqued and they take action to learn more about what is happening here.</td></tr>
</table>

Campaign 3: Encourage entrepreneurship

Audience	Desired Outcome	Message	Channels
Olin, Babson, and Mount Ida	Become partners in hosting events and leading education for local entrepreneurial network. Partnerships between educational institutions and innovative businesses. Students connected with internships and career opportunities with local entrepreneurial companies.	This is our opportunity to provide a growth path for young entrepreneurs and keep students local.	**Relationship Building** – This needs to be a specific working group that is created and starts working right away.
Entrepreneurs and Entrepreneur-minded Individuals New and old, local and regional	Choose to start their companies here.	It's the perfect place to grow your business. You'll have access – to a rich innovation ecosystem, to Boston and NYC, to a highly talented workforce, to nearby institutions, etc. Other top tech companies are succeeding here and you can too. Come for a visit and meet other like-minded individuals that share your passion.	**Events** – Designed to bring diverse groups together and strengthen the local entrepreneurial network through education and engagement – speaker series, lunch-and-learns, startup weekends, hackathons, business plan competitions, and meetups. Use demand-based pricing for events to retain interest of targeted audiences (i.e. make it cheap for entrepreneurs and expensive for solicitors). **Digital Marketing** – Promote events. Feature stories of local startups, celebrate their success.

Israeli Entrepreneurs	Choose to start their companies here.	You can access new markets from here. The best leaders build their businesses here. Note: Unlike typical American entrepreneurs that want to "change the world", Israeli entrepreneurs are generally in pursuit of "being the best." Marketing campaigns to this segment use words like "outstanding," "exceptional," "leadership," "uniquely positioned," and "first-ranking."	**Digital Marketing** – Israeli entrepreneurs tend to be tech-savvy problem solvers and frank communicators, which can make them weak storytellers. Solve their problem. Fill this gap by helping them tell their story and promote via digital media. **Relationship Building** – Attend events in NYC and Boston targeted to this segment to make connections and learn the culture. (Example: ICONYClabs). An ideal partner in implementing these strategies is the Jewish Community Center, which already has strong networks and relationships and could take the lead on working with N^2 to implement these marketing strategies.

Campaign 4: Educate on the Need for Affordable Housing Options & Mixed-Use Development

Audience	Desired Outcome	Message	Channels
Greater Newton-Needham Community Residents, Business Leaders, and Political Leaders	Understand the importance of diversity and the role it plays in innovative communities and how housing, in part, plays an important role in diversity and talent attraction. Change perception to be more welcoming for alternative housing types. Support changes to land use regulations to allow diverse housing options.	Diversity drives creativity and innovation; we need greater diversity. There is capacity for housing along the Needham Street Corridor. Successful innovation districts allow space for working, living, and playing. Both communities have a significant lack of young adults (25 to 40 year olds) relative to the Boston metro and state overall. This bimodal age distribution is, in part, a function of the communities' housing market, which is skewed toward single-family homes and has limited affordable options for young adults.	**Social Media & eNewsletter** – Draw attention to housing projects in the district. Author original content and link to external articles and information about role of diversity in driving innovation.
Real Estate Community Developers and realtors already working in N^2 as well as those working in other areas who may be interested in working in emerging innovation districts	Recognize that the community is taking action to support diverse housing options in the district and propose new investment opportunities and projects. Reach out to Newtown-Needham and work with municipal staff to design desired housing/mixed-use projects.	There is an unmet demand for diverse, modern, affordable housing options in the innovation district. We are reconsidering our land use decision making process to accommodate creative projects that support our vision. (Action 4.2.2)	**eNewsletter** – Development community list. Promote housing projects and changes to the land use and zoning regulations that allow diverse housing investment. **Relationship Building** **Website** – Showcase key investment properties**.**

Campaign 5: Marketing for Business Attraction

Audience	Desired Outcome	Message	Channels
Real Estate Community Developers and realtors already working in N^2 as well as those working in other areas who may be interested in working in emerging innovation districts	Greater collaboration with realtors for marketing sites and properties in the district.	We're your partners in marketing for real estate development and a trusted source for current socioeconomic and demographic information.	**Website** – Showcase key investment properties available for sale or lease**.** Provide information they can use to market real estate and/or make investment decisions. (Action 1.1.2) **Relationship Building** **Cut-Sheets** – Information on featured properties and why invest in the district. Sheets can be downloaded from website or printed for inclusion in hard-copy collateral. (Action 1.1.4)
State and Regional Business Attraction Partners	Develop and strengthen relationships with state and regional partners. Increased awareness of N^2 for better collaboration on marketing campaigns.	We're an innovation district in an innovative region that is taking strategic action to grow our innovation identity. N^2 has a highly talented workforce that is unmatched.	**Relationship Building** – Attend and host events to develop and strengthen relationships and increase awareness. (Action 1.2.2) **Website** – Updates on work plan and implementation progress. **Social Media** – Engage with digital marketing campaigns run by state and regional partners and feed these partners information to share through their networks.

Greater Boston Companies (Action 1.2.2)	Greater awareness and piqued interest in N^2, become "followers" of social media and/or eNewsletter updates. Recognize the growing opportunity of locating in the innovation district, leading to eventual relocation and investment in N^2.	We have a highly talented, extraordinarily well-educated workforce. You'll have roughly 150 technology companies in your local network including some big names like TripAdvisor. You get great proximity to Boston and NYC but better – more affordable – rent. A significant percentage of our residents were born in other countries – 21% – which contributes to our vibrancy and cultural diversity. N^2 is the emerging innovation hub. You have an opportunity to mold the ecosystem.	**Relationship Building** – Become actively involved in Greater Boston economic development related networks. **Website** – Information on workforce, business environment, quality of life, innovation assets, etc. Promote transportation options and explain how to get to N^2 from Boston using public transportation. **Social Media** – Promote innovation economy and quality of life assets in Newton & Needham.
National and International Companies (Actions 1.2.3 & 1.2.4) In priority industries and fit with innovation/ entrepreneur focus seeking to locate in Boston/U.S.			**Relationship Building** – Work with state and regional business attraction partners to target international businesses by participating in trade missions. **Website** – Information on workforce, business environment, quality of life, innovation assets, etc. **Social Media** – Promote innovation economy and quality of life assets in Newton & Needham.

Campaign 6: Coach on the Need for a Research Institution Partner

Audience	Desired Outcome	Message	Channels
Local Stakeholders	Support for this initiative.	Research focused anchor institutions are a critical element for a healthy innovation ecosystem.	**Relationship Building** **Digital Marketing** – Consider paid ads for this campaign. Link to Brookings research.
Higher Education Research Institutions In the region that may be in planning stages of new institutes that could be located off-campus.	Attract a research-based anchor institution to the district.	N^2 is the emerging innovation hub. You have an opportunity to mold the ecosystem.	**Relationship Building** **eNewsletter & Social Media** – Once in-person contacts are made, keep brand present by providing updates on activity in corridor through digital media marketing channels. **Events** – Invite prospects to entrepreneurial networking events, offering an experience which will create an emotional connection strengthening ties and interest in the district.

Targeted Audiences

The marketing campaigns outlined previously identify many internal and external audiences. A brief description of each audience, and the primary reason for targeting each audience, is provided below.

Internal Targets

Local Community Leaders & Founding Partners – This is the internal team of stakeholders that have been working to develop the strategy and will continue to lead implementation. It includes municipal and Chamber staff, business leaders, real estate professionals, elected officials, etc. It is important to keep this group engaged and informed on progress.

Greater Newton & Needham – Includes local residents, entrepreneurs, employees, and business leaders who may or may not be innovative themselves. The goal is to encourage to be innovative in their own way as part of developing the local identity as an innovation district. It is also important to generate support from this audience for the N^2 Strategy.

Local Development Community – Local realtors, developers, property owners, and others involved in the local real estate sector. This group is a critical partner in promoting the district and must be kept up-to-date with implementation progress and information about ongoing development projects.

Local Entrepreneurs and Entrepreneurial-Minded Individuals – The Newton-Needham community is rich with entrepreneurial talent. By targeting this group, the goal is to retain and foster this talent in the district.

Local Educational Institutions – Includes Olin, Babson, and Mount Ida, all of whom will be important partners in hosting events and leading education for the local entrepreneurial network. These partners need a greater relationship with the business community.

External Audiences

Visitors – Includes anyone visiting N^2 for work or recreation. The goal is for outside visitors to “feel” like they are in an innovative place and find the experience exciting and inspiring enough to tell the story to others.

Entrepreneurs – Includes anyone starting businesses, or thinking of starting a business. The goal is to position N^2 as a great place to grow a company because it offers opportunities to learn and network with other like-minded entrepreneurs, access to large markets, and offers a highly-talented workforce. A sub-market of this group includes Israeli entrepreneurs, who already have a strong presence in the region.

Development Community (External) – Includes site selectors and developers with experience or a desire to work in innovation districts. The goal of marketing campaigns targeted for this group is to attract them to the district to take on new development projects.

Greater Boston Innovative Businesses & National/International Innovation Businesses – Businesses in the targeted industry sectors who may be interested in locating in the Greater Boston region. Targeting these businesses will require working with state and regional partners for attraction including representatives from the Executive Office of Housing and Economic Development (EOHED). Priority industry areas include:

- Information technology
- Professional, scientific, and technical services
- Biotech and life sciences

Marketing Channels

Website

Revamp the N^2 website into the go-to digital platform for innovation news and community engagement in order to create and curate ongoing buzz about innovation in the N^2 Corridor and Newton-Needham communities—telling success stories that inspire people to live, work, and start or grow a business in the N^2 Corridor.

Website features:

- Promote N^2 Corridor news, events, and ongoing projects. Include an events calendar that can be downloaded into Gmail and Outlook calendars (iCal events). Partner communities could include this same calendar on their respective websites
- Feature available sites and properties. Develop pilot database that highlights available sites and is populated by willing real estate partners (Action 1.1.2)
- Social media streams and links
- Robust blog for posting stories about local innovation
- Link to innovation resources such as event venues, shared working spaces, coffee shops offering free Wi-Fi, etc.
- Job opportunities (allow postings by businesses in the N^2 Corridor)
- Map of district and partner communities including specific information on public transportation and how to get from Boston and Cambridge to N^2
- Sign-up for eNewsletters and links to past emails

eNewsletter

Create innovation-specific email lists and develop newsletter-style templates for each email list with similar branding. Design the templates to provide short blurbs or brief high-level information with click-through to the website for more information and/or articles.

Suggested email segments:

- **Greater Newton-Needham Innovation Ecosystem** – Public list of innovative companies, institutions, workers, and entrepreneurs who may live or work in the Greater Newton-Needham region or reside outside of the area but want to keep tabs on the N^2 ecosystem for happening, opportunities, properties, etc. Anyone can sign up for this list. Newsletter-style publication used to promote all things innovation happening in N^2.
- **Leadership team, Advisory Team, and Working Groups/Tasks Forces** – To share information with the internal N^2 team before it goes public and keep this group "in the know."
- **Entrepreneurs and entrepreneur-minded individuals** – Populated with local and regional contacts, used to promote targeted events.
- **Real estate developer and real estate community, site locators** – Create two segments for this group:
  - Local/regional real estate contacts – The local list will be used to inform with information that they can use in marketing.
  - External contacts – Campaigns sent to the external list should be designed to attract new developers to the area.
- **Companies/entrepreneurs in targeted sectors** (e.g. cyber, IT, bio) – Use to send highly-targeted emails. May want to purchase a list in specific segments as opportunities arise.

Social Media

Create social media accounts dedicated to promoting, engaging and learning about innovation in the N^2 Corridor and Newton-Needham communities.

- Identify which digital social networks entrepreneurs in the region engage with and why. While N^2 needs a presence on the big networks such as Instagram, Twitter, and Facebook, there may be other "niche" networks used now or in the future. Some examples are listed in this article: http://mashable.com/2009/03/12/entrepreneur-networks/#8.O5hA3dfaqT
- Utilize apps like Periscope, Facebook Live, and YouTube Live to broadcast events and meetups to a larger audience.
- Create a social media advocate team of partners that have large existing digital networks in the innovation space who are willing to share and engage with N^2 content. Utilize the advocate group to help create buzz about innovation and growth in the district and throughout the Newton-Needham community.
- Consider paid Facebook ads to support priority marketing campaigns.

Traditional Media

One of the leading sources of information influencing executive perceptions of an area's business climate is articles in newspapers and magazines. Attaining positive coverage in a top national business outlet is one of the most powerful tools when it comes to promoting N^2 as an innovation district. The approach is to develop a steady stream of high-quality content promoted through owned media streams that can support strong pitches to traditional media outlets.

- To get a pitch read, it helps to have existing relationships with journalists. Strengthen relationships with conventional media to encourage coverage of N^2 and its companies. Twitter is critical. Use Twitter to engage directly with local and regional traditional media outlets. Identify individual reporters that cover business, entrepreneurship, and innovation and regularly engage with them online and in-person. Be sure to show appreciation for any coverage they offer.
- Build strong storylines to bring to these publications. Use data and information to build out storylines and make sure you offer media outlets the absolute latest and greatest data and information. The more "best, first, and only" claims you can make, the better.
- Encourage companies, municipalities, and the Chamber to send business news your way in advance and partner on pushing out newsworthy announcements to relevant trade and national media.

- Focus in on regional, national, and trade media outlets—including specific journalists—that might be interested in covering stories in N². Monitor these media outlets to see where N²'s storylines fit into national trends or the interests and coverage areas of specific journalists. We recommend targeting the following publications:

  National/Regional Business Focused
  - *Bloomberg News*
  - *Boston Globe*
  - *Boston Herald*
  - *Business Insider*
  - *Entrepreneur*
  - *Fast Company*
  - *Forbes*
  - *Fortune*
  - *Harvard Business Review*
  - *Inc.*
  - *New York Times*
  - *NPR*
  - *Reuters*
  - *The Atlantic*
  - *The Daily Beast*
  - *Wall Street Journal*
  - *Wired*

  Site Selection & Real Estate
  - *Area Development*
  - *Business Facilities*
  - *BusinessXpansion Journal*
  - *City Lab*
  - *Expansion Solutions*
  - *Next City*
  - *SITE Selection*
  - *Urban Land Magazine*

  Information Technology Industry
  - *BetaNews*
  - *Engadget*
  - *IT World*
  - *MIT Technology Review*
  - *Network*
  - *TechCrunch*
  - *TheNextWeb*
  - *VentureBeat*

  Biotech & Life Sciences
  - *Bioscience Technology*
  - *BioTechniques*
  - *FierceMarkets*
  - *Life Science Leader*

Execution of the Marketing Strategy

The following details a step-by-step plan for executing the priority marketing tactics recommended for the first 8 quarters (2 years) following the summer 2016 kickoff of this effort. While it would be great to initiate all of the marketing campaigns now, this is a realistic plan that begins by establishing marketing channels and building campaigns, which coordinate with the overall implementation of the N^2 strategy.

Begin	Deadline	Action	Goals Supported
Q1	Q1	Reach consensus on the N^2 brand	All
Q1	Q1	Modify the logo to reflect the agreed upon brand	All
Q1	Ongoing	Form a tech team to support digital marketing – create a shared calendar – meet quarterly	All
Q1	Q1	Ramp up N^2 social media channels	All
Q2	Ongoing	Create social media advocate team – send email updates monthly	All
Q2	Q2	Design eNewsletter templates: Innovation ecosystem and real estate community segments	All
Q2	Q4	Develop website for N^2	All
Q2	Ongoing	Communicate results of the plan by creating a scorecard that is updated quarterly and shared across digital media. Email this scorecard with a detailed update to the leadership team email list.	6. Build Capacity
Q2	Q2	Develop cut sheets for marketing innovation ecosystem strengths and real estate in N^2 – push this information to state and regional partners for business attraction	1. Business Attraction
Q2	Q2	Develop a news strategy	5. Innovation Identity
Q3	Ongoing	Write storyline content about business successes, to be included on website and promoted across digital media platforms. (Support news strategy)	All
Q3	Q6	Develop content on need for research institution partner for eNewsletter N^2 Ecosystem segment and social media promotion	3. Research Institution Partner
Q3	Q4	Work with local Israeli entrepreneurs to write business success stories and share across digital media	2. Encourage Entrepreneurship
Q3	Ongoing	Create a campaign designed to encourage innovation and creativity locally	2. Encourage Entrepreneurship
Q4, Q8	Q4, Q8	Host and promote annual awards for entrepreneurs	2. Encourage Entrepreneurship
Q4, Q8	Q4, Q8	Host annual N^2 strategy updates meeting with key stakeholders	All
Q5	Q5	Write content about successful residential projects in the district linking to existing content about the role of diversity in creating innovation ecosystems – promote in monthly eNewsletter to Ecosystem and real estate segments and in social media	4. Mixed-use, Diverse Community
Q5	Ongoing	Showcase investment properties on website and promote in real estate eNewsletter segment	1. Business Attraction
Q6	Q8	Participate in international trade missions	1. Business Attraction
Q8	Q8	Write quality of place content to be used across digital media platforms (historic buildings and streetscapes)	5. Innovation Identity

Leading action to
grow your economy

Camoin Associates, Inc.
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ECONOMIC DEVELOPMENT

Appendix A: Situation Assessment

N² INNOVATION CORRIDOR ECONOMIC DEVELOPMENT STRATEGY & MARKETING PLAN

March 2016

Prepared for:

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Introduction

This situation assessment is the capstone of the first major phase of the development of the N^2 Innovation Corridor Economic Development Strategy & Marketing Plan. Working with the Newton-Needham Chamber of Commerce, the City of Newton, the Town of Needham, and other stakeholders, Camoin Associates has conducted foundational research and analysis and collected information and perspectives from interviews, a stakeholder meeting, and existing documents. The situation assessment compiles selected deliverables to date and summarizes the results of those tasks by answering the question, "Where is the N^2 Corridor today?"

Project Background & Objectives

The N^2 Innovation Corridor is an area of roughly 500 acres along the Newton-Needham line that includes two office parks and adjacent commercial streets. The N^2 Corridor straddles I-95, from Webster Street and Highland Ave. in Needham to Wells Ave., Echo Bridge, and Needham and Winchester Streets in Newton. The Corridor is already home to many innovation economy sector businesses as well as educational institutions, recreational areas, restaurants, pubs, hotels and retail shops. And there's still a lot of opportunity—at a diverse mix of price points—for companies of all sizes to grow and expand.

The N^2 Corridor project is a private-public collaboration between the Newton-Needham Chamber and its member businesses along with the City of Newton and Town of Needham. The N^2 Corridor Task Force includes local entrepreneurs, large and small businesses, educators, marketers, property owners, brokers, non-profit leaders and economic development experts. It focuses on six areas: strategic planning, marketing, networking, education, advocacy and technical assistance. Its objective is to promote economic development. That requires doing many things at the same time. The Task Force collaborates with state and local officials on policy and infrastructure. It works to connect developers and property owners with prospective tenants. It helps connect companies with municipal officials who can assist with permitting. And it holds dozens of networking and educational events to foster a vibrant community in the area.

The N^2 Corridor stakeholders wish to position the corridor for more innovation-related economic development. The objectives of this initiative are to:

- Promote the N^2 Corridor and its environs as a place for new business attraction and formation;
- Support the formation of and nurture new and innovative startup companies within N^2 area; and
- Advocate for business and economic development interests with local municipalities and with state agencies.

As part of this initiative, the N^2 Corridor stakeholders and Camoin Associates are developing this Economic Development Strategy and Marketing Plan. The objectives of the Plan are as follows:

- Understand the corridor's competitive economic position and innovation drivers;
- Identify the most strategic approach to further securing and enhancing the corridor's role in the innovation economy;
- Produce an economic development strategy that is data-driven, informed by current industry trends, based on the corridor's unique strengths and opportunities, action- and performance-oriented, and shaped by knowledgeable stakeholders and interested residents;
- Produce internal and external marketing strategies—integrated into the overall economic development strategy—designed to promote the corridor's innovation identity and competitive factors, to both industry decision makers and the N^2 communities;

- Determine the organizational structure for leading the implementation of the Economic Development Strategy & Marketing Plan; formally confirm the mission and vision for this operation.

Vision

The draft vision statement for the N^2 Innovation Corridor is as follows:

> *The N^2 Innovation Corridor is home to an increasing number of innovative businesses— new and established, large and small. It features a mixed-use community with retail, office space and open space integrated with housing and nearby transit, providing an affordable and desirable place to create, prosper, and adapt to an evolving business climate. The Corridor will become increasingly recognized as a destination for investment by innovation-driven industries and will enhance the quality of life in the Newton-Needham region by providing nearby employment, entertainment, educational, recreational, and cultural amenities.*

Mission

The draft mission statement for the entity ultimately designated to lead the implementation of the Economic Development Strategy & Marketing Plan is as follows:

> *The mission of the N^2 Innovation Corridor Initiative[1] is to promote targeted, sustainable, and well-planned ecosystem within the Corridor for the benefit of Needham and Newton and their residents, businesses, educational institutions, and community organizations.*

[1] This is an arbitrary name for the as-yet-undetermined initiative, organization, or entity that will lead implementation of the economic development strategy and marketing plan.

Summary of Findings from Interviews, Background Documents, & Forum #1

The following are brief overviews of more detailed notes documenting Camoin Associates' findings from its interviews, review of background documents, and the first forum.

What would success look like?

We asked interviewees and attendees at the first public forum to tell us what they thought success would look like. Our goal was to understand whether there was consensus over the vision, and whether respondents had thought about what a Corridor concept might entail. We also asked this question because the concept of an innovation district, as recently defined by the Brookings Institution, is an urban phenomenon, and usually is discussed in contrast with suburban office parks, such as the current configuration in the N^2 Corridor.

We learned that there is considerable energy behind the concept of positioning the N^2 Corridor as an innovation district or innovation corridor. Stakeholders recognize that the Corridor has strong momentum in that it is already home to a number of companies in the innovation and/or advanced technology sectors. They also recognize there exist constraints that prevent the Corridor from becoming a "textbook" innovation district (i.e. Brookings definition), or seeking to "replicate Kendall Square." Many stakeholders are interested in exploring creative, tailored, and forward-looking variations on how the N^2 Corridor can be a leading innovation-economy community, situated in a suburb, as opposed to in an urban core.

Stakeholders' visions for the Corridor include:

- Being an even more competitive destination for tech and bio companies (and noting that key targets are likely to be second- or later-stage technology companies that desire an alternative to downtown Boston are ready for a more mature workforce; and Israeli investment);
- Substantially greater "buzz" and trendiness, assisted by trendier streetscapes and fun/creative amenities;
- An authentic, enhanced sense of place—one that appeals to younger generations;
- A stronger link between the area's higher education institutions and its innovative companies;
- Improved networks among innovation assets and people, potentially including new gathering space(s) that help support an innovation culture; and
- Expanded transportation opportunities, possibly including company funded shuttle buses and/or for profit transit providers connected to existing public transit nodes.

Some stakeholders also made reference to increased local innovation-economy activity and related development potential outside the N^2 Corridor boundaries. However, there are also stakeholders who want to limit the Corridor to just the areas already identified at the border of the two communities. An important question to be answered through this process is how much of the innovation and entrepreneurial activity needs to occur within the N^2 Corridor boundaries, and how much already occurring in the two municipalities and in Boston in general can influence and be leveraged in the Corridor.

Business climate analysis

Newton and Needham have recently forged a strong and effective working relationship between the executive branches of their municipalities. This has included regular meetings that have produced real benefits around the funding of infrastructure investments throughout the core of the Corridor.

Needham has a reputation for being quick, flexible, and cordial in its interactions with developers and the business community, and is widely considered to have been far sighted in putting new zoning rules five years ago and tax incentives in place a decade ago that allowed the town to easily accommodate the TripAdvisor location decision.

A political divide between supporters of smart growth and affordable housing and those who feel Newton is already too built out was the central issue of a 2015 municipal election, with the results decisively favoring the pro-smart growth/affordable housing candidate. Also in 2015, a contentious proposed mixed-use project at 28 Austin Street was narrowly met the two-thirds super majority necessary for approval by the city's aldermen (now city council).

Both events have given pro-growth advocates reason for cautious optimism that the city may be reversing a long-held perception of opposition to new development at a time when the city's zoning code is undergoing review and a Charter Commission could potentially alter the land use decision making process.

Meanwhile, Newton's mayor is enthusiastically championing an innovation-focused economic development vision, has traveled to Israel to champion the N^2 Corridor and recruited the world renowned MassChallenge to open a satellite office at Newton Corner.

Business and property taxes are also high in the N^2 Corridor, but not higher than elsewhere in Metro Boston, so this is not an issue to the extent that competition is within the Bay State.

Workforce and Higher Education

Newton and Needham have extremely high educational attainment, and their residents represent an incredible pool of highly qualified workers for technology and other industries. Local businesses also employ significant numbers of people who commute from outside the municipalities. At the same time, however, recruiting younger employees to work in the N^2 Corridor is challenging, and graduates of local colleges rarely stay local. Reasons include a lack of transportation options, affordable housing, amenities aligned with Millennials' live-work-play preferences, and attractive networking opportunities to help bind them to the area.

Stakeholders generally recognize this issue and are interested in addressing it in the context of overall economic development efforts, for example by discussing transportation and housing needs though a workforce lens, and by further integrating area higher education institutions and their students into the community.

There are several colleges and universities situated either partly or entirely within the municipalities (Olin College, Boston College, Mount Ida College, William James College, Babson College, Lasell College) and several others just outside (Wellesley College, Brandeis University, MassBay Community College).

Several of them offer curricula directly relevant to the N^2 Corridor's workforce needs and already provide some degree of programming designed to build relationships between their student bodies and the local business community, or to lay foundations for local business incubation by their graduates. Olin College, for example, while nominally an engineering school, is known for producing well-rounded graduates with leadership, entrepreneurship, and innovation skills. Babson is considered the premiere business education institution in the United States. Mount Ida is undergoing considerable upgrades under the leadership of its relatively new president.

However, as stakeholders recognize, there is a perception that engagement between higher education and the rest of the Newton-Needham community—as well as among education institutions themselves— should be much deeper, broader, and better targeted. If well designed, these new engagements would make graduates more likely to stay in the area and apply their talents locally, and result in greater support to those who start businesses in the N^2 Corridor.

Higher education institutions would also benefit from the availability of additional housing affordable to their faculty and staff.

Housing

Housing prices are extraordinarily high in Newton and Needham. Most housing is single-family and is bifurcated between large new homes and those that are older and require significant upkeep. The median value of owner-occupied units is $715,000 in Newton and $669,000 in Needham. A lack of affordable workforce housing in the municipalities is a major feature of the local real estate market and looms as a negative factor in potential business relocation and growth decisions, although both communities have taken action to mitigate this issue.

There has been considerable movement on the affordable housing front, with several recent and planned housing developments incorporating affordable components. Within the N^2 Corridor, Charles River Landing was recently completed, and a 390-unit Normandy project in Needham Crossing has been approved. Just beyond the corridor, a 136-unit project on Greendale Avenue in Needham is planned, as well as another project at 28 Austin Street in Newtonville. Needham has a zoning amendment being proffered to allow for mixed-use residential development in the Mixed Use-128 zoning district of Needham Crossing.

This represents real momentum on the sometimes-divisive idea of adding a significant volume of affordable, denser housing suitable for seniors, students, and younger workers—a necessity for attracting Millennials and building a culture of diversity and innovation. This is a regional challenge as well as a local one, and it is recognized by the municipal leaders: a major housing study is underway in Newton. Of note, Needham has recently passed the threshold of the state-mandated level of affordable housing, meaning it will now be exempt from Massachusetts' 40B law that allows developers to bypass local zoning laws if they are offering enough affordable units.

Transportation

Heavy traffic and a lack of sufficient public transit to the N^2 Corridor are significant constraints on the area's attractiveness to younger and senior residents and new and expanding businesses. Talent recruitment and livability stand to be significantly improved if new transit options become available. Examples of solutions that have been explored include shared bicycle services, additional bus service like a line from the Wells Avenue Office Park to a T stop, and the potential for transit service and/or paths along an unused rail right-of-way. A 2013 MAPC concept plan estimated low reverse-commute demand for rail transit on the right-of-way, but the methodology was disputed by some stakeholders. In the meantime, shuttle buses are proving to be an important way to move workers and students from transit stops to key employers, office parks, and colleges, and there may be potential to better coordinate these services.

Newton and Needham have good, wide roads and have invested in roadway improvements that are currently or will soon be under construction. The new dedicated exit ramp off of Route 128/I-95 at Kendrick Street represents a watershed improvement to the Corridor's accessibility and drivability. The changes to be implemented on Highland Avenue/Needham Street are also promising. Meanwhile, access and egress in the Wells Avenue Office Park is particularly problematic, and the reality of its single-access-point roadway is a barrier to redeveloping it in ways that are aligned with the preferences of 21st century companies and their workforces.

Key industries and industry attraction

As detailed in the Demographic & Economic Analysis, Newton and Needham are home to approximately 79,800 jobs, having added about 4,600 jobs over the last ten years. There were vast differences in the way various economic sectors performed over the past decade, with some sectors exhibiting tremendous growth and others shedding large numbers of jobs, significantly shifting the communities' economic composition. Today, the highest concentrations of jobs in Newton and Needham are in educational services, real estate, the information industry, and professional, scientific, and technical services.

Industry attraction for Newton/Needham and for the N^2 Corridor in particular is focused on technology-intensive sectors associated with the innovation economy. The Corridor is already home to many private sector assets in this category: In addition to being the new location of TripAdvisor's world headquarters, which opened in July, it's also home to PTC, Turbine, SharkNinja, Verastem, CyberArk, Big Belly Solar, and Karyopharm Therapeutics, among others.

Building on the Demographic & Economic Base Analysis (see appendix), the Corridor's existing conditions, and its future vision, Camoin Associates plans to perform target analyses for the following broad industry categories: information technology; professional, scientific, and technical services; and biotechnology and life sciences. This will inform the prioritization of more specific industries for expansion and attraction efforts, and the development of strategies to leverage and build on innovation assets to help foster that growth.

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Appendix B: Innovation Assessment

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Executive Summary

As edge cities and suburbs of Boston, Newton and Needham enjoy the benefits of the strong innovation and entrepreneurial ecosystem in the region. However, to fully implement the N^2 Corridor vision, Newton and Needham need to have some elements of the ecosystem resident in the Corridor itself. This analysis seeks to understand what innovation assets exist in the region in early 2016.

Our findings are that Newton and Needham are home to many innovators, but that the vast majority of their work is assigned to companies and institutions that are outside the two municipalities. There are some Newton- and Needham-based companies that have patents or Small Business Innovation Research (SBIR) grants or have raised venture capital, but only a small number are based in the N^2 Corridor itself. Of the companies that are in the Corridor, most are larger, and growing.

We found that only a handful of Newton and Needham innovators that have assigned their patents to a start-up, or to SBIR, seed- or angel-funded companies, are still in the municipalities; and virtually none are in the Corridor. This confirms the generally held belief that start-ups in the Boston metro area are converging downtown and in Cambridge.

Similarly, some of the most productive Newton and Needham inventors work at the region's institutions of higher education and/or medical schools and teaching hospitals, but not in the N^2 Corridor or at the schools within five miles of the Corridor.

On the other hand, certain data regarding self-employment in key industry sectors, and regarding patenting activity that is not associated with larger institutions, point to potential for entrepreneurial activity.

These findings set the stage for further recommendations for the Corridor.

Introduction

Starting in the post-World War II era, economists started undertaking research about how knowledge affected economic growth.[1] By the 1980s, many recognized that new knowledge was as important to economic growth as labor and capital,[2] leading countries and states to consider science- and technology-based strategies to promote further economic development. These strategies have evolved over the years, but generally include focus on five elements of an innovation-based economy:

- Sources of innovation, such as universities, federal labs and non-profit research entities;
- Companies—entrepreneurial, small and large—that can bring new ideas to the market;
- Skilled knowledge workers with expertise in science, technology, engineering and math disciplines;
- Infrastructure that supports these entities, such as high-speed broadband connections, intellectual property protection, and equity capital markets; and
- Community, the connective tissue that links these elements into an ecosystem.

In the past three years, a paper by the Brookings Institution on innovation districts[3] added a new dimension: geography. The authors described a relatively new phenomenon of urban places with consolidated innovation activity. Motivated in part by the influence of Millennials (those born after 1980) for a live, work and play lifestyle

[1] Solow, Robert W. 1956. "A Contribution to the Theory of Growth." *The Quarterly Journal of Economics*.70 (1): 65-94.
[2] Romer, Paul. 1986. "Increasing Returns and Long-Run Growth."94 (5): 1001-1037.
[3] Katz, Bruce and Wagner, Julie. 2014. *The Rise of the Innovation District: A New Geography of Innovation in America*. Brookings Institution: Washington, DC. http://www.brookings.edu/about/programs/metro/innovation-districts.

in an urban setting, entrepreneurs and then larger firms began locating in urban settings, often co-located with research universities, medical schools and other sources of innovation. Examples often cited are Kendall Square, Cambridge, MA, located adjacent to the Massachusetts Institute of Technology; and University City, PA, next to the University of Pennsylvania and Drexel University. Soon, cities around the country started thinking about how to revitalize their cities with an innovation district strategy, and places like the Seaport District in Boston and Roosevelt Island in New York were transformed by activist mayors that attracted research entities, seeded the development of entrepreneurial support systems, and created public spaces that support community and the types of "happy collisions" that encourage creativity, entrepreneurship and innovation.

Research parks across the country have responded to this trend as well. The oldest research park, Research Triangle Park in Durham, NC, is re-inventing itself from a sprawling, suburban park to one with a higher-density urban core, adding retail and housing for the first time in fifty years. Other new developments on the edges of major cities, notably The Fitzsimmons Life Sciences Innovation Park in Aurora, CO just outside Denver, and the Cortex Innovation Hub in St. Louis, MO, were built to leverage existing research facilities, including teaching hospitals, and added entrepreneurial support organizations like incubators and accelerators. Companies, both large and small, soon followed.

To think about how this trend can be applied to the N^2 Corridor, we need to first understand what's already there. This assessment is designed to help us understand what assets exist that the N^2 Corridor project can build on, and what might be further needed to achieve the goals of the project.

Methodology

Since the five elements of an innovation economy are also elements of innovation districts, we will focus our attention there. The five elements are:

- Sources of innovation;
- Companies, entrepreneurial, small and large;
- Skilled knowledge workers;
- Infrastructure that supports these entities; and
- Community.

For ***sources of innovation***, we looked first for the existence of institutions of higher education, especially research universities, and also for teaching hospitals and medical schools, federal labs, and nonprofit research institutes. As a general rule, these types of organizations are related to the generation of new knowledge through their research activities, something that is less common at colleges that are four-year only and have more of a teaching mission. Earlier research confirms that "the research and technology creation functions [of U.S. research universities] generate significant knowledge spillovers that result in enhanced regional economic development that otherwise would not occur."[4]

We confirmed our findings by looking at all U.S. patents awarded to Newton and Needham inventors in 2015, and cataloging to whom the patents were assigned. We also looked at all patents assigned to entities in Newton and Needham in 2015.[5] This snapshot is one way of identifying sources of innovation in the N^2 Corridor. The U.S.

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[4] Goldstein, Harvey and Renault, Catherine. 2004. "Contributions of Universities to Regional Economic Development: A Quasi-experimental Approach." *Regional Studies*. 38: 733-746.

[5] Unfortunately, the USPTO lists only the town that the inventor resides in, not the zip code, so we were only able to do this analysis for the two towns, rather than the specific zip codes the overlay the N2 Corridor specifically. However, the smaller number of companies allowed us to look at each individually, and map their locations, as indicated in the text.

Patent and Trade Office (USPTO) lists inventors by their home addresses and requires patent applications to list the individual inventors. If, as a result of their employment relationship, a patent is actually owned by an inventor's employer, the usual practice is to assign the patent to the employer. This is most often a company or university, or several entities, if the patent lists several inventors.

It is important to note that patent analysis is only one indicator of knowledge production, as some new knowledge is protected by trade secrets, trademarks, or not at all. We also note that not all patents are innovations, because they are not brought to market. However, patents are commonly used as a proxy for the invention of new knowledge, as any patent must be unique, non-obvious and new.

To identify ***innovative companies, large and small***, in the area, we use the patent analysis as a starting place, but also add both SBIR/STTR and venture capital analysis. The Small Business Innovation Research (SBIR) program and its companion, the Small Business Technology Transfer Program (STTR), are two federal set-aside programs by which agencies that perform intermural research are required to award a small portion of their research awards to small businesses (generally less than 500 employees). With the STTR, the small business must be teamed with a university. Companies that win SBIRs and STTRs are generally research organizations or start-ups, since there is no matching requirement, and the awards are grants that do not have to be paid back. They are awarded competitively based on the quality of the science and on the potential for the technology to be commercialized and support the agency's mission.

Venture capital, including in this case seed funding and angel investors, is a source of equity financing used by rapidly growing companies to accelerate their growth. While not all innovative companies succeed in getting venture capital, or want to dilute their ownership by obtaining outside capital, the presence of venture capital denotes a company that outside investors find to be attractive, usually because of its technology, potential markets and management team.

In this analysis, we did not look at ***workforce***, as this is covered elsewhere in the report. Nor did we specifically review the ***innovation infrastructure***, as it is well documented that the region has sufficient high-speed broadband capacity.[6] In addition, because of its proximity to Boston, the N^2 Corridor is well served by professional services providers focused on innovation-based companies.

Lastly, we note that the N^2 Corridor itself has a thin ***entrepreneurial ecosystem***. While the cities of Boston and Cambridge boast a wide variety of entrepreneurial support organizations, and Newton has lured the MassChallenge accelerator program and the Cambridge Innovation Center (CIC) to open satellite operations in Newton Corner, these are not present in the N^2 Corridor itself.

Findings

Our findings are that Newton and Needham are home to many innovators, but that the vast majority of their work is assigned to companies and institutions that are outside the two municipalities, and that furthermore that distribution is quite unlike the commuting patterns described in the Economic Base Analysis appendix. For instance, 28% of Newton and Needham residents commute to Boston, but only 16% of the patents are assigned there. On the other hand, 6 percent of residents commute to Cambridge, but 27% of patents are assigned there. Although 29 percent of residents work in the two municipalities, only 7 percent of the patents are assigned to companies there. Although some Newton- and Needham-based companies have patents or SBIRs or have raised

[6] The National Broadband Map shows eight vendors offering speeds in excess of 3Mbps in the corridor. http://www.broadbandmap.gov/internet-service-providers/281-needham-street,-newton,-ma/lat=42.308697/long=-71.21559869999999/.

venture capital, only a small number are based in the N^2 Corridor itself. Of the companies that are in the Corridor, most are larger, and growing, and some are still raising later rounds of capital.

We found that only a handful of Newton and Needham innovators that have assigned their patents to a start-up or to SBIR-, seed-, or angel-funded companies are still in the municipalities, and virtually none are in the Corridor. This confirms the generally held belief that start-ups in the Boston metro area are converging downtown and in Cambridge.

Similarly, some of the most productive Newton and Needham inventors work at the region's institutions of higher education and/or medical schools/teaching hospitals, but not in the N^2 Corridor or at the schools within five miles of the Corridor.

Newton and Needham are home to many innovators

In an innovative state, Newton and Needham are home to many innovators. In a single year (2015), 596 individual inventors were awarded 1,064 patents. This is 8.98 patents per 1,000 residents. For the entire state of Massachusetts, the patenting rate is 1.52 per 1,000 residents, and for the U.S. as a whole, it's 1.02. This result is not that surprising given the high educational attainment and high income levels in Newton and Needham.

The top local innovators in 2015 are listed below. To obtain even a single patent in one year is an extraordinary accomplishment, but these individuals were listed on more than ten patents, with one listed on 34.

Newton and Needham Inventors With Ten or More Patents in 2015

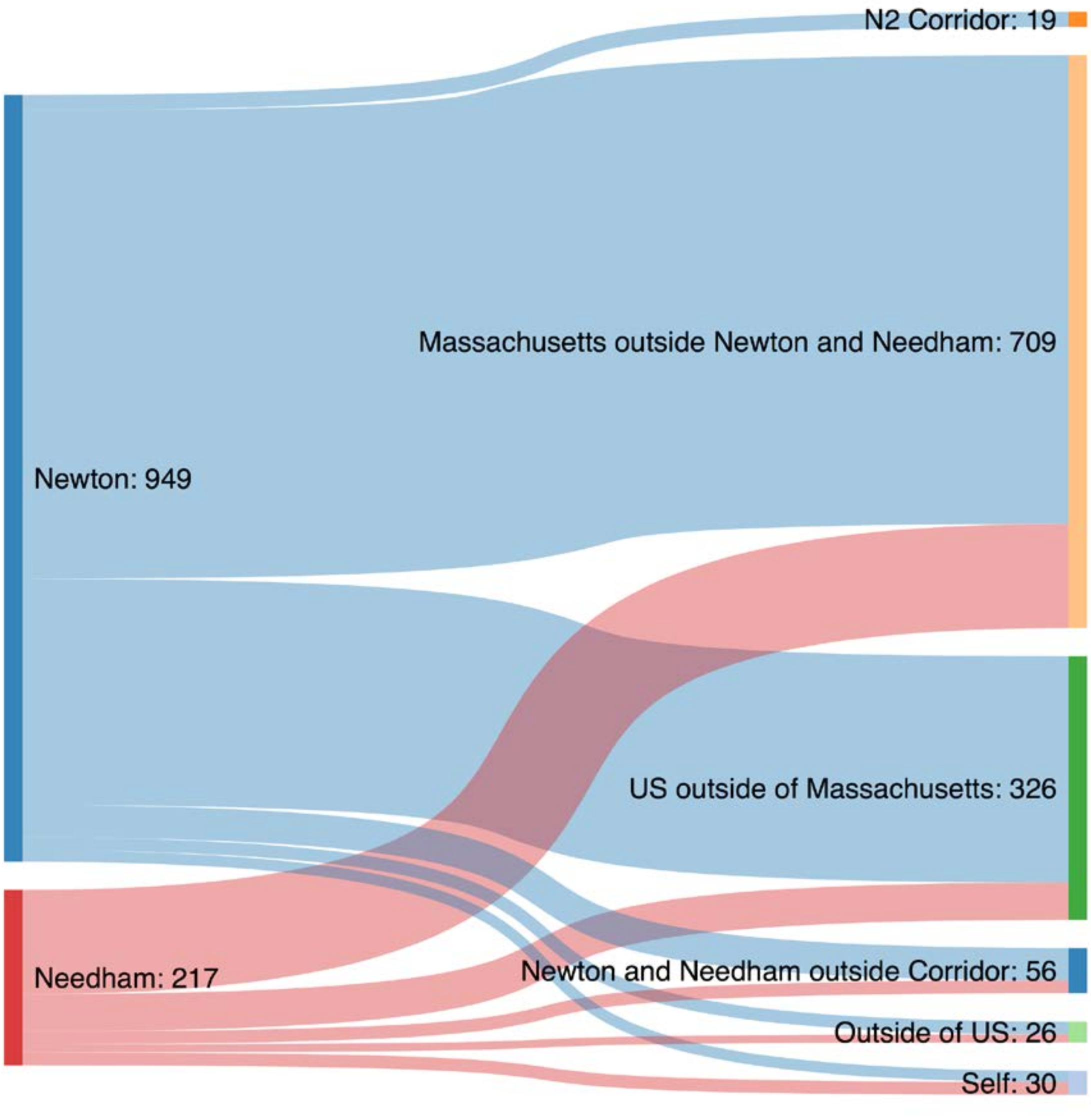
Last Name	First Name	Patents
Langer	Robert	34
Don	Arien	15
Faibish	Soren	15
Neustadt	Keith	12
Metcalf	Chester	12
Dotan	Yedidya	11
Marshak	Marik	10

Source: Innovation Policyworks LLC analysis of USPTO records

Most Newton and Needham innovators work for large companies, universities, and/or medical institutions

Only 75 of the over 1,000 patents awarded to Newton and Needham innovators in 2015 were assigned to companies in area; 709 went to companies and institutions in Massachusetts, but outside Newton and Needham; 326 went to companies headquartered in the U.S., but outside of Massachusetts, and 26 went to companies headquartered outside of the U.S. It is likely that many of the companies headquartered outside of Massachusetts actually have locations in the state, so the “drain” of intellectual property outside of the state is relatively minor.

This diagram shows the locations of the patents awarded to Newton and Needham residents in 2015.



Source: Innovation Policyworks LLC analysis of USPTO records

The top locations for companies that were assigned patents from Newton and Needham residents are listed below.

Top Locations for Companies Assigned Patents from Newton & Needham Residents

In Mass	Newton	Needham	Total
Cambridge	167	24	191
Boston	101	26	127
Hopkinton	63	4	67
Waltham	40	8	48
Newton	36		36
Natick	23	4	27
Marlborough	19	6	25
Framingham	22		22
Lexington	11	11	22
Bedford	12	8	20
Watertown	10	10	20
Norwood	12	3	15
Raynham	8	7	15
Billerica	7	3	10
Burlington	8	2	10
Chelmsford	10		10
Ipswich	8		8
Milford	3	4	7
Westborough	7		7
Danvers	6		6

Source: Innovation Policyworks LLC analysis of USPTO records

Other States	Newton	Needham	Total
California	107	11	118
New Jersey	36	14	50
New York	41	4	45
Washington	21	1	22
Utah	20		20
Illinois	17		17
Florida	4	1	5
Maryland	5		5
New Hampshire	3	2	5
District of Columbia	3	1	4
Michigan	3	1	4

Source: Innovation Policyworks LLC analysis of USPTO records

Other Countries	Newton	Needham	Total
Japan	3	3	6
Switzerland	2	2	4
France	2	1	3
Israel	2		2
Sweden	2		2
Ireland		2	2

Source: Innovation Policyworks LLC analysis of USPTO records

A total of 375 companies were assigned patents by Newton and Needham inventors. The USPTO lists inventors by their residences, however by the terms of their employment, most inventions are assigned to their employers. This list also demonstrates that companies with headquarters in other states likely have significant research and development operations in the states, such as Merck (NJ) and Schlumberger (IL).

These employers all had ten or more patents assigned to them in 2015 alone by Newton and Needham residents.

Top Employers Assigned Patents by Newton and Needham Inventors, 2015

Employer	Patents by Newton and Needham Inventors
EMC*	67
MIT	53
Merck	30
General Hospital	28
Harvard	26
Bose	22
Draper Labs	21
MathWorks	20
Schlumberger	18
iRobot	18
Pfizer	15
Invention Science Fund	15
Mitsubishi	14
IBM	14
Brigham & Women's	14
Symantec	13
Analog Devices	13
AbbVie	11

Source: Innovation Policyworks LLC analysis of USPTO records

**In this analysis, we counted EMC by its headquarters in Hopkinton, but it also has a presence in the Corridor.*

Few Newton and Needham companies that have assigned patents are in the Corridor

Seventy-one companies with headquarters in Newton and Needham were assigned patents by residents of these two localities, but few are in the Corridor. Here is a list of the companies with the more than one patent assigned to them with local resident inventors in 2015:

Newton and Needham Companies	Location	Number of Patents Assigned, 2015
Boston College	Newton	6
Karyopharm	Newton	4
Euro-Pro	Newton	3
Topokine	Newton	3
N-Vision Optics	Needham	2
Energy Intelligence	Newton	2
General Compression	Newton	2
K-NFB Reading	Newton	2

Source: Innovation Policyworks LLC analysis of USPTO records

More interestingly, the list below is of companies in the two localities that had more than one patent assigned to them in 2015, regardless of the residence of the inventors:

Company	Location	Number of Patents Assigned, 2015
Euro-Pro	Newton	46
H.C. Starch	Newton	9
Shark Ninja	Newton	8
General Compression	Newton	6
PTC	Needham	5
Topokine	Newton	4
KaryoPharm	Newton	3
Attenuex Technologies	Newton	3
PeerApp	Newton	2
CellDex	Needham	2
N-Vision Optics	Needham	2
K-NFB	Newton	2
Self	Newton	2
CoActive Technologies	Newton	2

Source: Innovation Policyworks LLC analysis of USPTO records

The companies located in the N^2 Corridor itself that have patents assigned to them, regardless of the residence of the inventors, are listed below.

Company	Location	Number of Patents Assigned, 2015
Euro-Pro	Newton	46
H.C. Starch	Newton	9
Shark Ninja	Newton	8
PTC	Needham	5
KaryoPharm	Newton	3
PeerApp	Newton	2
CellDex	Needham	2
N-Vision Optics	Needham	2
Medminder	Newton	1
Overture Networks	Newton	1
Ambient Corp	Newton	1
Visual IQ	Needham	1
Verastem	Needham	1

Source: Innovation Policyworks LLC analysis of USPTO records

Some of the most innovative companies in the N^2 Corridor are highlighted here.

Trip Advisor (Needham)

Founded in 2000 by Stephen Kaufer and Langley Steinert, TripAdvisor is a travel website that provides reviews and other information for consumers about travel destinations around the world. The company is now pervasive, with 65 million unique visitors each month scouring the site for reviews of hotels, restaurants and sites around the globe.

TripAdvisor grew rapidly. The company agreed to be acquired by Expedia/IAC in 2004 for $210 million in cash, a huge win for all, particularly given their amazing capital efficiency: They had only raised $4 million in venture capital. Under Expedia, TripAdvisor continued to flourish and grow. It would feature Expedia's ads on its site and reap the revenue benefit when users clicked on those ads. Expedia grew to account for roughly one third of the company's revenues. In December 2011, Expedia felt it wasn't getting full economic credit for TripAdvisor buried within its financials and so spun TripAdvisor out as an independent company, where it now trades on the NASDAQ with a $4.8 billion market capitalization as of this writing.

PTC (Needham)

PTC was founded in 1985 and went public in 1988. Since then, the company has acquired 24 other software companies, including Prime Computer and Computervision, relics of Boston's early minicomputer industry.

Today, PTC transforms the way customers create, connect, operate and service smart things and systems through the combination of process know-how and best of breed capabilities, all delivered through a flexible platform. Its solutions for Computer Aided Design (CAD), Product Lifecycle Management (PLM), Application Lifecycle

Management (ALM), Service Lifecycle Management (SLM), and the Internet of Things (IoT) enable process transformation and new sources of innovation for products and services that are increasingly smart and connected. The combination delivers a disruptive suite of technology that enables companies to securely connect smart things, quickly create applications, and ultimately transform the value chain.

Turbine (Needham)

Turbine is a pioneering developer and operator of online entertainment, with breakthroughs in the free-to-play model and successful long-running titles like The Lord of the Rings Online™ and Dungeons & Dragons Online™. Founded in 1994, Turbine has been developing acclaimed online games for over 20 years. Johnny Monsarrat, Jeremy Gaffney, Kevin Langevin, and Timothy Miller founded Turbine, though Warner Brothers Home Entertainment Group recently acquired the company. The company has been credited with pioneering the 3-D massively multiplayer role-playing game in 1999 with the release of Asheron's Call, an online title.

Turbine recently expanded its 45,000-square-foot facility to incorporate a 24,000-square-foot addition. The studio employs more than 350 people, and among those positions available within the company are roles for game designers, artists, animators, programmers, systems engineers, and game testers. In fact, Turbine has a large quality assurance stable, as well as customer service team, that are at the forefront of ensuring that online gamers enjoy a bug-free experience. Additional departments include marketing, database management, finance, and administration.

SharkNinja (formerly Euro-Pro) (Needham and Newton)

Founded in 1993, this company has two major brands, Shark vacuums and Ninja food processors/blenders. The company has been on the INC 500 for five of the last six years and is experiencing rapid growth. Its website says: "We engineer cutting-edge, easy-to-use technology. We foster an environment of breakthrough thinkers, who look forward to creating the next big thing. And we keep our customers at the heart of every product we develop."

In mid-2015, Euro-Pro announced its corporate rename to SharkNinja. This change allows the company to capitalize on the awareness, consumer trust and success of each brand to establish one unified identity. With more than $1.6 billion in annual revenue, the company has the top-selling and highest consumer-rated vacuum cleaner in the U.S., and #1 market share across the motorized kitchen appliances space.

SharkNinja has also implemented an aggressive real estate strategy, announcing its signing of a lease for a new 150,000 square foot world-class corporate headquarters in Needham, and pursuit of new facilities for its teams currently based in Alabama and Suzhou, China, as well as the opening of an office in Toronto, Ontario. In the last year the company has also opened a state-of-the art distribution center in Chino, California; a sales office in Wakefield in the United Kingdom; and a design center in downtown London.

Verastem (Needham)

Verastem, Inc. (NASDAQ: VSTM) is a clinical-stage biopharmaceutical company focused on discovering and developing drugs to treat cancer by the targeted killing of cancer stem cells. Cancer stem cells are an underlying cause of tumor recurrence and metastasis. Verastem is developing small molecule inhibitors of signaling pathways that are critical to cancer stem cell survival and proliferation: FAK, PI3K/mTOR and Wnt.

In October 2015, the company announced a reduction of its workforce by approximately 50% to twenty full time employees. This was likely related to the announcement only a week before of disappointing results from a clinical study of a mesothelioma drug, and that the drug was pulled from further research.

Last year, the company moved to Needham from Cambridge amid much fanfare. It signed a lease for a 15,000-square-foot space on Kendrick Street in Needham, in an office park that is home to a research lab for Celldex Therapeutics and is where Karyopharm later relocated to from Natick. The new headquarters doubled the size of its previous office in Kendall Square, where it had been located since soon after its founding in 2010. Verastem has said that part of the motivation to move was that the Cambridge offices were already cramped for the 30 employees that worked there. "

In 2014, the company touted its now discontinued drug that was aimed at mesothelioma. Verastem has been quoted as foreseeing a change in demographics within the company: Its president has said, "We've gone from a discovery company to a full-fledged drug and soon-to-be commercial company," and as a result he expected to attract more experienced employees in the suburbs.

CyberArk

CyberArk touts itself as the only security company laser-focused on striking down targeted cyber threats, those that make their way inside to attack the heart of an enterprise. Dedicated to stopping attacks before they stop business, CyberArk's clients include some of the world's leading companies—in fact, 40% of Fortune 100 companies—who entrust CyberArk to protect their highest-value information assets, infrastructure and applications.

CyberArk has been a market leader for over a decade and today is delivering a new category of targeted security solutions that help leaders stop reacting to cyber threats and get ahead of them. At a time when auditors and regulators are recognizing that privileged accounts are the fast track for cyber attacks and demanding stronger protection, CyberArk's security solutions master high-stakes compliance and audit requirements while arming businesses to protect what matters most.

The company started in 1999 and in 2011 raised $40 million in investment led by Goldman Sachs and Jerusalem Venture Partners. The deal included the purchase of stock from existing shareholders as well as growth capital. CyberArk had previously raised $25 million in venture and angel capital. In September 2014, CyberArk raised $92.5 million in its IPO. As of 2011, the company had 170 employees worldwide.

Bigbelly Solar

Trash-can maker Bigbelly Solar Inc. more than doubled the size of its headquarters when it moved to Needham in June 2015, leaving its home in Newton behind.

Bigbelly was founded in 2003 with the goal of transforming one of the least efficient and resource-intensive industries on the planet—waste collection. Cities typically either collect too often and waste fuel and labor while creating CO2 emissions or are not able to keep up with the demands and overflowing trash cans and the associated litter, health and safety issues.

Solar-powered trash compactors made by Bigbelly are a familiar sight on the streets of big cities including Amsterdam, Boston, Chicago, Dublin, Hamburg, New York and Stockholm. The company said it ended 2014 with more than 1,500 customers in 47 countries on its account list. That's roughly 30,000 bins worldwide. The 12-year-old company's original sales pitch centered on helping municipalities, business districts, and university administrations reduce the number of trash pickups required on routes. That's one reason that Waste Management jumped on board as a key distribution partner.

The Bigbelly "can" is a sleek and distinctive design. Solar panels are embedded in the top, gathering energy even when there's no direct sunlight. Each unit has a capacity of up to 150 gallons, over four times the capacity of a traditional 35-gallon trash can. Built-in sensors detect when a container has reached capacity.

Looking ahead, Bigbelly's aspirations rise far above smarter waste management. It is endowing its trash systems with additional sensors and wireless communications technologies that enable it to collect and communicate a variety of useful data points both about the system itself, as well as the surrounding environment. Those metrics could include capacity updates, how many times per day a bin is used, footfall measurements (which would count passersby), temperature, humidity or even radiation. Because solar energy already runs the units, the power source argument is already settled. By communicating "status" reports to a central dashboard, municipal agencies can gather richer information about the neighborhoods where the Bigbelly containers are being used. The units also could serve as a source of municipal wireless service.

Karyopharm Therapeutics

Karyopharm Therapeutics Inc. is a clinical-stage pharmaceutical company focused on discovery and development of novel first-in-class drugs directed against nuclear transport targets for the treatment of cancer and other major diseases. In May 2015, Karyopharm expanded its presence in the its Wells Street building in Newton by 16,234 square feet, bringing its total footprint to 46,167 square feet of office and laboratory space on the second and third floors. Karyopharm selected the location in May 2014 after outgrowing its Natick facility.

However, in August 2015, shares of Karyopharm Therapeutics fell to their lowest point since December 2013 after the company said it has lowered the dosage of its lead cancer drug in an ongoing mid-stage trial due to concerns about a higher-than-expected incidence of sepsis.

Few N^2 Corridor innovative companies are small

Looking at the list of innovative companies in the N2 Corridor (based on their patenting history), we find that these are generally larger companies. Another approach is to look at N2 Corridor companies that have won Small Business Innovation Research (SBIR) or Small Business Technology Transfer (STTR) awards. SBIR and STTR are federal initiatives where a portion of each agency's R&D budget is set aside for award to companies with less than 500 employees. We looked at 2014 and 2015 winners in the zip codes of interest. In the two years, we found 20 companies listed, several of which had won multiple awards. In general, MA is very strong in SBIRs, with 575 in 2014 and 235 in 2015. MA is usually first or second in the nation in SBIRs awarded.

There are four SBIR winners in the N2 Corridor, but all are older small businesses (not start-ups). These are: Polestar Technologies, Inflexxion, the Center for Social Innovation, and Celldex Therapeutics (headquartered in New Jersey).

Interestingly, two more companies won SBIRs based from home addresses in the area, but the companies have moved to Cambridge/Allston. This pattern was also reflected in the patent data, where two small, start-up companies appeared to be located in Newton or Needham, but a check of their website showed Boston or Cambridge addresses, indicating that they have moved.

Few start-up companies are located in the Corridor

Reviewing financing data, we find that thirteen companies in Newton and Needham raised seed, angel or venture capital in 2015, according to CrunchBase. Of these, the smallest and most early stage companies have either moved to Cambridge or are located outside the N^2 Corridor.

However, seven companies that raised capital in 2014 and 2015 are located in the N^2 Corridor. Only three are very early stage. The rest are raising significant amounts of capital, indicating that they are farther along in their development.

Company Name	Amount Raised in 2014/15	Total Raised to Date
Ever Present	$600,000	$1.2 million
BBK Worldwide	$3 million	$3 million
Priority 5	$60,000	$60,000
Kaminario	$15 million	$108 million
Intigua	$21 million	$29.6 million
Inflexxion	Undisclosed	Undisclosed
Colonary Concepts	$2.25 million	$4.35 million

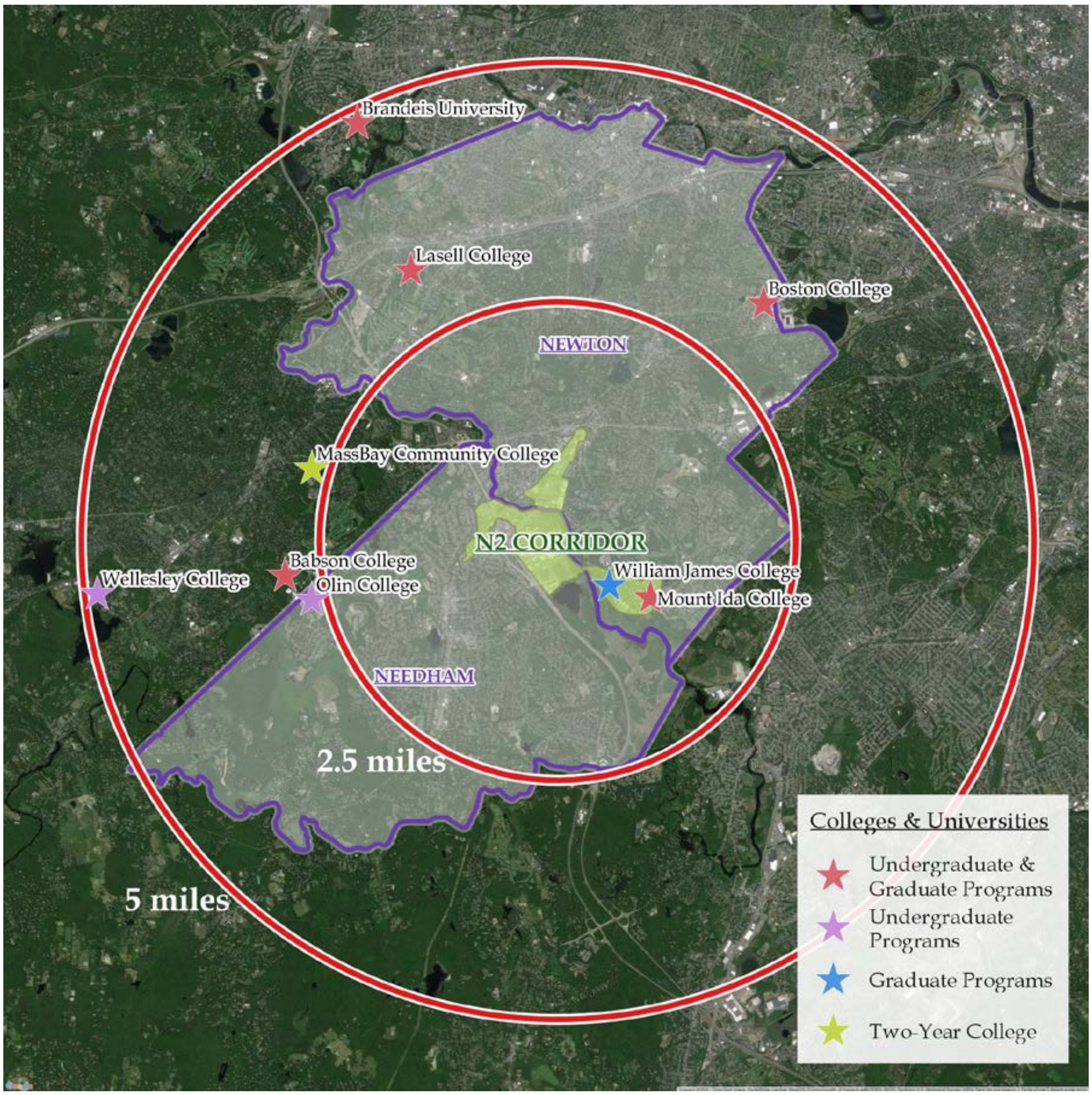
Source: CrunchBase, https://www.crunchbase.com

However, it should be noted that thirty residents of Newton and Needham were awarded patents in 2015 that were not assigned to anyone else, usually an indication of a potential entrepreneurial business. And, the economic base analysis shows 2,002 people self-employed in the two localities in the professional, technical and scientific services NAICs, another indication of potential entrepreneurial activity.

N^2 Corridor institutions of higher education aren't research-focused

There are five institutions of higher education in Newton and Needham (Olin College, Boston College, Mount Ida College, William James College, Lasell College, and part of Babson College) with two directly in the N^2 Corridor, and there are several others just outside the municipalities (Wellesley College, Brandeis University, and MassBay Community College). The map on the following page shows these institutions' location relative to the N^2 Corridor.

Only Boston College has a research mission in addition to its educational mission. It was awarded six patents from Newton and Needham residents in 2015, and has a portfolio of 50 patents overall.



The entrepreneurial ecosystem is thin in the N^2 Corridor

In terms of the traditional elements of an entrepreneurial ecosystem, Newton and Needham are thinly served. Although the Cambridge Innovation Center and Mass Challenge have opened offices in Newton Corner, there are no such facilities in the N^2 Corridor.

Summary

As summarized in the table below, Needham and Newton already have several established or emerging innovation ecosystem elements, and clearly benefit from proximity to the larger Boston metro innovation ecosystem. However, the full suite of innovation drivers is not yet as mature in Newton and Needham as they are in traditional innovation districts, and in some cases are not represented in the N^2 Corridor itself.

Elements of an Innovation Economy	N2 Corridor	Newton and Needham	Greater Boston
Source of innovation	Few	Many	Many
Companies, large and small	Some, mostly larger	Some, mostly larger	Many, both
Skilled STEM knowledge workers	Many, skewed older	Many, skewed older	Many
Innovation infrastructure	Good	Good	Excellent
Entrepreneurial community	Thin	Emerging	Very Strong

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Appendix C: Demographic & Economic Base Analysis

N² INNOVATION CORRIDOR ECONOMIC DEVELOPMENT STRATEGY & MARKETING PLAN

March 2016

Prepared for:

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About Camoin Associates

Camoin Associates has provided economic development consulting services to municipalities, economic development agencies, and private enterprises since 1999. We specialize in real estate market analysis to evaluate the feasibility and impacts of proposed projects. Through the services offered, Camoin Associates has had the opportunity to serve EDOs and local and state governments from Maine to California; corporations and organizations that include Lowes Home Improvement, FedEx, Volvo (Nova Bus) and the New York Islanders; as well as private developers proposing projects in excess of $600 million. Our reputation for detailed, place-specific, and accurate analysis has led to projects in over twenty states and garnered attention from national media outlets including *Marketplace* (NPR), *Forbes* magazine, and *The Wall Street Journal*. Additionally, our marketing strategies have helped our clients gain both national and local media coverage for their projects in order to build public support and leverage additional funding. The firm currently has offices in Saratoga Springs, NY, Portland, ME, and Brattleboro, VT. To learn more about our experience and projects in all of our service lines, please visit our website at www.camoinassociates.com. You can also find us on Twitter @camoinassociate and on Facebook.

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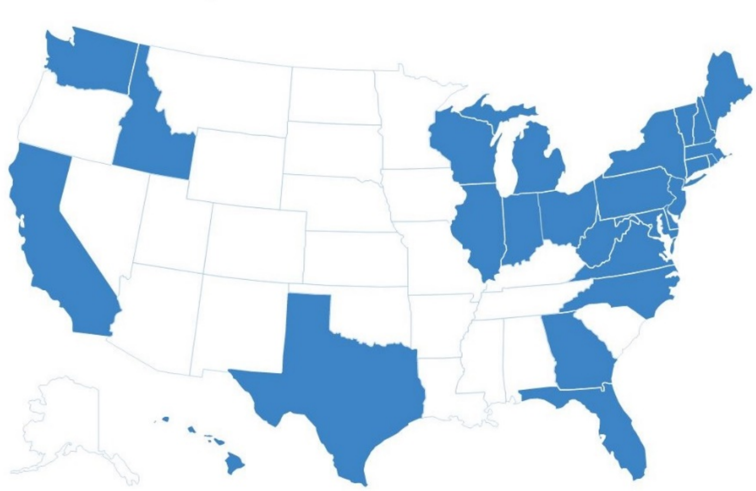


Table of Contents

Executive Summary

As part of the initial research for the N[2] Innovation Corridor Economic Development Strategy & Marketing Plan, Camoin Associates gathered data to fully understand the existing conditions in Newton and Needham in terms of demographics and the economic base. This information will be used to inform the subsequent steps of the analysis including identifying targeted clusters, potential economic development initiatives, and opportunities for economic growth. The following report includes a socioeconomic characterization and an economic base analysis.

Demographic Analysis

There are a number of significant demographic and socioeconomic trends that are shaping the context in which Newton and Needham strive to become a hub of innovation within the Boston region. The demographic composition of these communities impacts the types of firms and employees that choose to locate within them.

- After a decade of relatively flat population growth during the 2000s, both Newton and Needham have experienced an uptick in growth since 2014, with growth rates surpassing the state and nation.
- Newton and Needham both exhibit bimodal age distributions, with a high share of population within the adolescent/young adult and later middle-age cohorts. Both communities have a significant lack of young adults (25 to 40 year olds) relative to the MSA and state overall. This bimodal age distribution is, in part, a function of the communities' housing market, which is skewed toward single-family homes and has limited affordable options for young adults.
- Incomes and educational attainment in the two communities are very high. Median household income stands at $118,000 in Newton and $131,000 in Needham, compared to $75,000 in the Boston MSA. Almost half of all residents over age 25 in Newton and Needham have a graduate or professional degree. This points to the high desirability of the two communities and the availability of amenities sought by high-income, highly educated residents.
- Newton and Needham have proportionately more white and Asian residents, and fewer black and Hispanic residents, when compared to the Boston MSA, Massachusetts, and the nation.
- Relative to the comparison geographies, Newton has a high share of foreign-born residents, with 21% of the city's population born abroad. Newton is perceived as an attractive location for foreign entrepreneurs seeking to start and expand businesses in the Boston region.
- Twenty-two percent (22%) of Newton and Needham workers also live in the two municipalities. This means that 78% of workers are commuting in from other cities and towns. Fifteen percent (15%) live in Boston. This highlights the crucial role of efficient transportation connections between Newton and Needham and the surrounding region. In order for innovative businesses to be successful in these communities, they must be accessible to the skilled workforce they employ.

Economic Base Analysis

An analysis of Newton and Needham's economic composition points to several key industries that have recently driven growth within the two communities. These sectors will be of primary importance as Newton and Needham seek to attract and support entrepreneurs and innovators.

- Small firms are driving employment growth in the Boston region. Mirroring national trends, small firms accounted for the highest employment growth in the Boston MSA between 2003 and 2013. Firms with between 2 and 9 employees accounted 59% of all job growth over that period. Meanwhile, firms with 500 or more employees were the only category to lose jobs.

- Job growth in Newton and Needham has lagged slightly behind the Boston region, but is on par with Massachusetts. The Newton and Needham economies added 4,600 jobs between 2005 and 2015, an increase of 6%. This compared to growth of 8% in Boston MSA and 6% in Massachusetts, and 5% nationally. The most significant growth sectors in Newton and Needham include:
    - Health Care and Social Assistance (+4,900 jobs, +43%)
    - Professional, Scientific, and Technical Services (+1,880 jobs, +21%)
    - Information (+450 jobs, +16%)
- The sectors with the largest contractions included:
    - Manufacturing (-2,500 jobs, -54%)
    - Finance and Insurance (-600 jobs, -16%)
    - Retail and Wholesale Trade (-800 jobs, -9%)
- The communities' most highly concentrated sectors include Educational Services; Real Estate; Information; and Professional, Scientific, and Technical Services. These sectors all have national location quotients over 2, indicating that employment in these sectors as a share of Newton and Needham economy-wide employment is more than double their share nationally.
- A formal analysis of Newton's and Needham's sources of innovation follows in a subsequent task. However, from the economic base analysis, interviews, and other information collection, it is clear that the communities are home to a number of higher education institutions, companies in technology and life sciences, and entrepreneurial companies. Camoin Associates will build on the economic base analysis by performing a more detailed set of analyses on the following broad industry categories: healthcare; real estate; professional, scientific, and technical services; the information industry; and biotechnology and life sciences. This will inform the prioritization of more specific industries for expansion and attraction efforts, and the development of strategies to leverage and build on innovation assets to help foster that growth.

Introduction

As part of the initial research for the N^2 Innovation Corridor Strategic Plan, Camoin Associates gathered data to fully understand the existing conditions in Newton and Needham in terms of demographics and the economic base. This information will be used to inform the subsequent steps of the analysis including identifying targeted clusters, potential economic development initiatives, and opportunities for economic growth. The following report includes a socioeconomic characterization and an economic base analysis.

Data Sources

Much of the data in this report was acquired from ESRI Business Analyst Online (ESRI) and Economic Modeling Specialists Intl. (EMSI). ESRI's base data are the 2000 and 2010 Census. It uses proprietary statistical models and updated data from the U.S. Census Bureau, the U.S. Postal Service, and various other sources to project current statistics and future trends. ESRI data are often used for economic development, marketing, site selection, and strategic decision making. For more information, visit www.esri.com.

EMSI's data are compiled from several sources, including the U.S. Census Bureau and U.S. Departments of Health and Labor using specialized proprietary processes and models to estimate current statistics and predict future trends. Visit www.economicmodeling.com for additional information. The data used are from EMSI's "complete employment" data set, which includes both covered and uncovered jobs.[1] In other words, it includes both traditional employment and non-traditional employment such as the self-employed (self-employed includes sole proprietorships and partnerships). As traditional jobs have been replaced or augmented by freelance work, consulting, and self-employment, these non-covered jobs have become much more important to the economy, and EMSI provides researchers with a way to track the trends over time.

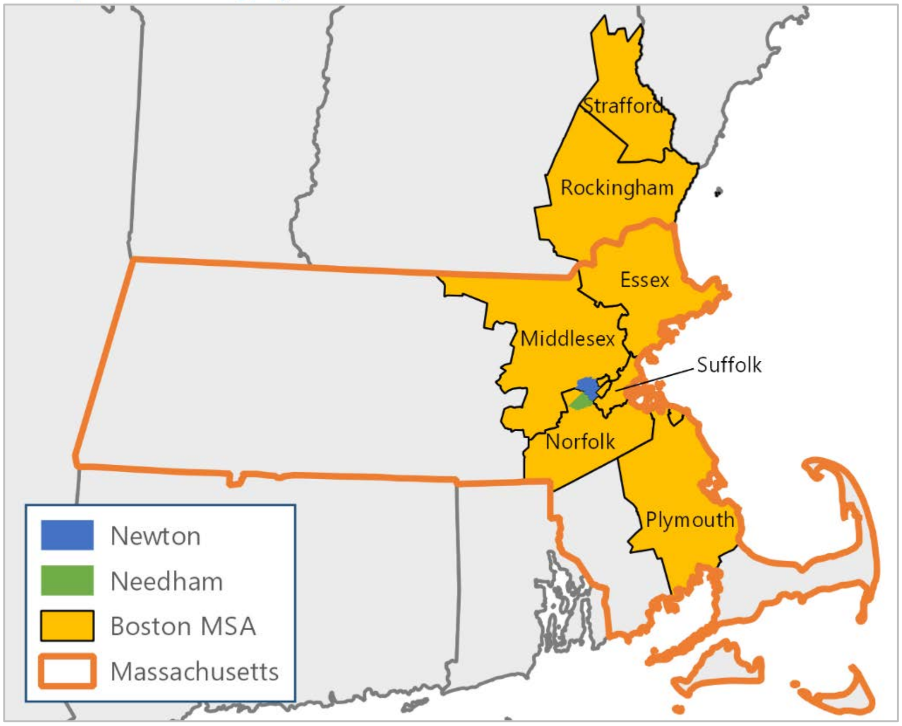
Other sources include the American Community Survey for demographic and socioeconomic data and YourEconomy.org for data on establishments by stage of growth.

[1] Jobs covered by unemployment insurance are tracked by the Bureau of Labor Statistics' Quarterly Census of Employment and Wages, but EMSI uses EMSI Complete Employment uses Bureau of Economic Analysis data (www.bea.gov/bea/regional/) as its primary benchmark. In addition to jobs covered by QCEW, BEA data attempt to count all types of paid employment.

Comparison Geographies

This data analysis was conducted to identify existing conditions and trends within industry sectors that make up the Newton/Needham economy in comparison to the regional and state economies. Data was collected for the following geographies: The municipalities of Newton and Needham, the Boston metropolitan statistical area (MSA),[2] and the Commonwealth of Massachusetts.

Comparison Geographies



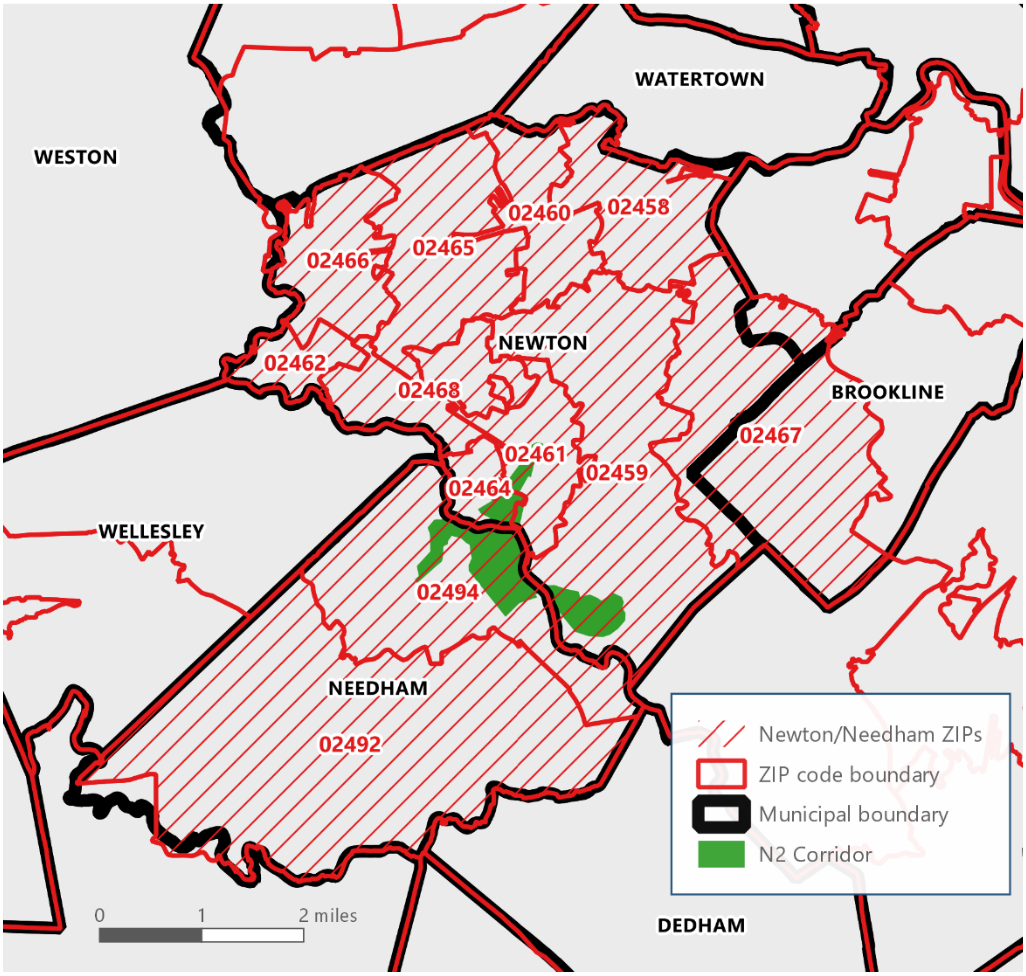
[2] As defined by the U.S. Office of Management and Budget, the Boston MSA (officially, the Boston–Cambridge–Newton MSA) is comprised of seven counties in Massachusetts and New Hampshire that have a high degree of social and economic cohesion with the Boston urban core. These counties include Essex, Middlesex, Norfolk, Plymouth, and Suffolk counties in Massachusetts; and Rockingham and Strafford counties in New Hampshire.

Most demographic and socioeconomic data analyzed for this report is available at the county subdivision level, i.e. tabulated for the municipalities of Newton and Needham. The exception is the employment data gathered from EMSI, for which the smallest available geography is the ZIP code. For the purpose of presenting employment data for Newton and Needham, the municipal boundaries were approximated using 12 ZIP codes. These ZIP codes are listed in the table at right. As shown in the map below, the 12 ZIP codes used align fairly well with municipal boundaries, with the exception of 02467 – Chestnut Hill, which encompasses a large part of the Town of Brookline, as well as a small piece of the City of Boston. It is important to note that jobs located in these other municipalities are included in the EMSI employment data.

Newton/Needham ZIP Codes

ZIP Code	Postal Area Name
02458	Newton
02459	Newton Center
02460	Newtonville
02461	Newton Highlands
02462	Newton Lower Falls
02464	Newton Upper Falls
02465	West Newton
02466	Auburndale
02467	Chestnut Hill
02468	Waban
02492	Needham
02494	Needham Heights

Employment Data ZIP Code Geography



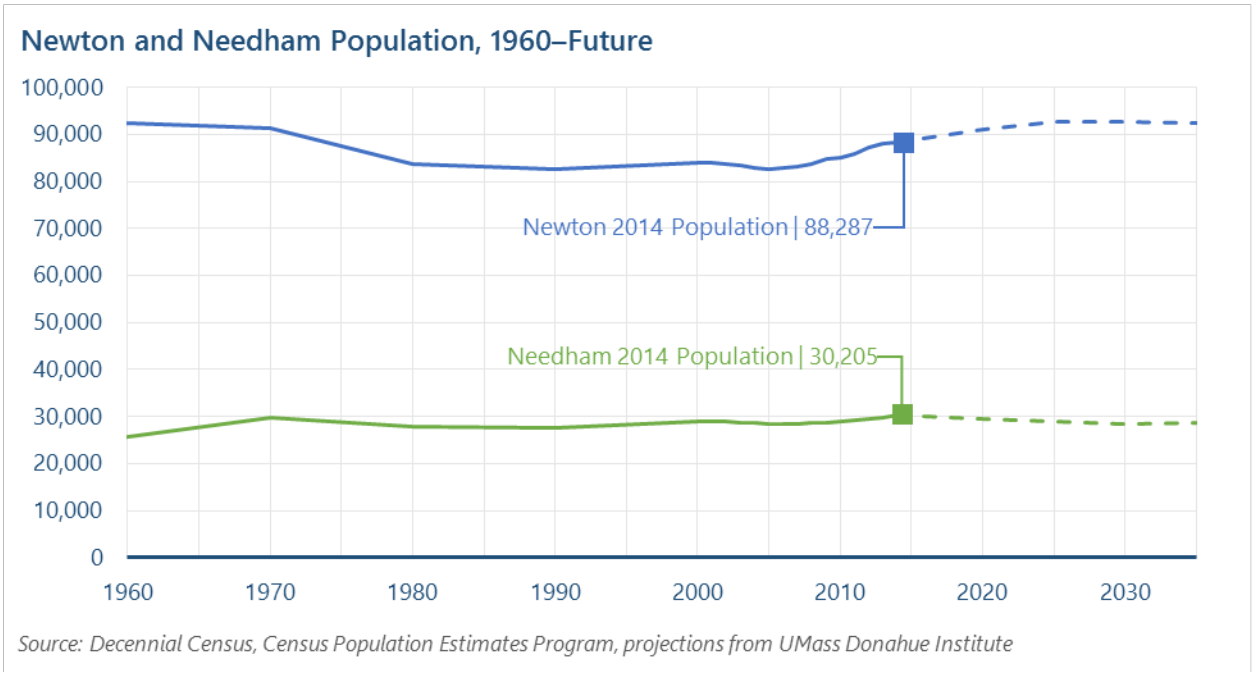
Demographic Analysis

As part of the planning process, it is important to understand the current socioeconomic conditions in the communities in order to identify challenges and opportunities for future economic development initiatives. The following section highlights some important demographic and socioeconomic characteristics of Newton and Needham.

Population Change

The resident population of both Newton and Needham has remained relatively stable over the past 50 years. Newton reached its all-time peak population of over 92,000 in 1960, from which it declined by almost 10% through 1980. From 1980 through the mid-2000s, the population remained flat, hovering around 83,000. After decades of almost no growth, the city's population has increased significantly in the last ten years. Census population estimates for 2014 place Newton's population at 88,287, its highest point since the 1970s. The population is projected to continue to increase over the next ten years.[3]

Needham has experienced minimal population change since 1970, with population fluctuating by no more than 1,300 residents over that period. Like Newton, there has been a slight upward trend since the mid-2000s, though growth in Needham is more moderate. The 2014 estimate for Needham's population is 30,205, the highest it has ever been.



Newton and Needham have both added more population between 2010 and 2014 than they did over the entire 2000s decade. Needham has grown by 4.6% since 2010, outpacing both the MSA and Massachusetts, while Newton has outpaced Massachusetts with an increase of 3.7%. Collectively, the two communities have added close to 4,500 residents since 2010.

[3] UMass Donahue Institute

While Newton and Needham experienced practically flat population growth between 2000 and 2010, growth in the U.S. as a whole was almost 10%. Since 2010, however, the rate of growth in each of the two communities has been higher than that of the nation, as shown in the following table.

Comparison of Population Growth

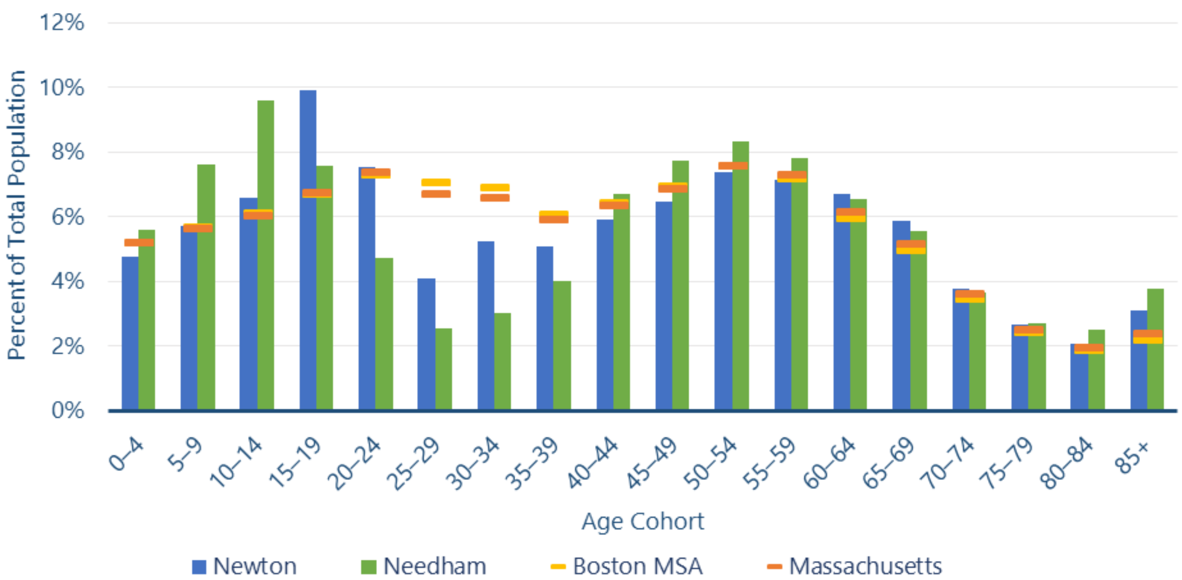
	2000	2010	2014	Pct. Change 2000–2010	Pct. Change 2010–2014
Newton	83,829	85,146	88,287	1.6%	3.7%
Needham	28,911	28,886	30,205	-0.1%	4.6%
MSA	4,355,960	4,552,402	4,732,161	4.5%	3.9%
Massachusetts	6,349,097	6,547,629	6,745,408	3.1%	3.0%
United States	281,421,906	308,746,065	318,857,056	9.7%	3.3%

Source: Decennial Census, Census Population Estimates Program

Age

Newton and Needham both exhibit bimodal age distributions, with a high share of population within the adolescent/young adult and later middle-age cohorts. Newton's largest age cohort is made up of 15 to 19 year olds, while in Needham it is 10 to 14 year-olds. Both communities have a significant lack of young adults (25 to 40 year olds) relative to the MSA and state overall, though this pattern is less extreme in Newton, likely due to the presence of Boston College and other colleges. This bimodal age distribution is, in part, a function of the communities' housing market, which is skewed toward single-family homes and has limited affordable options for young adults.

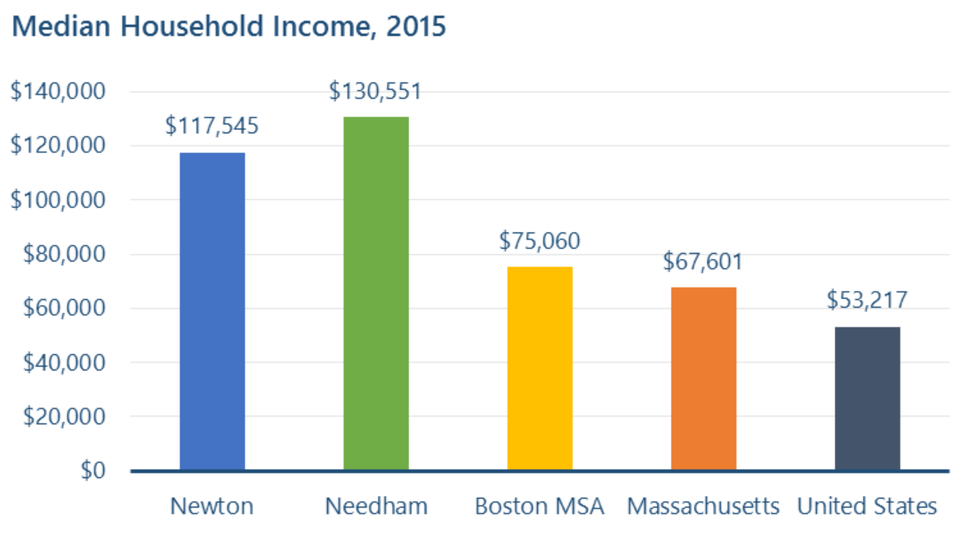
Share of Population by Age Cohort, 2015



Source: Esri

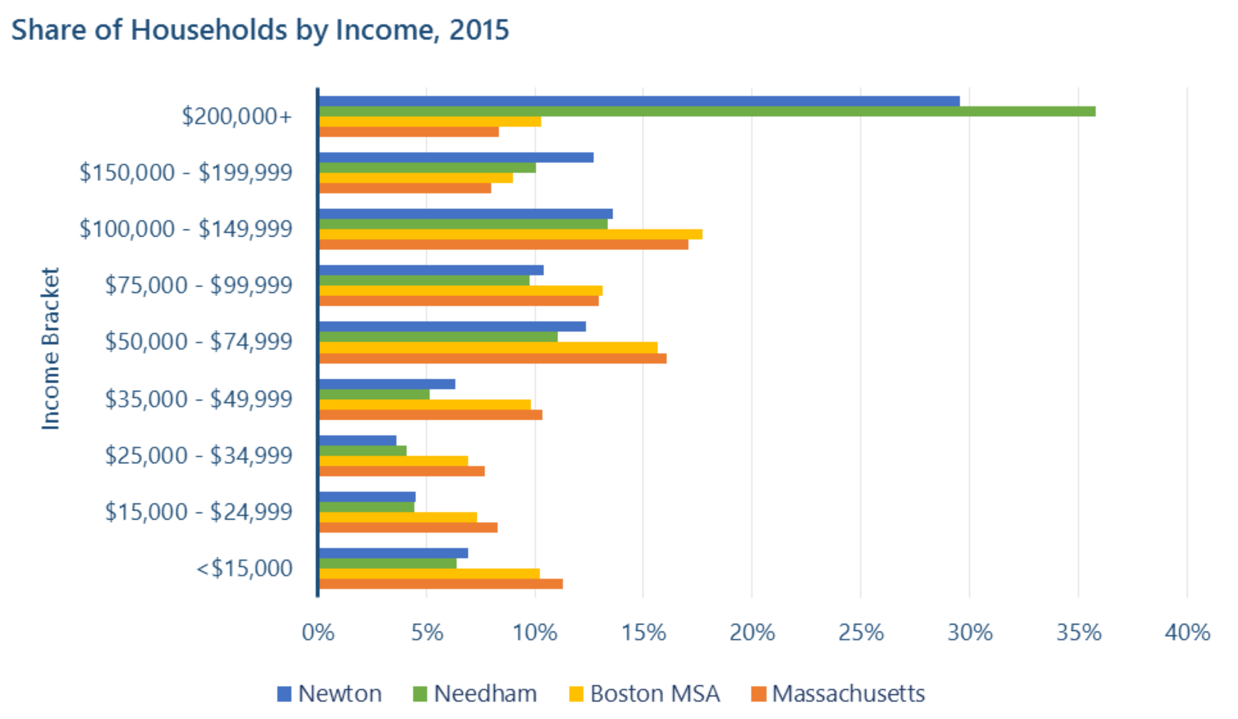
Income

Median household income in both Newton and Needham is very high. In 2015, Newton median household income stands at almost $118,000, which is 57% higher than the Boston MSA median of $75,000. In Needham, the median household has an income of $131,000, 74% higher than that of the Boston MSA.



Source: Esri

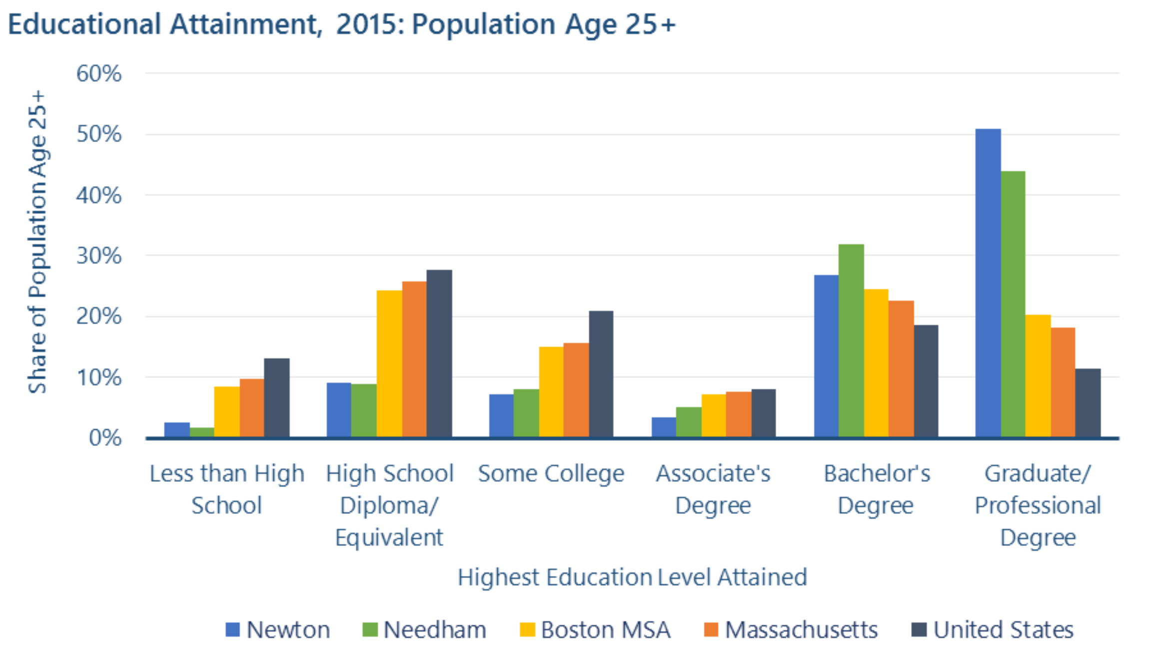
Household incomes in both communities are greatly skewed toward the highest income bracket, with 30% of Newton households and 36% of Needham households earning at least $200,000 annually. This compares to just 10% of households in the Boston MSA and 8% in Massachusetts.



Source: Esri

Educational Attainment

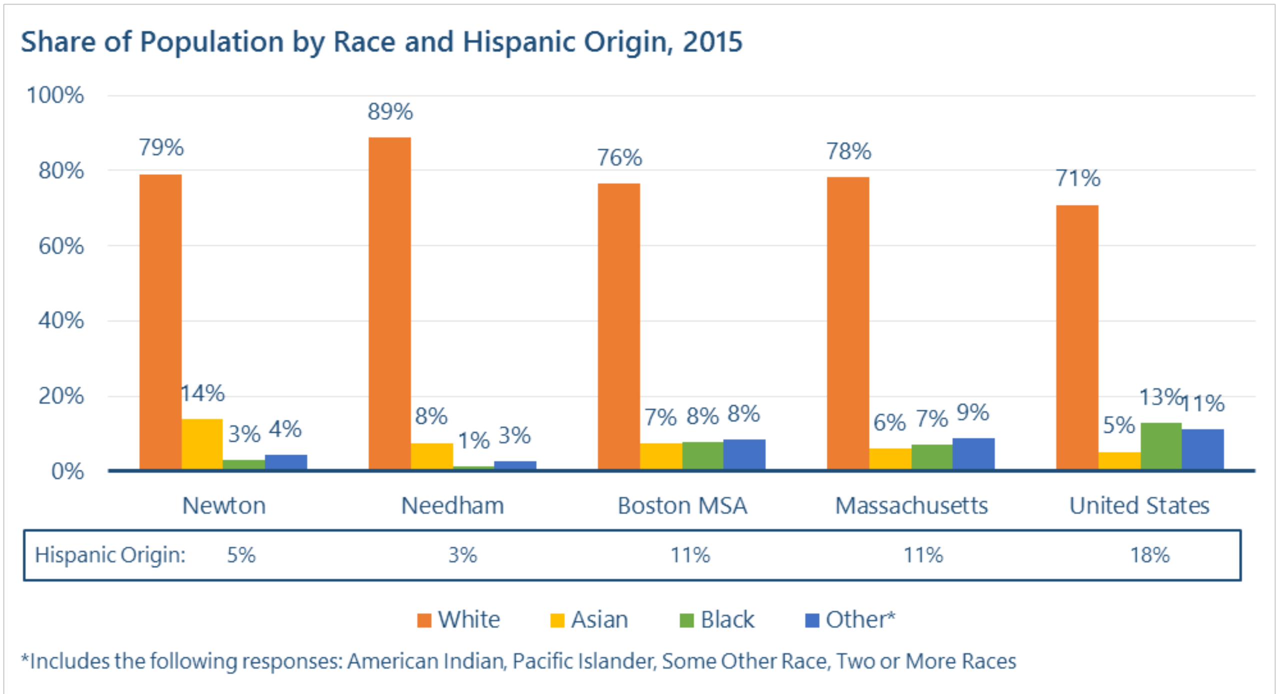
Newton and Needham residents have a very high level of education. Seventy-eight percent (78%) of Newton's 25-and-up population, and 76% of Needham's, have at least a bachelor's degree. This compares to 45% in the Boston MSA and 41% in Massachusetts. Just over half (51%) of Newton residents and 44% of Needham residents have a graduate or professional degree.



Source: Esri

Race/Ethnicity

Non-white residents comprise about 21% of Newton's population and 11% of Needham's population, compared to 24% and 22%, respectively, in the Boston MSA and Massachusetts. Newton has a significant Asian population, with 14% of residents self-identifying their race as Asian, compared to 8% in Needham, 7% in the MSA, and 6% in the state overall. Both communities have disproportionately small black and Hispanic populations. Note that people who identify their origin as Hispanic can be of any race.



Source: Esri

Nativity

Relative to the comparison geographies, Newton has a high share of foreign-born residents, with 21% of the city's population born abroad. By contrast, only 12% of Needham's population is foreign-born. This compares to figures of 17% and 15% for the MSA and state, respectively, and 13% for the U.S.

Nativity of Population

	Native-Born		Foreign-Born		Total
	Population	Pct. of Total	Population	Pct. of Total	
Newton	69,119	79%	17,899	21%	**87,018**
Needham	25,841	88%	3,584	12%	**29,425**
Boston MSA	3,856,545	83%	786,826	17%	**4,643,371**
Massachusetts	5,637,682	85%	1,010,456	15%	**6,648,138**
United States	272,943,892	87%	40,917,831	13%	**313,861,723**

Source: 2013 ACS 3-Year Estimates

Foreign-born residents of Newton and Needham hail from around the globe. Residents born in China account for 20% of the foreign-born population in the two communities, the most of any country. Russia occupies the number two slot, with 8.2% of all residents. India, Korea, and Ukraine round out the top five.

Top 10 Countries of Origin of the Foreign-Born Population, Newton and Needham

Place of Birth	Foreign-Born Population	Pct. of All Foreign-Born
China	4,382	20.0%
Russia	1,809	8.2%
India	1,318	6.0%
Korea	1,317	6.0%
Ukraine	951	4.3%
U.K.	834	3.8%
Iran	711	3.2%
Canada	650	3.0%
Germany	568	2.6%
Israel	542	2.5%
Total (Top 10)	13,082	59.6%
Total (All Foreign-Born)	**21,953**	**100%**

Source: 2014 ACS 5-Year Estimates

Commute Patterns

The following tables show the top 10 places of work for Newton and Needham residents, as well as the top 10 places of residence for Newton and Needham workers. Boston is the most common commute destination for Newton and Needham residents, with 28% of residents traveling to Boston for work. 22% of the municipalities' residents work in Newton. Together, Boston and Newton account for about half of residents' commute destinations, and the top 10 places of work account for 77% of all work destinations, indicating that jobs held by Newton and Needham residents are heavily concentrated in a small number of cities and towns.

Twenty-two percent (22%) of Newton and Needham workers also live in the two municipalities, and 15% are residents of Boston: This points to a substantial number of workers who are "reverse commuting" from the regional core (Boston) out to suburban Newton and Needham. Collectively, the top 10 places of residence for Newton and Needham workers account for 54% of all workers, indicating that the commute shed for in-commuters is geographically more dispersed than that of out-commuters. This pattern can be seen in the maps that follow.

Top 10 Places of Work for Newton and Needham Residents

Place of Work	Number of Residents	Percent of Residents
Boston	15,937	28%
Newton	12,276	22%
Needham	4,182	7%
Cambridge	3,365	6%
Waltham	2,365	4%
Wellesley	1,747	3%
Brookline	1,187	2%
Framingham	1,159	2%
Watertown	898	2%
Burlington	646	1%
Total (Top 10)	43,762	77%
Total (All Places of Work)	**56,699**	**100%**

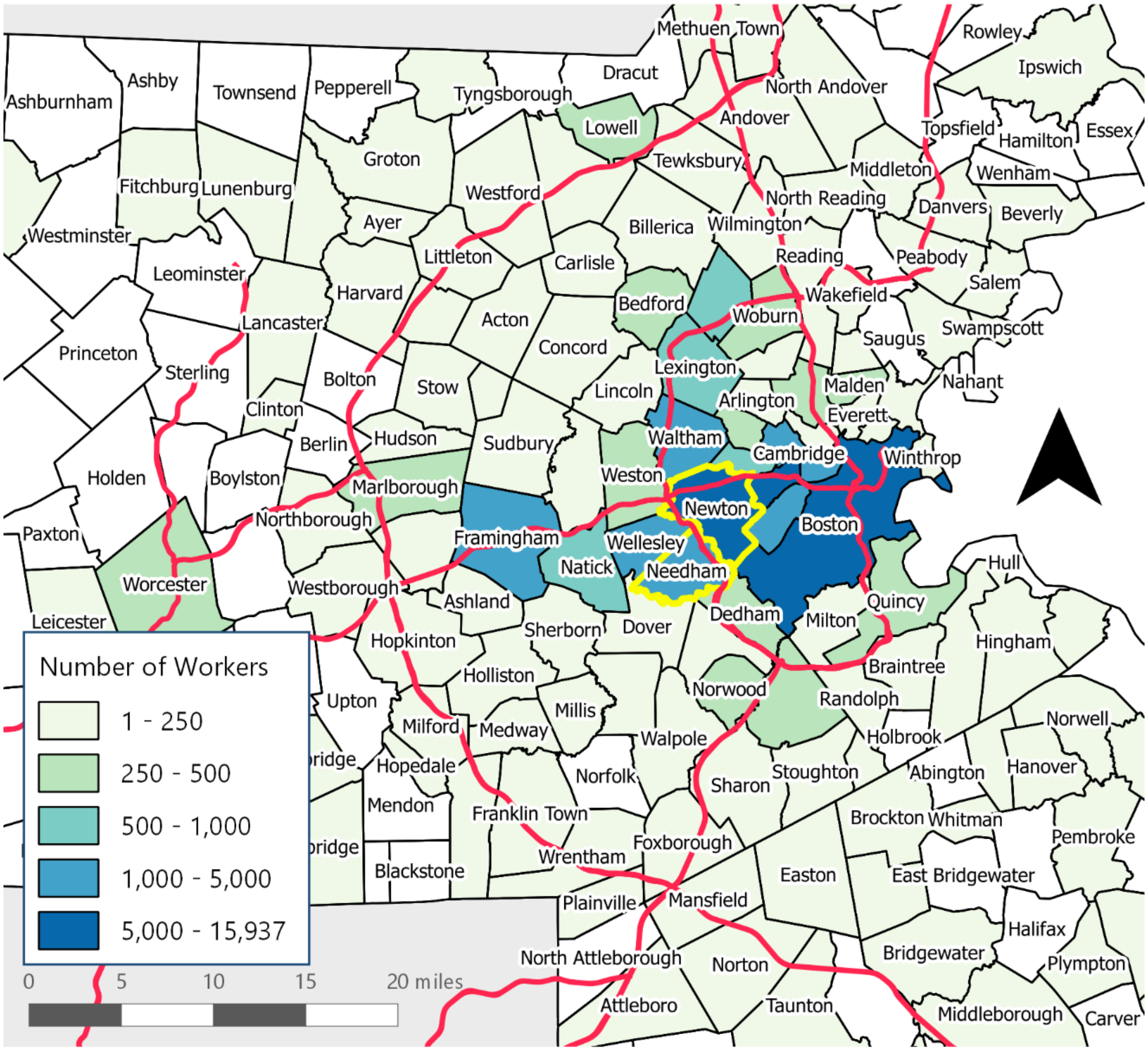
Source: ACS 2009-2013 MCD Commuting Flows

Top 10 Places of Residence for Newton and Needham Workers

Place of Residence	Number of Workers	Percent of Workers
Newton	11,866	16%
Boston	10,675	15%
Needham	4,592	6%
Waltham	2,856	4%
Framingham	2,105	3%
Watertown	1,534	2%
Natick	1,502	2%
Somerville	1,438	2%
Brookline	1,327	2%
Cambridge	1,313	2%
Total (Top 10)	39,208	54%
Total (All Places of Residence)	**72,564**	**100%**

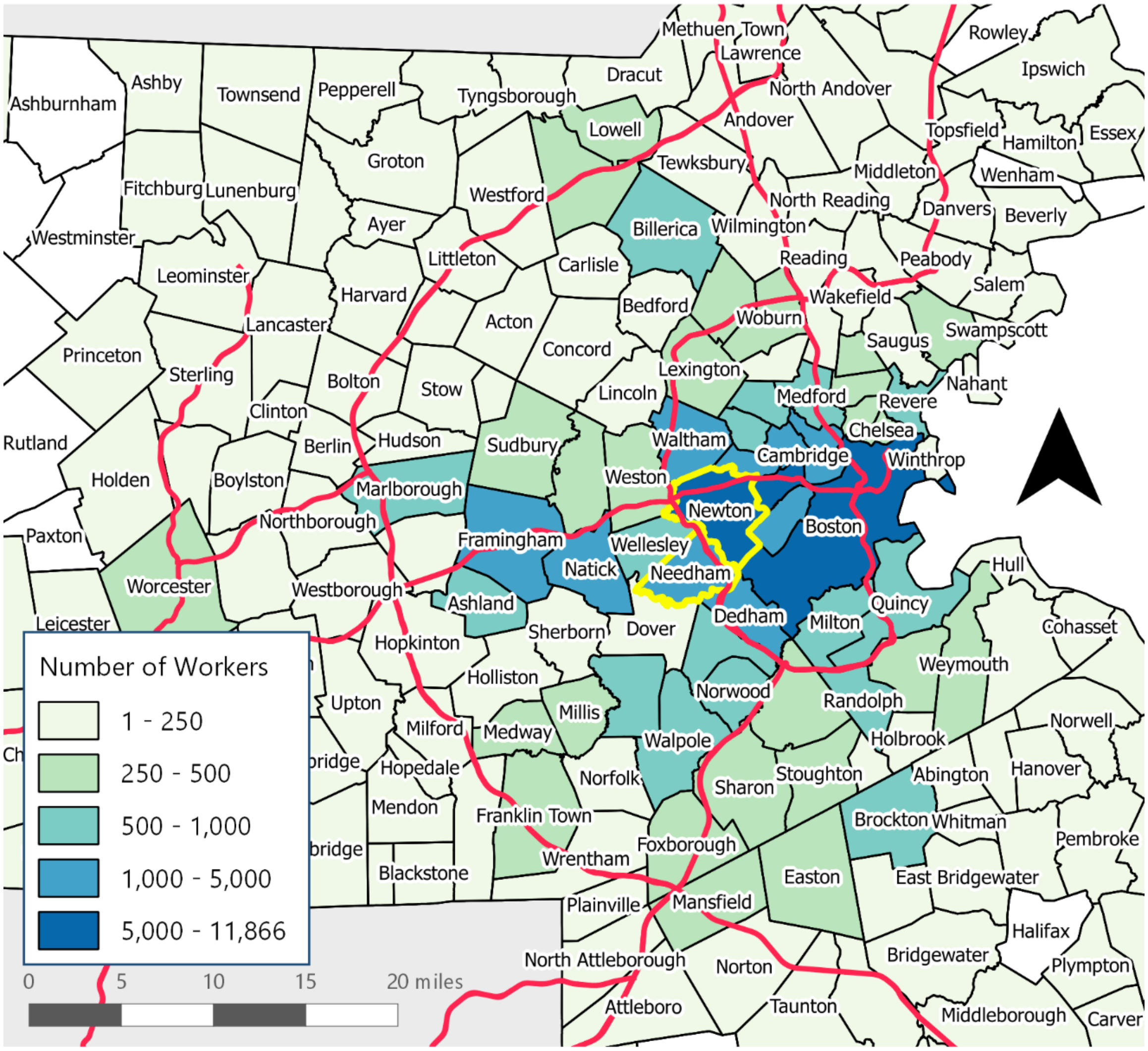
Source: ACS 2009-2013 MCD Commuting Flows

Place of Work for Newton and Needham Residents



Source: ACS 2009-2013 MCD Commuting Flows

Place of Residence for Newton and Needham Workers



Source: ACS 2009-2013 MCD Commuting Flows

Economic Base Analysis

Establishment and Job Growth by Stage

Between 2003 and 2013, the number of establishments in the Boston MSA increased by 2.7%, compared to 2.9% nationally. Stage 1 firms—firms with between 2 and 9 employees—constituted the vast majority of this growth, growing by 67,100 and accounting for 90% of the overall increase in number of establishments. This trend was mirrored at the national level. Establishments in this stage represented 62% of all establishments in 2013, up from 55% ten year prior. Stage 4 firms—those with 500 or more employees—were the only group to lose establishments over this period, declining by just under 1%.

Establishments by Stage, Boston MSA

Establishment Stage (No. of Employees)	2003	2013	2013 Pct. of Total	2003–13 Change	2003–13 Pct. Change
Self-Employed (1)	77,614	83,060	24%	5,446	0.70%
Stage 1 (2-9)	150,149	217,249	62%	67,100	4.50%
Stage 2 (10-99)	41,074	42,744	12%	1,670	0.40%
Stage 3 (100-499)	4,125	4,375	1%	250	0.60%
Stage 4 (500+)	605	552	0%	(53)	-0.90%
Total	**273,567**	**347,980**	**100%**	**74,413**	**2.70%**

Source: YourEconomy.org

Establishments by Stage, United States

Establishment Stage (No. of Employees)	2003	2013	2013 Pct. of Total	2003–13 Change	2003–13 Pct. Change
Self-Employed (1)	5,189,939	5,616,142	25%	426,203	0.80%
Stage 1 (2-9)	9,671,681	14,116,860	63%	4,445,179	4.60%
Stage 2 (10-99)	2,360,146	2,546,841	11%	186,695	0.80%
Stage 3 (100-499)	206,261	219,441	1%	13,180	0.60%
Stage 4 (500+)	26,877	24,813	0%	(2,064)	-0.80%
Total	**17,454,904**	**22,524,097**	**100%**	**5,069,193**	**2.90%**

Source: YourEconomy.org

Stage 1 firms also contributed the largest growth in number of jobs over the ten-year period, adding close to 163,000 jobs and making up 63% of all job growth. Stage 2 firms (10 to 99 employees) continued to account for the greatest share of jobs of all stages, about one third. Stage 4 firms were the only group to shed jobs over the period, pointing to a regional shift in which job growth is occurring mostly at small and medium sized firms. These trends were similar nationally, with Stage 1 firms accounting for 59% of all job growth, and Stage 4 firms being the only category to lose jobs.

Jobs by Stage of Establishment, Boston MSA

Establishment Stage (No. of Employees)	2003	2013	2013 Pct. of Total	2003–13 Change	2003–13 Pct. Change
Self-Employed (1)	77,614	83,060	2%	5,446	0.70%
Stage 1 (2-9)	513,191	676,053	20%	162,862	3.20%
Stage 2 (10-99)	1,050,028	1,108,034	33%	58,006	0.60%
Stage 3 (100-499)	730,119	775,030	23%	44,911	0.60%
Stage 4 (500+)	704,560	692,750	21%	(11,810)	-0.20%
Total	**3,075,512**	**3,334,927**	**100%**	**259,415**	**0.80%**

Source: YourEconomy.org

Jobs by Stage of Establishment, United States

Establishment Stage (No. of Employees)	2003	2013	2013 Pct. of Total	2003–13 Change	2003–13 Pct. Change
Self-Employed (1)	5,189,939	5,616,142	3%	426,203	0.80%
Stage 1 (2-9)	32,753,928	43,540,000	24%	10,786,072	3.30%
Stage 2 (10-99)	59,604,389	64,929,469	35%	5,325,080	0.90%
Stage 3 (100-499)	36,620,447	38,702,153	21%	2,081,706	0.60%
Stage 4 (500+)	32,461,842	32,000,515	17%	(461,327)	-0.10%
Total	**166,630,545**	**184,788,279**	**100%**	**18,157,734**	**1.10%**

Source: YourEconomy.org

Employment by Sector (2-digit NAICS)

Newton and Needham are home to approximately 79,800 jobs, having added about 4,600 jobs over the last ten years, an increase of 6%. There were vast differences in the way various economic sectors performed, with some sectors exhibiting tremendous growth and others shedding large numbers of jobs, significantly shifting the communities' economic composition.

Growing and Shrinking Sectors

Between 2005 and 2015, Health Care and Social Assistance sector employment far outpaced that of any other sector in both absolute and percentage terms, adding 4,900 jobs for an increase of 43%. This sector alone added more jobs than did the entire economy (on net). Professional, Scientific, and Technical Services also showed significant growth, expanding by 1,880 jobs, or 21%. Other notable growth sectors included Accommodation and Food Services (+620 jobs, +12%) and Information (+450 jobs, +16%).

Manufacturing saw the biggest contraction, shedding almost 2,500 jobs, or 54% of its workforce. Finance and Insurance lost 600 jobs (-16%) and Retail and Wholesale Trade each contracted by over 400 positions.

Employment by Sector, 2-digit NAICS – Newton and Needham

NAICS	Description	2005 Jobs	2015 Jobs	2005–15 Change	2005–15 % Chg.	2015 Nat'l LQ	2015 Avg. Earnings*
11	Crop and Animal Production	63	80	17	27%	0.08	$49,391
21	Mining, Quarrying, and Oil and Gas Extraction	21	26	5	24%	0.06	$27,758
22	Utilities	16	0	(16)	(100%)	0.00	$0
23	Construction	3,053	2,830	(223)	(7%)	0.66	$76,741
31	Manufacturing	4,527	2,064	(2,463)	(54%)	0.32	$96,593
42	Wholesale Trade	2,843	2,430	(413)	(15%)	0.78	$103,832
44	Retail Trade	6,442	6,022	(420)	(7%)	0.73	$39,271
48	Transportation and Warehousing	870	1,008	138	16%	0.38	$50,639
51	Information	2,819	3,267	448	16%	2.19	$114,880
52	Finance and Insurance	3,627	3,029	(598)	(16%)	0.95	$128,600
53	Real Estate and Rental and Leasing	2,905	3,175	270	9%	2.41	$79,370
54	Professional, Scientific, and Technical Services	9,003	10,883	1,880	21%	2.16	$116,923
55	Management of Companies and Enterprises	1,762	1,834	72	4%	1.64	$161,479
56	Administrative and Support	3,383	3,563	180	5%	0.71	$54,054
61	Educational Services	9,543	9,472	(71)	(1%)	4.75	$61,395
62	Health Care and Social Assistance	11,563	16,509	4,946	43%	1.67	$58,596
71	Arts, Entertainment, and Recreation	1,915	2,003	88	5%	1.52	$26,920
72	Accommodation and Food Services	5,287	5,910	623	12%	0.88	$27,234
81	Other Services (except Public Administration)	3,665	3,797	132	4%	1.00	$32,256
90	Government	1,846	1,887	41	2%	0.15	$69,584
99	Unclassified Industry	0	0	0	0%	0.00	$0
	Total	**75,157**	**79,791**	**4,634**	**6%**		**$72,148**

*Includes wages and supplements

Source: EMSI Complete Employment 2015.2

Highly Concentrated Sectors

Location quotient (LQ) is a measure of industry concentration, indicating how concentrated a certain sector in a given area of study, relative to the nation as a whole. It can reveal what makes a particular region "unique" in comparison with the national average. An LQ greater than 1 indicates that sector employment in the study area is more concentrated than it is as the national level. In Newton and Needham, the sector with highest concentration is Educational Services with an LQ of 4.75, meaning that the share of Educational Services employment in these communities relative to total employment is almost 5 times greater than its share nationally. Other highly concentrated sectors include Real Estate (LQ = 2.41), Information (LQ = 2.19), and Professional, Scientific, and Technical Services (LQ = 2.16).

Earnings

Average earnings per job (including wages and supplements) in Newton and Needham were about $72,000 in 2015. Sectors with the highest average earnings included Management of Companies and Enterprises ($161,000), Finance and Insurance ($128,600), and Professional, Scientific, and Technical Services ($117,000). Arts, Entertainment, and Recreation ($27,000) and Accommodation and Food Services ($27,000) were at the low end of the earnings spectrum.

Regional Comparison

The following charts tabulate the same data for the Boston MSA and Massachusetts.

Employment by Sector, 2-digit NAICS – Boston MSA

NAICS	Description	2005 Jobs	2015 Jobs	2005–15 Change	2005–15 % Chg.	2015 Nat'l LQ	2015 Avg. Earnings*
11	Crop and Animal Production	6,029	7,526	1,497	25%	0.22	$46,104
21	Mining, Quarrying, and Oil and Gas Extraction	1,220	638	(582)	(48%)	0.04	$71,929
22	Utilities	6,447	6,661	214	3%	0.67	$153,096
23	Construction	136,994	122,870	(14,124)	(10%)	0.82	$70,983
31	Manufacturing	211,415	181,837	(29,578)	(14%)	0.81	$107,486
42	Wholesale Trade	97,115	87,165	(9,950)	(10%)	0.80	$101,172
44	Retail Trade	258,428	258,985	557	0%	0.89	$36,788
48	Transportation and Warehousing	57,262	58,778	1,516	3%	0.64	$56,332
51	Information	76,184	79,688	3,504	5%	1.52	$125,721
52	Finance and Insurance	155,552	148,152	(7,400)	(5%)	1.33	$163,821
53	Real Estate and Rental and Leasing	46,042	44,762	(1,280)	(3%)	0.97	$78,011
54	Professional, Scientific, and Technical Services	234,039	288,134	54,095	23%	1.63	$124,582
55	Management of Companies and Enterprises	52,825	53,568	743	1%	1.37	$160,677
56	Administrative and Support	139,827	149,834	10,007	7%	0.85	$50,323
61	Educational Services	149,508	161,621	12,113	8%	2.31	$58,235
62	Health Care and Social Assistance	330,032	434,939	104,907	32%	1.25	$66,311
71	Arts, Entertainment, and Recreation	42,067	46,379	4,312	10%	1.00	$40,885
72	Accommodation and Food Services	177,467	217,747	40,280	23%	0.93	$25,782
81	Other Services (except Public Administration)	116,533	124,699	8,166	7%	0.94	$35,304
90	Government	300,931	322,718	21,787	7%	0.75	$85,654
99	Unclassified Industry	79	28	(51)	(65%)	0.01	$53,349
	Total	**2,595,996**	**2,796,731**	**200,735**	**8%**		**$78,295**

*Includes wages and supplements

Source: EMSI Complete Employment 2015.2

Employment by Sector, 2-digit NAICS – Massachusetts

NAICS	Description	2005 Jobs	2015 Jobs	2005–15 Change	2005–15 % Chg.	2015 Nat'l LQ	2015 Avg. Earnings*
11	Crop and Animal Production	11,730	12,759	1,029	9%	0.28	$47,042
21	Mining, Quarrying, and Oil and Gas Extraction	1,890	1,032	(858)	(45%)	0.05	$71,019
22	Utilities	9,610	10,581	971	10%	0.78	$145,786
23	Construction	195,971	174,935	(21,036)	(11%)	0.86	$66,757
31	Manufacturing	311,448	253,703	(57,745)	(19%)	0.84	$100,396
42	Wholesale Trade	136,233	126,518	(9,715)	(7%)	0.86	$98,679
44	Retail Trade	370,296	363,312	(6,984)	(2%)	0.92	$35,980
48	Transportation and Warehousing	77,867	83,212	5,345	7%	0.67	$54,258
51	Information	90,834	91,883	1,049	1%	1.30	$118,936
52	Finance and Insurance	186,601	177,168	(9,433)	(5%)	1.18	$152,657
53	Real Estate and Rental and Leasing	58,802	55,196	(3,606)	(6%)	0.89	$71,763
54	Professional, Scientific, and Technical Services	275,164	334,950	59,786	22%	1.40	$119,196
55	Management of Companies and Enterprises	65,618	64,998	(620)	(1%)	1.23	$150,593
56	Administrative and Support	182,148	194,254	12,106	7%	0.82	$47,098
61	Educational Services	186,241	204,915	18,674	10%	2.17	$54,965
62	Health Care and Social Assistance	466,692	622,035	155,343	33%	1.33	$62,098
71	Arts, Entertainment, and Recreation	58,236	62,156	3,920	7%	1.00	$37,920
72	Accommodation and Food Services	251,330	297,254	45,924	18%	0.94	$24,587
81	Other Services (except Public Administration)	175,575	171,764	(3,811)	(2%)	0.95	$33,295
90	Government	434,025	472,531	38,506	9%	0.81	$81,869
99	Unclassified Industry	0	0	0	0%	0.00	$0
	Total	**3,546,310**	**3,775,161**	**228,851**	**6%**		**$72,631**

*Includes wages and supplements

Source: EMSI Complete Employment 2015.2

Regional Comparison of Employment Share by Sector

The next table summarizes the each sector's share of total employment in Newton/Needham, the Boston MSA, and Massachusetts. Notably, the share of educational services jobs in Newton and Needham is more than double that of the comparison geographies. In addition, almost 21% of Newton and Needham jobs are in the Health Care and Social Assistance sector, compared to 16% and 17% in the comparison regions. Manufacturing jobs comprise a comparatively smaller portion of the Newton/Needham economy, as do Government jobs.

2015 Employment Share by Sector, Regional Comparison

NAICS	Description	Newton/ Needham	Boston MSA	Mass.	U.S.
11	Crop and Animal Production	0.1%	0.3%	0.3%	1.2%
21	Mining, Quarrying, and Oil and Gas Extraction	0.0%	0.0%	0.0%	0.6%
22	Utilities	0.0%	0.2%	0.3%	0.4%
23	Construction	3.5%	4.4%	4.6%	5.4%
31	Manufacturing	2.6%	6.5%	6.7%	8.0%
42	Wholesale Trade	3.0%	3.1%	3.4%	3.9%
44	Retail Trade	7.5%	9.3%	9.6%	10.4%
48	Transportation and Warehousing	1.3%	2.1%	2.2%	3.3%
51	Information	4.1%	2.8%	2.4%	1.9%
52	Finance and Insurance	3.8%	5.3%	4.7%	4.0%
53	Real Estate and Rental and Leasing	4.0%	1.6%	1.5%	1.7%
54	Professional, Scientific, and Technical Services	13.6%	10.3%	8.9%	6.3%
55	Management of Companies and Enterprises	2.3%	1.9%	1.7%	1.4%
56	Administrative and Support	4.5%	5.4%	5.1%	6.3%
61	Educational Services	11.9%	5.8%	5.4%	2.5%
62	Health Care and Social Assistance	20.7%	15.6%	16.5%	12.4%
71	Arts, Entertainment, and Recreation	2.5%	1.7%	1.6%	1.7%
72	Accommodation and Food Services	7.4%	7.8%	7.9%	8.4%
81	Other Services (except Public Administration)	4.8%	4.5%	4.5%	4.8%
90	Government	2.4%	11.5%	12.5%	15.5%
99	Unclassified Industry	0.0%	0.0%	0.0%	0.1%
	Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: EMSI Complete Employment 2015.2

Historic Employment Growth by Sector

Economy-wide, employment in Newton and Needham expanded by 6% over the last decade. Massachusetts grew at the same rate, while the Boston MSA increased by 8%. The U.S. lagged slightly behind, growing by 5%. Sectors in which employment growth in Newton and Needham significantly outpaced that of the comparison geographies include Information, Transportation and Warehousing, Health Care, and Real Estate. Newton and Needham significantly underperformed in Manufacturing, in which they lost 54% of jobs, compared to reductions of 14%, 19%, and 13% in the MSA, state, and nation, respectively.

2005–2015 Percent Change in Employment, Regional Comparison

NAICS	Description	Newton/ Needham	Boston MSA	Mass.	U.S.
11	Crop and Animal Production	27%	25%	9%	(2%)
21	Mining, Quarrying, and Oil and Gas Extraction	24%	(48%)	(45%)	50%
22	Utilities	(100%)	3%	10%	1%
23	Construction	(7%)	(10%)	(11%)	(13%)
31	Manufacturing	(54%)	(14%)	(19%)	(13%)
42	Wholesale Trade	(15%)	(10%)	(7%)	2%
44	Retail Trade	(7%)	0%	(2%)	1%
48	Transportation and Warehousing	16%	3%	7%	8%
51	Information	16%	5%	1%	(9%)
52	Finance and Insurance	(16%)	(5%)	(5%)	(2%)
53	Real Estate and Rental and Leasing	9%	(3%)	(6%)	(6%)
54	Professional, Scientific, and Technical Services	21%	23%	22%	18%
55	Management of Companies and Enterprises	4%	1%	(1%)	25%
56	Administrative and Support	5%	7%	7%	9%
61	Educational Services	(1%)	8%	10%	23%
62	Health Care and Social Assistance	43%	32%	33%	25%
71	Arts, Entertainment, and Recreation	5%	10%	7%	13%
72	Accommodation and Food Services	12%	23%	18%	18%
81	Other Services (except Public Administration)	4%	7%	(2%)	2%
90	Government	2%	7%	9%	1%
99	Unclassified Industry	0%	(65%)	0%	(23%)
	Total	**6%**	**8%**	**6%**	**5%**

Source: EMSI Complete Employment 2015.2

Average Earnings by Sector

Average earnings per job were on par with the state average (about $73,000), and slightly lower than average earnings for the MSA ($78,000). This compares to average earnings of $59,000 nationally. Notably, earnings for Finance and Insurance workers were somewhat lower in Needham and Newton ($129,000 compared to upwards of $150,000 for the MSA and Commonwealth). Earnings for other significant industries were generally comparable across the local, regional, and state geographies.

2015 Average Earnings,* Regional Comparison

NAICS	Description	Newton/ Needham	Boston MSA	Mass.	U.S.
11	Crop and Animal Production	$49,391	$46,104	$47,042	$32,073
21	Mining, Quarrying, and Oil and Gas Extraction	$27,758	$71,929	$71,019	$117,269
22	Utilities	$0	$153,096	$145,786	$132,070
23	Construction	$76,741	$70,983	$66,757	$55,900
31	Manufacturing	$96,593	$107,486	$100,396	$76,958
42	Wholesale Trade	$103,832	$101,172	$98,679	$80,626
44	Retail Trade	$39,271	$36,788	$35,980	$34,013
48	Transportation and Warehousing	$50,639	$56,332	$54,258	$58,839
51	Information	$114,880	$125,721	$118,936	$106,178
52	Finance and Insurance	$128,600	$163,821	$152,657	$108,648
53	Real Estate and Rental and Leasing	$79,370	$78,011	$71,763	$54,099
54	Professional, Scientific, and Technical Services	$116,923	$124,582	$119,196	$91,469
55	Management of Companies and Enterprises	$161,479	$160,677	$150,593	$133,177
56	Administrative and Support	$54,054	$50,323	$47,098	$39,676
61	Educational Services	$61,395	$58,235	$54,965	$44,819
62	Health Care and Social Assistance	$58,596	$66,311	$62,098	$54,354
71	Arts, Entertainment, and Recreation	$26,920	$40,885	$37,920	$36,853
72	Accommodation and Food Services	$27,234	$25,782	$24,587	$21,480
81	Other Services (except Public Administration)	$32,256	$35,304	$33,295	$29,884
90	Government	$69,584	$85,654	$81,869	$69,657
99	Unclassified Industry	$0	$53,349	$0	$57,629
	Total	**$72,148**	**$78,295**	**$72,631**	**$59,240**

*Includes wages and supplements

Source: EMSI Complete Employment 2015.2

Top Industries (4-digit NAICS)

"Eds and meds"—that is educational and healthcare professions—make up ten of the top 25 4-digit NAICS industries in Newton and Needham. Colleges, Universities, and Professional Schools top the list, with close to 5,700 jobs in 2015, though down 11% over the last ten years. Restaurants and Computer Systems Design round out the top three. Various professional services industries are also well represented.

Top 25 Industries by Employment, 4-digit NAICS – Newton and Needham

NAICS	Description	2005 Jobs	2015 Jobs	2005–15 Change	2005–15 % Chg.	2015 Nat'l LQ	2015 Avg. Earnings*
6113	Colleges, Universities, and Professional Schools	6,365	5,681	(684)	(11%)	5.95	$71,639
7225	Restaurants and Other Eating Places	3,091	3,824	733	24%	0.75	$22,661
5415	Computer Systems Design and Related Services	2,065	3,102	1,037	50%	3.04	$165,378
6241	Individual and Family Services	1,065	2,990	1,925	181%	2.61	$32,575
6221	General Medical and Surgical Hospitals	2,410	2,762	352	15%	1.20	$83,387
6111	Elementary and Secondary Schools	2,111	2,344	233	11%	4.35	$53,660
6213	Offices of Other Health Practitioners	1,422	2,115	693	49%	4.43	$52,078
5511	Management of Companies and Enterprises	1,762	1,834	72	4%	1.64	$161,479
6211	Offices of Physicians	1,557	1,794	237	15%	1.35	$119,352
5416	Management, Scientific, and Technical Consulting Services	1,433	1,672	239	17%	2.06	$103,699
6216	Home Health Care Services	748	1,622	874	117%	2.30	$42,715
7223	Special Food Services	1,710	1,584	(126)	(7%)	3.88	$35,351
5313	Activities Related to Real Estate	1,224	1,469	245	20%	3.72	$98,264
6231	Nursing Care Facilities (Skilled Nursing Facilities)	1,372	1,424	52	4%	1.68	$47,401
4451	Grocery Stores	1,113	1,360	247	22%	0.99	$27,992
5411	Legal Services	1,406	1,341	(65)	(5%)	1.94	$80,297
5311	Lessors of Real Estate	1,017	1,265	248	24%	3.11	$63,771
7139	Other Amusement and Recreation Industries	1,094	1,250	156	14%	1.89	$26,661
5417	Scientific Research and Development Services	958	1,194	236	25%	3.50	$146,169
6244	Child Day Care Services	969	1,178	209	22%	1.85	$27,958
6116	Other Schools and Instruction	697	1,071	374	54%	3.95	$27,711
5419	Other Professional, Scientific, and Technical Services	488	1,030	542	111%	2.62	$66,353
5413	Architectural, Engineering, and Related Services	1,099	1,021	(78)	(7%)	1.32	$110,036
2382	Building Equipment Contractors	943	1,011	68	7%	0.91	$85,930
5112	Software Publishers	717	983	266	37%	6.03	$130,976

*Includes wages and supplements

Source: EMSI Complete Employment 2015.2

Over half of the industries in the Newton/Needham top 25 overlap with those on the Boston MSA list; however, there are several industry groupings that are unique to Newton and Needham. Educational industries, including (private) Elementary and Secondary Schools, Child Day Care Services, and Other Schools and Instruction are key employers in Newton and Needham, but less important in the MSA overall. Real estate industries—including Activities Related to Real Estate and Lessors of Real Estate—are also unique to Newton and Needham's top 25.

Top 25 Industries by Employment, 4-digit NAICS – Boston MSA

NAICS	Description	2005 Jobs	2015 Jobs	2005–15 Change	2005–15 % Chg.	2015 Nat'l LQ	2015 Avg. Earnings*
7225	Restaurants and Other Eating Places	132,491	167,011	34,520	26%	0.93	$22,629
6221	General Medical and Surgical Hospitals	105,305	123,211	17,906	17%	1.53	$89,016
9036	Education and Hospitals (Local Government)	105,442	116,404	10,962	10%	0.77	$81,230
6113	Colleges, Universities, and Professional Schools	108,972	112,182	3,210	3%	3.35	$64,152
5415	Computer Systems Design and Related Services	43,497	70,251	26,754	62%	1.96	$147,620
9039	Local Government, Excluding Education and Hospitals	64,077	65,926	1,849	3%	0.66	$94,320
4451	Grocery Stores	52,225	62,186	9,961	19%	1.28	$26,973
6241	Individual and Family Services	19,818	54,399	34,581	174%	1.35	$32,409
5511	Management of Companies and Enterprises	52,825	53,568	743	1%	1.37	$160,677
5617	Services to Buildings and Dwellings	46,171	52,318	6,147	13%	1.07	$34,873
9029	State Government, Excluding Education and Hospitals	49,339	52,020	2,681	5%	1.28	$104,594
5613	Employment Services	45,936	49,999	4,063	9%	0.77	$53,553
5417	Scientific Research and Development Services	34,513	49,119	14,606	42%	4.10	$162,332
5416	Management, Scientific, and Technical Consulting Services	37,143	47,982	10,839	29%	1.68	$120,929
6211	Offices of Physicians	37,055	45,137	8,082	22%	0.97	$125,895
9026	Education and Hospitals (State Government)	28,439	37,871	9,432	33%	0.70	$59,119
2382	Building Equipment Contractors	39,043	37,601	(1,442)	(4%)	0.96	$77,086
5221	Depository Credit Intermediation	38,231	36,620	(1,611)	(4%)	1.20	$117,401
9011	Federal Government, Civilian	39,403	35,593	(3,810)	(10%)	0.70	$106,408
5241	Insurance Carriers	33,572	35,572	2,000	6%	1.53	$123,121
5413	Architectural, Engineering, and Related Services	36,654	34,688	(1,966)	(5%)	1.28	$106,918
6231	Nursing Care Facilities (Skilled Nursing Facilities)	34,502	33,797	(705)	(2%)	1.14	$46,168
6216	Home Health Care Services	14,231	31,227	16,996	119%	1.26	$44,133
5239	Other Financial Investment Activities	23,350	31,151	7,801	33%	3.39	$268,498
5411	Legal Services	33,820	30,914	(2,906)	(9%)	1.28	$113,558

*Includes wages and supplements

Source: EMSI Complete Employment 2015.2

Newton and Needham's educational and real estate industries also stand out when compared against Massachusetts. Notably, no government industries makes these communities' top 25 list, while five of the top industries for Massachusetts (and also the Boston MSA) fall within Local, State, or Federal Government.

Top 25 Industries by Employment, 4-digit NAICS – Massachusetts

NAICS	Description	2005 Jobs	2015 Jobs	2005–15 Change	2005–15 % Chg.	2015 Nat'l LQ	2015 Avg. Earnings*
7225	Restaurants and Other Eating Places	187,445	228,199	40,754	22%	0.94	$21,828
9036	Education and Hospitals (Local Government)	158,150	171,409	13,259	8%	0.84	$79,267
6221	General Medical and Surgical Hospitals	141,227	162,945	21,718	15%	1.50	$86,031
6113	Colleges, Universities, and Professional Schools	130,332	137,330	6,998	5%	3.04	$60,946
9039	Local Government, Excluding Education and Hospitals	93,161	96,242	3,081	3%	0.72	$88,555
6241	Individual and Family Services	29,075	90,441	61,366	211%	1.67	$29,655
4451	Grocery Stores	73,888	85,084	11,196	15%	1.30	$27,452
5415	Computer Systems Design and Related Services	50,171	80,165	29,994	60%	1.66	$143,512
9029	State Government, Excluding Education and Hospitals	64,124	70,964	6,840	11%	1.29	$102,732
5617	Services to Buildings and Dwellings	61,823	70,414	8,591	14%	1.07	$34,047
9026	Education and Hospitals (State Government)	47,993	67,276	19,283	40%	0.92	$57,996
5613	Employment Services	61,123	66,913	5,790	9%	0.77	$48,177
5511	Management of Companies and Enterprises	65,618	64,998	(620)	(1%)	1.23	$150,593
6211	Offices of Physicians	50,161	59,763	9,602	19%	0.95	$119,053
5416	Management, Scientific, and Technical Consulting Services	43,176	55,408	12,232	28%	1.44	$116,291
6231	Nursing Care Facilities (Skilled Nursing Facilities)	56,318	55,317	(1,001)	(2%)	1.38	$44,983
5417	Scientific Research and Development Services	39,053	54,168	15,115	39%	3.35	$158,677
2382	Building Equipment Contractors	52,633	50,891	(1,742)	(3%)	0.96	$73,941
5221	Depository Credit Intermediation	48,382	47,345	(1,037)	(2%)	1.15	$107,202
9011	Federal Government, Civilian	50,849	46,427	(4,422)	(9%)	0.68	$102,031
5241	Insurance Carriers	42,763	44,949	2,186	5%	1.43	$121,497
6216	Home Health Care Services	20,680	42,306	21,626	105%	1.27	$44,676
5413	Architectural, Engineering, and Related Services	42,766	40,549	(2,217)	(5%)	1.10	$103,047
5411	Legal Services	40,956	36,853	(4,103)	(10%)	1.13	$105,918
6244	Child Day Care Services	31,868	36,222	4,354	14%	1.20	$25,189

*Includes wages and supplements

Source: EMSI Complete Employment 2015.2

Self-Employment

A significant proportion of Newton and Needham jobs are held by self-employed workers—over 9%. Professional, Scientific, and Technical Services jobs account for more than a quarter (26.9%) of all self-employed positions, with Health Care and Social Assistance and Arts, Entertainment, and Recreation jobs also comprising significant shares—12.1% and 12.9%, respectively.

Almost half (47.9%) of all Arts, Entertainment, and Recreation jobs are self-employed positions. The comparable figure for Professional, Scientific, and Technical Services is 18.4%.

Average earnings for self-employed positions are low relative to earnings for all jobs. Across industries, average self-employed earnings are $34,705, compared to $72,148 for all jobs.

Self-Employment by Sector, 2-digit NAICS – Newton and Needham, 2015

NAICS	Description	Self-Emp. Jobs	Total Jobs	% Self-Emp. in Industry	% of All Self-Emp. Jobs	Avg. Earnings, Self-Emp.*	Avg. Earnings, All Jobs*
11	Crop and Animal Production	0	80	0.0%	0.0%	--	$49,391
21	Mining, Quarrying, and Oil and Gas Extraction	25	26	93.2%	0.3%	$10,859	$27,758
22	Utilities	0	0	--	0.0%	--	--
23	Construction	561	2,830	19.8%	7.5%	$31,548	$76,741
31	Manufacturing	37	2,064	1.8%	0.5%	$31,339	$96,593
42	Wholesale Trade	27	2,430	1.1%	0.4%	$39,929	$103,832
44	Retail Trade	200	6,022	3.3%	2.7%	$33,491	$39,271
48	Transportation and Warehousing	78	1,008	7.7%	1.0%	$21,270	$50,639
51	Information	207	3,267	6.4%	2.8%	$10,386	$114,880
52	Finance and Insurance	154	3,029	5.1%	2.1%	$68,556	$128,600
53	Real Estate and Rental and Leasing	629	3,175	19.8%	8.5%	$36,055	$79,370
54	Professional, Scientific, and Technical Services	2,002	10,883	18.4%	26.9%	$46,918	$116,923
55	Management of Companies and Enterprises	0	1,834	0.0%	0.0%	--	$161,479
56	Administrative and Support	347	3,563	9.7%	4.7%	$26,163	$54,054
61	Educational Services	473	9,472	5.0%	6.4%	$23,917	$61,395
62	Health Care and Social Assistance	902	16,509	5.5%	12.1%	$54,328	$58,596
71	Arts, Entertainment, and Recreation	959	2,003	47.9%	12.9%	$17,918	$26,920
72	Accommodation and Food Services	71	5,910	1.2%	1.0%	$18,141	$27,234
81	Other Services (except Public Administration)	767	3,797	20.2%	10.3%	$16,200	$32,256
90	Government	0	1,887	0.0%	0.0%	--	$69,584
99	Unclassified Industry	0	0	--	0.0%	--	--
	Total	**7,439**	**79,791**	**9.3%**	**100.0%**	**$34,705**	**$72,148**

*Includes wages and supplements

Source: EMSI Complete Employment 2015.2

Examining self-employment at the 4-digit NAICS level, Independent Artists, Writers, and Performers represent 11.1% of self-employed positions, the most of any industry. Management, Scientific, and Technical Consulting Services follows at 7.5%, and Legal Services occupies the third place slot, at 7.4%.

Top 25 Industries by Self-Employed Jobs, 4-digit NAICS – Newton and Needham, 2015

NAICS	Description	Self-Emp. Jobs	Total Jobs	% Self-Emp. in Industry	% of All Self-Emp. Jobs	Avg. Earnings, Self-Emp.*	Avg. Earnings, All Jobs*
7115	Independent Artists, Writers, and Performers	824	886	93.0%	11.1%	$17,702	$20,302
5416	Management, Scientific, and Technical Consulting Services	560	2,119	26.4%	7.5%	$37,037	$100,956
5411	Legal Services	549	1,400	39.2%	7.4%	$73,972	$80,723
8141	Private Households	402	591	68.0%	5.4%	$9,628	$16,669
6116	Other Schools and Instruction	315	1,126	28.0%	4.2%	$19,816	$30,365
6213	Offices of Other Health Practitioners	310	1,598	19.4%	4.2%	$52,870	$54,791
5311	Lessors of Real Estate	288	1,071	26.8%	3.9%	$49,924	$65,364
5313	Activities Related to Real Estate	237	1,638	14.5%	3.2%	$27,375	$101,067
8121	Personal Care Services	229	1,039	22.0%	3.1%	$20,618	$26,630
5415	Computer Systems Design and Related Services	228	3,707	6.1%	3.1%	$40,324	$155,823
2361	Residential Building Construction	209	615	33.9%	2.8%	$44,307	$65,810
6244	Child Day Care Services	197	1,146	17.2%	2.6%	$15,719	$28,925
5419	Other Professional, Scientific, and Technical Services	189	701	27.0%	2.5%	$27,698	$61,831
5414	Specialized Design Services	185	290	63.6%	2.5%	$21,987	$43,532
5617	Services to Buildings and Dwellings	158	811	19.4%	2.1%	$19,832	$41,829
5121	Motion Picture and Video Industries	151	373	40.6%	2.0%	$930	$39,846
2383	Building Finishing Contractors	148	433	34.2%	2.0%	$20,311	$58,703
5614	Business Support Services	137	691	19.8%	1.8%	$28,947	$51,551
6211	Offices of Physicians	131	1,674	7.8%	1.8%	$131,933	$118,235
6241	Individual and Family Services	120	3,350	3.6%	1.6%	$37,788	$34,370
6111	Elementary and Secondary Schools	102	2,354	4.3%	1.4%	$31,455	$53,546
5312	Offices of Real Estate Agents and Brokers	101	303	33.3%	1.4%	$17,923	$57,510
5412	Accounting, Tax Preparation, Bookkeeping, and Payroll Services	98	1,010	9.7%	1.3%	$54,295	$96,537
5413	Architectural, Engineering, and Related Services	91	966	9.4%	1.2%	$39,034	$108,832
5239	Other Financial Investment Activities	81	502	16.1%	1.1%	$66,993	$186,027

*Includes wages and supplements

Source: EMSI Complete Employment 2015.2

Top Occupations (SOC)

Top occupations in Newton and Needham include Health Diagnosing and Treating Practitioners (which includes doctors and nurses), Computer Occupations, Retail Sales Workers, and Food and Beverage Serving Workers.

Top 25 Occupations by Employment, 3-digit SOC – Newton and Needham

NAICS	Description	2005 Jobs	2015 Jobs	2005–15 Change	2005–15 % Chg.	2015 Nat'l LQ	Med. Hrly Earnings
29-1000	Health Diagnosing and Treating Practitioners	3,154	3,928	774	25%	1.47	$50
15-1100	Computer Occupations	3,324	3,797	473	14%	1.84	$45
41-2000	Retail Sales Workers	3,977	3,614	(363)	(9%)	0.79	$11
35-3000	Food and Beverage Serving Workers	2,829	3,225	396	14%	0.88	$10
43-6000	Secretaries and Administrative Assistants	2,796	2,862	66	2%	1.33	$22
39-9000	Other Personal Care and Service Workers	1,770	2,778	1,008	57%	1.39	$14
13-1000	Business Operations Specialists	2,497	2,738	241	10%	1.12	$36
43-4000	Information and Record Clerks	2,685	2,611	(74)	(3%)	0.88	$18
43-9000	Other Office and Administrative Support Workers	2,556	2,403	(153)	(6%)	1.04	$18
11-9000	Other Management Occupations	2,086	2,298	212	10%	1.33	$38
13-2000	Financial Specialists	2,121	2,086	(35)	(2%)	1.40	$35
31-1000	Nursing, Psychiatric, and Home Health Aides	1,267	1,962	695	55%	1.48	$14
43-3000	Financial Clerks	1,887	1,848	(39)	(2%)	1.03	$20
29-2000	Health Technologists and Technicians	1,470	1,796	326	22%	1.17	$26
37-2000	Building Cleaning and Pest Control Workers	1,592	1,706	114	7%	0.80	$13
47-2000	Construction Trades Workers	1,801	1,693	(108)	(6%)	0.60	$25
11-1000	Top Executives	1,552	1,635	83	5%	1.26	$62
25-2000	Preschool, Primary, Secondary, and Special Education School Teachers	1,394	1,615	221	16%	0.76	$27
21-1000	Counselors, Social Workers, and Other Community and Social Service Specialists	991	1,585	594	60%	1.51	$22
25-1000	Postsecondary Teachers	1,469	1,513	44	3%	1.98	$43
11-3000	Operations Specialties Managers	1,429	1,477	48	3%	1.67	$56
35-2000	Cooks and Food Preparation Workers	1,302	1,472	170	13%	0.88	$13
53-3000	Motor Vehicle Operators	1,340	1,459	119	9%	0.68	$17
43-5000	Material Recording, Scheduling, Dispatching, and Distributing Workers	1,643	1,439	(204)	(12%)	0.70	$17
41-3000	Sales Representatives, Services	1,636	1,436	(200)	(12%)	1.23	$33

Source: EMSI Complete Employment 2015.2

Top occupations were generally similarly across the comparison geographies. Occupations for which Newton and Needham showed high concentrations relative to the Boston MSA and Massachusetts as a whole included Postsecondary Teachers, Computer Occupations, and Health Diagnosing and Treating Practitioners.

Top 25 Occupations by Employment, 3-digit SOC – Boston MSA

NAICS	Description	2005 Jobs	2015 Jobs	2005–15 Change	2005–15 % Chg.	2015 Nat'l LQ	Med. Hrly Earnings
41-2000	Retail Sales Workers	145,259	142,881	(2,378)	(2%)	0.89	$11
35-3000	Food and Beverage Serving Workers	99,182	121,996	22,814	23%	0.95	$10
29-1000	Health Diagnosing and Treating Practitioners	98,864	118,950	20,086	20%	1.27	$50
15-1100	Computer Occupations	95,035	115,221	20,186	21%	1.59	$46
13-1000	Business Operations Specialists	91,276	101,739	10,463	11%	1.19	$36
43-4000	Information and Record Clerks	89,939	90,061	122	0%	0.87	$18
43-6000	Secretaries and Administrative Assistants	83,008	87,734	4,726	6%	1.16	$22
47-2000	Construction Trades Workers	88,707	81,412	(7,295)	(8%)	0.83	$24
43-9000	Other Office and Administrative Support Workers	79,025	78,476	(549)	(1%)	0.97	$18
25-2000	Preschool, Primary, Secondary, and Special Education School Teachers	67,322	77,002	9,680	14%	1.04	$31
37-2000	Building Cleaning and Pest Control Workers	70,327	75,675	5,348	8%	1.01	$14
13-2000	Financial Specialists	70,761	74,543	3,782	5%	1.43	$37
39-9000	Other Personal Care and Service Workers	49,465	67,579	18,114	37%	0.96	$13
43-5000	Material Recording, Scheduling, Dispatching, and Distributing Workers	72,434	67,567	(4,867)	(7%)	0.94	$17
11-9000	Other Management Occupations	60,695	66,794	6,099	10%	1.10	$41
29-2000	Health Technologists and Technicians	53,070	64,649	11,579	22%	1.20	$25
43-3000	Financial Clerks	60,683	62,213	1,530	3%	0.99	$20
53-3000	Motor Vehicle Operators	56,221	60,653	4,432	8%	0.80	$17
11-1000	Top Executives	52,448	56,213	3,765	7%	1.24	$61
11-3000	Operations Specialties Managers	49,862	54,118	4,256	9%	1.74	$56
21-1000	Counselors, Social Workers, and Other Community and Social Service Specialists	39,763	53,556	13,793	35%	1.45	$22
35-2000	Cooks and Food Preparation Workers	42,806	51,750	8,944	21%	0.89	$12
31-1000	Nursing, Psychiatric, and Home Health Aides	36,577	49,327	12,750	35%	1.06	$14
53-7000	Material Moving Workers	48,473	46,891	(1,582)	(3%)	0.56	$14
49-9000	Other Installation, Maintenance, and Repair Occupations	41,100	41,914	814	2%	0.76	$23

Source: EMSI Complete Employment 2015.2

Top 25 Occupations by Employment, 3-digit SOC – Massachusetts

NAICS	Description	2005 Jobs	2015 Jobs	2005–15 Change	2005–15 % Chg.	2015 Nat'l LQ	Med. Hrly Earnings
41-2000	Retail Sales Workers	204,979	198,226	(6,753)	(3%)	0.92	$11
35-3000	Food and Beverage Serving Workers	141,337	167,689	26,352	19%	0.97	$10
29-1000	Health Diagnosing and Treating Practitioners	135,180	160,522	25,342	19%	1.27	$49
15-1100	Computer Occupations	113,433	135,968	22,535	20%	1.39	$44
13-1000	Business Operations Specialists	115,862	127,858	11,996	10%	1.11	$34
47-2000	Construction Trades Workers	127,634	116,712	(10,922)	(9%)	0.88	$23
43-4000	Information and Record Clerks	116,537	115,990	(547)	(0%)	0.83	$18
43-6000	Secretaries and Administrative Assistants	109,073	115,294	6,221	6%	1.13	$21
25-2000	Preschool, Primary, Secondary, and Special Education School Teachers	99,262	110,832	11,570	12%	1.11	$30
43-9000	Other Office and Administrative Support Workers	102,995	102,354	(641)	(1%)	0.93	$17
39-9000	Other Personal Care and Service Workers	74,796	100,545	25,749	34%	1.06	$13
37-2000	Building Cleaning and Pest Control Workers	96,907	100,005	3,098	3%	0.99	$13
43-5000	Material Recording, Scheduling, Dispatching, and Distributing Workers	100,956	94,173	(6,783)	(7%)	0.97	$16
13-2000	Financial Specialists	87,494	91,407	3,913	4%	1.30	$36
11-9000	Other Management Occupations	82,210	89,175	6,965	8%	1.09	$39
29-2000	Health Technologists and Technicians	74,349	89,155	14,806	20%	1.23	$25
53-3000	Motor Vehicle Operators	80,453	87,162	6,709	8%	0.85	$17
21-1000	Counselors, Social Workers, and Other Community and Social Service Specialists	58,383	82,299	23,916	41%	1.66	$21
43-3000	Financial Clerks	79,458	80,805	1,347	2%	0.95	$19
11-1000	Top Executives	71,418	75,393	3,975	6%	1.23	$59
31-1000	Nursing, Psychiatric, and Home Health Aides	54,704	73,641	18,937	35%	1.18	$14
35-2000	Cooks and Food Preparation Workers	60,140	70,162	10,022	17%	0.89	$12
11-3000	Operations Specialties Managers	64,607	69,228	4,621	7%	1.65	$53
53-7000	Material Moving Workers	69,683	67,061	(2,622)	(4%)	0.60	$14
49-9000	Other Installation, Maintenance, and Repair Occupations	56,681	56,912	231	0%	0.76	$23

Source: EMSI Complete Employment 2015.2

Over 9 percent of jobs in Newton and Needham are in STEM (science, technology, engineering, and math) occupations. This is a considerably higher percentage than the national figure of 5.5%. There has been 10% job growth in STEM occupations in Newton and Needham over the past ten years, which is higher than the growth nationally for this group of occupations.

Jobs in STEM Occupations

	Newton & Needham	United States
STEM Occupation Jobs	7,645	8,609,364
Percentage of All Jobs	9.3%	5.5%
STEM Occupation Job Growth, 2010-2015	10%	7%

Source: 2015.4 – QCEW Employees, Non-QCEW Employees, and Self-Employed. Group of 99 STEM occupations, as defined by the US Census.

The table below shows the breakdown of those STEM jobs in Newton and Needham by occupation category. Computer occupations are the most prevalent STEM occupation in Newton and Needham. Of note with respect to the biotech industry, there are a total of approximately 500 workers in the categories of life scientists and life, physical, and social science technicians.

STEM Jobs in Newton and Needham by Occupation Category

Description	2005 Jobs	2015 Jobs	2005 - 2015 Change	2005 - 2015 % Change
Computer and Information Systems Managers	395	479	84	21.4%
Engineering and Natural Sciences Managers	172	154	(19)	-10.9%
Computer Occupations	3,832	4,613	781	20.4%
Mathematical Science Occupations	139	173	34	24.4%
Cartographers and Surveyors	21	22	0	2.2%
Engineers	934	819	(115)	-12.3%
Drafters, Engineering Technicians, and Mappir	395	315	(80)	-20.2%
Life Scientists	270	298	28	10.5%
Physical Scientists	149	150	1	0.5%
Social Scientists and Related Workers	331	361	30	9.0%
Life, Physical, and Social Science Technicians	249	233	(16)	-6.5%
Sales Engineers	87	89	3	2.9%
Total	6,920	7,645	725	10.5%

Source: 2015.4 – QCEW Employees, Non-QCEW Employees, and Self-Employed. Group of 99 STEM occupations.

At a more granular level, we see that the most common STEM occupations in Newton and Needham are a variety of computer occupations, including software developers, programmers, and support specialists.

Specific STEM Occupations With Over 100 Jobs in Newton and Needham

SOC	Description	2010 Jobs	2015 Jobs	2005 - 2015 Change	2005 - 2015 % Change	2015 Location Quotient
15-1132	Software Developers, Applications	786	1,030	244	31.0%	2.65
15-1133	Software Developers, Systems Software	819	926	107	13.1%	4.30
15-1151	Computer User Support Specialists	544	635	91	16.7%	1.85
15-1121	Computer Systems Analysts	439	550	111	25.3%	1.81
11-3021	Computer and Information Systems Managers	395	479	84	21.3%	2.58
15-1131	Computer Programmers	296	347	51	17.2%	1.98
15-1142	Network and Computer Systems Administrators	261	289	28	10.7%	1.44
19-3031	Clinical, Counseling, and School Psychologists	217	225	8	3.7%	2.73
15-1134	Web Developers	133	217	84	63.2%	2.50
19-1042	Medical Scientists, Except Epidemiologists	133	150	17	12.8%	2.73
15-1143	Computer Network Architects	125	138	13	10.4%	1.78
15-1199	Computer Occupations, All Other	125	137	12	9.6%	1.11
15-1152	Computer Network Support Specialists	133	128	-5	-3.8%	1.26
17-2061	Computer Hardware Engineers	163	127	-36	-22.1%	3.02
17-2141	Mechanical Engineers	144	122	-22	-15.3%	0.83
17-2051	Civil Engineers	102	115	13	12.7%	0.77
17-2071	Electrical Engineers	139	114	-25	-18.0%	1.20
11-9041	Architectural and Engineering Managers	133	113	-20	-15.0%	1.15
15-1141	Database Administrators	93	110	17	18.3%	1.78
17-3023	Electrical and Electronics Engineering Technicians	140	101	-39	-27.9%	1.36

Source: 2015.4 – QCEW Employees, Non-QCEW Employees, and Self-Employed. Group of 99 STEM occupations.

It is worth noting that for the industries examined in the Priority Industry Analysis appendix—particularly information technology and biotech & life sciences—businesses often cluster geographically near top universities that produce their employment pools. For example, companies with locations near the campuses of the best universities and in attractive locations are better positioned to compete for the best software programmers. Massachusetts is already home to 5.6% of the software publishing industry workforce—the third highest percentage after California and Texas—as well as several prestigious schools for the field, including Harvard and the Massachusetts Institute of Technology.[4]

Newton and Needham, and the N^2 Corridor, benefit from proximity to Boston metro higher education assets, to the extent that these graduates and their more experienced cohorts can be attracted to work and potentially live in these western suburbs. The Peer Set Analysis appendix examines STEM training program completions and STEM occupation concentration for the larger Boston metro region in comparison to several peer metros. The Boston metro area compares well to the other metros in terms of these indicators. Only the Washington, DC metro area has a comparable number of STEM related completions—33,072 compared to the Boston metro's 30,519. The Boston metro does have a higher concentration of STEM occupations compared to occupations nationwide, for a location quotient of 1.60, which exceeds that of the Denver and Baltimore metros. However, the Washington DC and Seattle metros had even higher location quotients (with Washington DC's being 2.02).

[4] IBISWorld Industry Report 51121: Software Publishing in the U.S., December 2015.

Top Employers

The following is a non-definitive list of major employers in Newton and Needham, collected from municipal and area websites as well as the interviews to give context to Camoin Associates' understanding of the economic trends described in this base analysis.

- Boston College
- City of Newton
- Newton–Wellesley Hospital
- Jewish Community Centers of Greater Boston
- Bloomingdale's
- Clarks Companies North America
- EMC Corporation
- Lasell College
- Boston Marriott Newton
- Questex Media Group LLC
- Tech Target Inc.
- Upromise Inc.
- Wegmans
- TripAdvisor
- Coca-Cola Bottling Co
- Beth Israel Deaconess Hospital–Needham
- GateHouse Media Inc.
- PTC Inc.
- Charles River Center

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Appendix D: Priority Industry Analysis

N² INNOVATION CORRIDOR ECONOMIC DEVELOPMENT STRATEGY & MARKETING PLAN

April 2016

Prepared for:

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About Camoin Associates

Camoin Associates has provided economic development consulting services to municipalities, economic development agencies, and private enterprises since 1999. We specialize in real estate market analysis to evaluate the feasibility and impacts of proposed projects. Through the services offered, Camoin Associates has had the opportunity to serve EDOs and local and state governments from Maine to California; corporations and organizations that include Lowes Home Improvement, FedEx, Volvo (Nova Bus) and the New York Islanders; as well as private developers proposing projects in excess of $600 million. Our reputation for detailed, place-specific, and accurate analysis has led to projects in over twenty states and garnered attention from national media outlets including *Marketplace* (NPR), *Forbes* magazine, and *The Wall Street Journal*. Additionally, our marketing strategies have helped our clients gain both national and local media coverage for their projects in order to build public support and leverage additional funding. The firm currently has offices in Saratoga Springs, NY, Portland, ME, and Brattleboro, VT. To learn more about our experience and projects in all of our service lines, please visit our website at www.camoinassociates.com. You can also find us on Twitter @camoinassociate and on Facebook.

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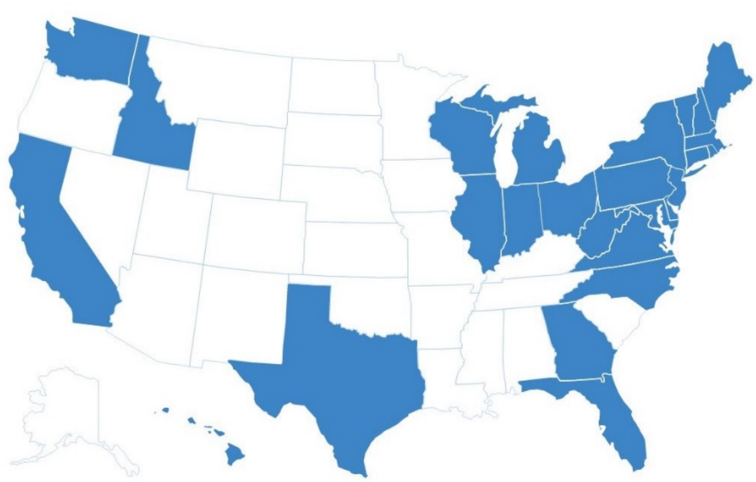

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Introduction

As part of the research for the N² Innovation Corridor, a priority industry sector analysis was conducted. This analysis is a deeper examination of industries identified in the economic base analysis and through other information collection that are in some way significant and/or relevant to the Newton and Needham innovation economy and provides an understanding of the potential for growth. The priority industry areas include:

- Information technology
- Professional, scientific, and technical services
- Biotech and life sciences

These sectors were identified as having potential for the N² Corridor, either for their component industries' concentration in employment (e.g. software publishing, with a location quotient of 6.39) or growth over the last decade (e.g. management consulting added over 300 jobs), recent national trends that show increasing demand (e.g. biotechnology). It should be noted that these are highly aligned with the MassTLC 2015 State of Technology Report that names the Internet of things, security, and health care / life sciences information technologies as three emerging technology areas that Massachusetts has the potential to dominate.

Sources for this analysis include IBISWorld, a global market research firm to which Camoin subscribes for its leading business intelligence research and insights into market conditions for targeted industries; Economic Modeling Specialists Intl. for local and industry-specific employment data and employment trends; as well as from reports from industry organizations and entities important to the Boston area's larger innovation economy.

Each section includes a description of the industry, a summary of performance in the N² area, a discussion highlighting relevant industry trends.

Executive Summary

Our research of Newton and Needham's economic base and national trends for these industries has further affirmed that these areas should be prioritized by the N² Corridor as industries to monitor, cultivate, and target in marketing efforts.

Of the industries studied, Newton and Needham have performed particularly strongly in the past five years in internet publishing; custom computer programming; marketing consulting; process, physical distribution, and logistics consulting; R&D in the physical, engineering, and life sciences; and other scientific and technical consulting services. Computer facilities maintenance services also grew significantly, albeit at a lower overall employment level.

Most of the industries of highest relevance to the N² Innovation Corridor vision are in the growth stage of the business life cycle, that is, they are increasing in their importance to the overall economy. All the industries studied are projected to outpace gross domestic product growth over the next five years, with the exception of R&D in the social sciences and humanities, as shown in the table here. Biotechnology's growth is expected to be nearly quadruple that of GDP, and robust growth rates are also projected for pharmaceutical manufacturing, internet publishing, and medical equipment and supplies manufacturing.

Projected Growth for Priority Industries (Nationally)

Industry	Projected Annualized Growth Rate for 2015-2020
Biotechnology	8.3%
Pharmaceutical manufacturing (brand name)	6.2%
Internet publishing and broadcasting	5.6%
Medical equipment and supplies manufacturing	5.3%
Scientific and economic consulting	3.8%
Management consulting (inclusive of marketing consulting)	3.6%
IT consulting	3.2%
HR consulting	3.2%
Software publishing	3.0%
R&D in the physical, engineering, and life sciences	2.8%
R&D in the social sciences & humanities	1.2%
GDP	2.2%

Source: IBISWorld reports.

Even those industries that are closer to the bottom of this list and may be designated as "mature" are ones that could be shifted back into a "quality growth" status by the confluence of key technological developments that forge new markets and demand for new products.

Most industries studied are characterized by extremely high levels of technological change, even in more mature industries like scientific research and development, and are in fact fueling their own technological change. An array of emerging disruptive technologies is creating as-yet-unshaped opportunities across the IT industry (the Internet of things, artificial intelligence, big data analytics) and the biotechnology / life sciences industry (genomics, biomass energy production). While management and scientific consulting services are typically not drivers of technological change, the pervasiveness of technology, along with the growing importance of sustainable energy, is also a major driver of demand for those services.

Relatedly, high levels of R&D and innovation are necessary conditions for the success of most IT and biotechnology / life sciences industries. And they require a great deal of high-skilled labor. Consequently, many industry players cluster in regions with key higher educational and research institutions, large enterprises in related fields, and innovation support ecosystems that help them attract investment and other resources.

Generally improving macroeconomic conditions are important factors for these industries' strong growth prospects, and in many cases the aging population and surging demand for and access to health care are also growth drivers, directly or indirectly.

All industries studied here are undergoing some degree of consolidation. But even though merger and acquisition activity is robust throughout the IT and biotechnology / life sciences industries, they continue to feature a high number of new entrants, with successful entrepreneurs and start-ups continually being acquired by larger firms seeking to add niche new technologies and knowledge to their portfolios.

The table below summarizes the industries analyzed in terms of their life cycle stages, market share concentration levels (nationally), levels of technological change, and barriers to entry.

Life Cycle and Other Industry Categorizations

NAICS	Industry	Life Cycle Stage	Market Share Concentration	Technological Change	Barriers to Entry
51121	Software Publishing	Quality Growth	Low	High	Medium
51913b	Internet Publishing and Broadcasting	Quality Growth	High	High	Low
51913a	Search Engines	Quality Growth	High	High	High
54151	IT Consulting (Computer Systems Design)	Quality Growth	Low	High	Low
54161	Management Consulting	Maturity	Low	Low	Low
54162	Environmental Consulting	Quality Growth	Low	Low	Low
54169	Scientific & Economic Consulting	Quality Growth	Low	Medium	Low
--	Biotechnology	Quality Growth	Medium	High	Medium
54171	Scientific Research & Development	Maturity	Low	High	High
33911	Medical Equipment & Supplies Manufacturing	Mature/Declining	Low	High	Medium
32541	Pharmaceutical Manufacturing (brand name)	Maturity	Medium	High	High
32541	Pharmaceutical Manufacturing (generic)	Quality Growth	Low	High	High

Source: IBISWorld
All information concerns industries in the U.S. only
Maturity: Company consolidation; level of economic importance is stable
Quality Growth: High growth in economic importance; weaker companies close down; developed technology and markets
Quantity Growth: Many new companies; minor growth in economic importance; substantial technology change
Decline: Shrinking economic importance

Information Technology

Industry Area Description

Camoin Associates has defined an Information Technology industry cluster of particular relevance to the innovation economy and to the N^2 Corridor's existing and potential strengths. It includes the following industries:[1]

- Software publishers
- Internet publishing and broadcasting and web search portals
- Computer systems design and related services (part of IT consulting)
- Cybersecurity

Software publishers are defined as firms that market and distribute software products and that may also design the software, produce support materials and provide support services.

Internet publishers offer nonphysical products, such as news, music and video, and social networking, exclusively through the Internet. Revenue in this industry is derived from the sale of advertising space or subscriptions to consumers, and/or revenue from intellectual property licensing and the sale of user information to third parties. Web search portal firms operate search engines and other types of search-based websites that display advertisements.

"Computer systems design and related services" is an industry comprising a range of companies that provide expertise in the IT field. They may do so by writing, modifying, testing, and supporting software for individual

[1] Definitions are adapted from IBIS reports for the associated NAICS codes.

customers; by planning and designing computer systems; by managing clients' computer systems or data processing facilities; or by providing other computer-related services.

Cybersecurity is a field that cuts across multiple industry designations. While some cybersecurity companies would be classified as providing custom computer programming services, others may be software publishers, computer systems designers, or some other designation; and not all firms in these industries are cybersecurity enterprises. The World Economic Forum characterizes the market opportunity for cybersecurity as embedding security into the lifecycle of products and communications. Applications include secure communications, using big data to identify "insider" risks, a "genetic" approach to malware, software-defined firewalls, security as a service, network instrumentation, and embedded SCADA (supervisory control and data acquisition).[2]

Industry Market Trends

The IT industry is constantly changing with advancements in technology, new uses, emerging media, and overall increase in the use of technology in nearly every aspect of life. Nearly all IT industries are in the "quality growth" stage of the industry life cycle—that is, they are experiencing high growth in their overall economic importance, weaker companies are exiting the industry, and markets and technology are substantially developed.

All industries reviewed for this analysis are highly dependent on investments in R&D, protection of patents, a highly skilled workforce, and access to the latest available and most efficient technology and techniques. There is significant overlap in their external drivers of demand, with multiple industries' growth driven by increased corporate profits (i.e. the ability of businesses to invest in IT) and the rise of mobile Internet devices. Most of these industries are characterized by the presence of large industry players complemented by a vast number of small firms and new entrants, as well as by perpetual merger and acquisition activity in which the larger firms acquire the intellectual property portfolios of newer niche firms in order to stay competitive in these fast-evolving IT fields.

Each of these IT industries is characterized by a very high degree of technological and product innovation, and are engaged in heavy and continuous research and development investments. Further shifts in technological innovation and the evolution of both consumer and business preferences are expected to propel all of them forward over the next five years. The rise of mobile devices, the Internet of things (IoT), big data and predictive analytics, and cloud computing are common themes driving as-yet unshaped opportunities for the software publishing, Internet publishing, IT consulting, and cybersecurity industries.

Local Industry Performance

Within Newton and Needham, there are close to 5,700 jobs in the IT cluster, a number that has increased by more than 50% over the last ten years. Computer Systems Design, including custom programming and systems design services, makes up about two thirds of cluster jobs, and accounted for about half of the cluster's growth in the last decade. Specifically, the Custom Computer Programming Services subsector more than doubled, adding over 1,100 jobs in the two communities.

Internet Publishing and Web Search Portals tripled its employment over the last decade, adding close to 600 jobs. As of 2015, this industry's national location quotient is 9.23, indicating that this industry's share of total employment is over nine times higher in Newton and Needham as compared to the U.S. overall.

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[2] World Economic Forum, "Risk and responsibility in a hyper-connected world," in collaboration with McKinsey, January 2014.

Average earnings for these industries collectively are more than double the economy-wide average wage of $74,467 for Newton and Needham.[3]

Information Technology Cluster, Newton and Needham

NAICS	Description	2005 Jobs	2015 Jobs	2005–15 Change	2005–15 % Chg.	2015 Nat'l LQ	2015 Avg. Earnings*
51121	Software Publishers	765	1,064	299	39%	6.39	$137,104
51913	Internet Publishing and Broadcasting and Web Search Portals	298	887	589	198%	9.23	$181,437
54151	Computer Systems Design and Related Services	2,620	3,707	1,087	41%	3.53	$155,823
541511	Custom Computer Programming Services	1,104	2,222	1,118	101%	4.81	$171,121
541512	Computer Systems Design Services	1,400	1,355	(45)	(3%)	2.74	$134,871
541513	Computer Facilities Management Services	22	38	16	73%	1.16	$83,724
541519	Other Computer Related Services	94	91	(3)	(3%)	1.50	$124,593
	Total	3,683	5,657	1,974	54%		$156,319

*Includes wages and supplements

Source: EMSI Complete Employment 2015.3

Local Companies

Examples of companies in the N² Corridor that fall under these NAICS codes include Forum Systems and Promisec, both of which made the “Cybersecurity 500” list of the hottest cybersecurity companies to watch in 2016.[4] The other 33 Massachusetts firms that made the list are concentrated in Boston and Waltham (home to Raytheon).

CyberArk, an Israeli-invested company headquartered in Newton’s Wells Avenue Office Park, may be the N² Corridor’s highest profile cybersecurity firm. It’s notable for having secured the third largest volume of venture capital in Massachusetts in 2011, and is an example of Israeli entrepreneurs choosing Massachusetts as the base from which to pursue the American market.

PTC is an example of a software publisher in the N² Corridor, and is one that is potentially helping to disrupt the field of manufacturing, which constitutes is main market. PTC delivers technology solutions comprised of software & services that help manufacturers and other companies design products, manage product information and improve their product development and services processes. It is helping to define the Internet of things (IoT) field, including through integration of augmented reality (the overlaying of digital data onto the physical

Example Companies

- TripAdvisor
- CyberArk
- Forum Systems
- Promisec
- PTC
- Building36
- Adobe
- Turbine
- EMC

[3] *EMSI Complete Employment 2015.3.* Average earnings include wages, salaries, supplements (additional employee benefits), and proprietor income.
[4] http://www.cybersecurity500.com/

world)—a subject on which its CEO is known for his thought leadership.

Building36, which also operates in the IoT space in the area of home systems automation, just moved back to the N^2 Corridor and is promoting its “innovation district” location.

TripAdvisor, which is sometimes classified under computer systems design and related services, is the Corridor’s highest profile innovation company, having moved about 1,000 people to its new headquarters there last summer.

Adobe, the major transnational computer software company known for Photoshop, Acrobat, and other universally used applications, has major development operations in Newton but outside the N^2 Corridor.

Turbine is an online game developer with breakthroughs in free-to-play model and successful long-running titles like The Lord of the Rings Online™ and Dungeons & Dragons Online™. The studio employs more than 350 people, and among those positions available within the company are roles for game designers, artists, animators, programmers, systems engineers, and game testers.

EMC, a data storage provider acquired last year by Dell, is a multinational company has its corporate headquarters in Hopkinton, MA, and a facility in the Wells Avenue Office Park. It is a major player in helping businesses and service providers to transform their operations and deliver information technology as a service (ITaaS).

Regional Ecosystem

Massachusetts and the Boston area in general have tremendous strengths in IT industries,[5] and are home to a first-rate array of university research and training programs of relevance to IT field.

The state government and various statewide organizations have leaned in to further cultivate Massachusetts’ leadership in several relevant fields. There is a Massachusetts Big Data Initiative, started by MassTech in 2012 under former Governor Deval Patrick, whose mission is to expand the Commonwealth’s position as a world leader in the growing big data industry and enable the region to become the premier global hub for big data innovation and technology. Governor Patrick also held an IoT week during his last year in office. There is an Advanced Cyber Security Center—a nonprofit consortium, launched 2011 and supported by Mass Insight Global Partnerships—that brings together industry, university, and government partners to address the most advanced cyber threats through sharing of cyber threat information, engagement in next-generation cybersecurity R&D, and support for educational programs to address the workforce gap. The Massachusetts Open Cloud project is the first of its kind, a government/industry/university collaboration designed to create new public cloud-computing infrastructure to spur big data innovation.

Software publishers

General Outlook and Life Cycle Position for Software Publishers

Software publishing has grown dramatically over the past five years, and is predicted to experience 3% annualized growth over the next five years (above expected annualized GDP growth of 2.2%), as software becomes more prevalent in day-to-day activities and as a range of technological advancements create new downstream markets for new software products. The industry is marked by a trend, which analysts expect to continue, of large software

[5] EMSI research; Massachusetts Technology Leadership Council 2015 State of Technology Report.

publishers actively purchasing smaller ones with niche specialties, in order to compete in an ever-increasing array of platforms.[6]

Industry Drivers and Performance Factors for Software Publishers[7]

All major external drivers for the software publishing industry are expected to see positive movement in 2016. These include business and government investment in computers and software; the rapid proliferation of broadband-enabled mobile devices; the flourishing entertainment software sub-industry; and higher rates of personal computers along with increasing per capita disposable income. Advancements in the semiconductor and telecommunications sectors, and the attendant proliferation of computing platforms, are stimulating the development of new software markets.

There is a high level of merger and acquisition churn in software publishing, driven by large companies' appetites for strategic and diverse intellectual property portfolios. This in turn is attracting large numbers of new startups to the industry, which is in turn driving employment growth. The industry is characterized by low barriers to entry and low market share concentration.

Emerging Technologies and Opportunities for Software Publishers [8]

Emerging opportunities in this field will be especially defined by the rise of artificial intelligence and predictive analytics (e.g. software to help businesses use big data to predict demand patterns). Technological advancements are expected to expand product offerings and the potential markets that are served by software publishers. Mobile computing devices are providing new platforms on which software publishers can compete. The rapid move toward cloud computing is opening a wider array of software possibilities for mobile phones and tablets no longer hampered by low storage capacities. Connected cars, logistics, sensors and monitors, as well as smart appliances, are expected to enter the everyday life of American businesses and consumers.

The software publishing industry is undergoing business model shifts, especially toward subscription-based models like software as a service (SaaS) and cloud computing, which produce more stable revenues than the traditional develop-and-release format. This can be seen as an ongoing shift toward software being delivered online.

Internet publishers

General Outlook and Life Cycle Position for Internet Publishers

The Internet publishing and broadcasting industry has grown rapidly and is projected to grow at an annualized rate of 5.6% over the next five years, driven by the fact that its products are an increasingly favored medium for the advertising industry. Growth is not as steadily attributable to the "paid" segment of the industry due to piracy challenges for paid Internet content. Major players like Facebook and Google are expected to capture a large portion of the projected growth. IBISWorld predicts that the industry will continue to be dominated by large, horizontally integrated players and small independent publishers, with very little in between, and with the entry of

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[6] IBISWorld Industry Report 51121: Software Publishing in the U.S., December 2015.
[7] IBISWorld Industry Report 51121: Software Publishing in the U.S., December 2015.
[8] IBISWorld Industry Report 51121: Software Publishing in the U.S., December 2015.

another 66,000 new enterprises by 2020. These new entrants' viability is dependent on their ability to attract Internet traffic; most will generate only modest revenue or eventually exit the industry.[9]

Emerging Technologies and Opportunities for Internet Publishers

The rise of mobile broadband-enabled devices is the largest technological change reshaping the Internet publishing industry. There will be increasing demand for mobile content, especially content that can enable interactive advertising with mobile users—think text message ads, media-rich ads, and geolocation-enabled targeted marketing.

IT consulting & Computer Systems Design

General Outlook and Life Cycle Position for IT Consulting

IT consulting—including computer systems design firms—has also been a strong growth industry nationally and is also projected to see strong continued growth of 3.2% (annualized) between 2015 and 2020. This is occurring on the back of improved macroeconomic conditions, favorable shirts in technological innovation, and business trends that have boosted demand for the industry's services.[10]

Industry Drivers and Performance Factors for IT Consulting [11]

Demand for this industry's services is derived primarily from private consumer investment in computers and software; from corporate profit growth enabling large IT investments; from the finance and insurance industry in particular, given its need for products that help them manage large amounts of sensitive client and proprietary data; and from federal and state governments, whose slow budget growth is a potential threat to the IT consulting industry.

Emerging Technologies and Opportunities for IT Consulting [12]

The rise of cloud computing and big data analytics has been very disruptive to traditional IT consulting firms focused on services like on-premise server and software solutions. But this trend is benefiting firms who are able to leverage their expertise toward infrastructure solutions for a cloud-based future, and large firms who are able to shift away from low-profit hardware business segments into high-value-added activities associated with the shift toward integrated computer systems. A clear example of this is IBM's recent divestment of its microelectronics business and investment of billions of dollars to develop a platform-as-a-service (PaaS) and big data analytics segment.

Big data will continue to drive the industry over the next five years, as the IT consulting industry is called on to provide solutions for organizing, managing, and analyzing the increasingly vast volume of data. Like the other industries analyzed here, larger operators are best positioned to compete in this sphere and to benefit from projected growth, but ongoing technological changes will also create opportunities for smaller and newer entrants as well as drive ongoing merger and acquisition activity.

The rise of mobile Internet devices and the Internet of things will help drive change and new opportunities for this industry as well, as they create demand for application and system design.

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[9] IBISWorld Industry Report 51913b: Internet Publishing and Broadcasting in the U.S., September 2015 2015.
[10] IBISWorld Industry Report 54151: IT Consulting in the U.S., October 2015.
[11] IBISWorld Industry Report 54151: IT Consulting in the U.S., October 2015.
[12] IBISWorld Industry Report 54151: IT Consulting in the U.S., October 2015.

IBISWorld assesses that despite a concentration of employment growth in the larger end of firm sizes, there are still plenty of opportunities for small-scale IT consultants. Moreover, a comparison of growth in the number of establishments versus (slower) growth in the number of enterprises indicates that there are new locations resulting from expansion among existing firms and widespread acquisition of niche companies.

Cybersecurity

General Outlook and Life Cycle Position for the Cybersecurity Industry

Globally, the cybersecurity market reached $75 billion in 2015, and is projected to more than double to $170 billion by 2020.[13] Cybersecurity is the target of significant venture capital interest; alongside corporate investors, there are several new cybersecurity VC investment funds that have raised hundreds of millions of dollars to invest as of 2015. Corporate investors are major funding sources for cybersecurity startups, alongside the VC firms.[14]

Industry Drivers and Performance Factors for Cybersecurity Firms

Banking and financial services constitute the fastest growing non-government cybersecurity market.[15] The U.S. government alone has spent $100 billion on cybersecurity over the past decade, and after declaring a national emergency regarding the threat of cyberattacks, the president requested a budget of $14 billion for cybersecurity in 2016.[16] The rise of web-based solutions and the increasing popularity of mobile devices have triggered an explosion of increasingly private and sensitive data, requiring more complex security software products.[17] The mobile security market is exploding with 30%-plus growth projected through 2019, driven by mass-adoption of smart phones, tablets, and other mobile devices by consumers and corporations globally.[18] Foreign demand is also an important driver: The U.S. is the larger exporter of cyber products, with Israel coming in second.[19]

Emerging Technologies and Opportunities for Cybersecurity Firms

All of the technological shifts mentioned above—like the move to new computing platforms and the growth of vast amounts of sensitive data—will also create opportunities in the cybersecurity arena, which cuts across many of the industry areas treated earlier. For cybersecurity, the hot areas for growth are security analytics / SIEM (security information and event management); threat intelligence; mobile security; and cloud security.[20] During the next five years, as data breaches increase in frequency and intensity, data security firms will benefit from opportunities to develop solutions to these issues, which will boost help boost revenue in industries like IT consulting.[21]

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[13] "Cyber Security Market Worth $170.21 Billion by 2020," MarketsandMarkets, http://www.marketsandmarkets.com/PressReleases/cyber-security.asp.
[14] Steve Morgan, "The Business of Cybersecurity: 2015 Market Size, Cyber Crime, Employment, and Industry Statistics," *Forbes*, October 16, 2015, http://www.forbes.com/sites/stevemorgan/2015/10/16/the-business-of-cybersecurity-2015-market-size-cyber-crime-employment-and-industry-statistics/3/#1e07d741219120588cdc26f9.
[15] Morgan 2015.
[16] Morgan 2015.
[17] IBISWorld Industry Report 51121: Software Publishing in the U.S., December 2015.
[18] Morgan 2015.
[19] Morgan 2015.
[20] Morgan 2015.
[21] IBISWorld Industry Report 54151: IT Consulting in the U.S., October 2015.

The multi-trillion dollar global Internet of Things (IoT) market is expected to further lift security research and spending through 2025. A huge but as-yet undefined market for securing non-computer devices will come in to sharp focus over the next few years.[22] Automobiles are among them: there's a cybersecurity market emerging around protecting cars from being hacked.[23] PTC is well positioned to exploit these opportunities.

The security analytics sector has emerged out of the broader $100 billion-plus big data and analytics market. A lot of new startups are getting funded in this crowding sector.[24]

Professional, Scientific, and Technical Services

Industry Area Description

Camoin Associates has defined a professional, scientific, and technical services industry cluster of particular relevance to the innovation economy and to the N^2 Corridor's existing and potential strengths. The industry cluster includes the following industries.[25]

- Management consulting services: Individuals in this profession work with businesses, non-profits and the public sector to streamline overall business procedures through: organizational design, human resources, corporate strategy, information technology strategy, marketing, sales, finances and logistics. The private and public sectors use consultants in this industry to determine the best course forward in efficiency and competitiveness for their market.
    - Human resources consulting: Professionals who work in this subsector of management consulting offer assistance to the private and public sector in dealing with human relations subjects like: resource and personnel policies, employee benefits, compensation systems, wage and salary, recruitment and retention and professional development.
- Other scientific and technical consulting services: In this industry, consultants specialize in a range of subjects, but broadly range in the fields of economics, energy, security, and agricultural sectors. However, nearly 50% of the industry advises on other consulting services.
- Research and development in the social sciences humanities: This industry comprises establishments primarily engaged in conducting research and analyses in cognitive development, sociology, psychology, language, behavior, economic, and other social science and humanities research.[26]

It should be noted that although there is significant employment in architectural and engineering services, these were not studied; instead we considered these subsectors as part of the real estate cluster that, while high performing, follows and supports an innovation economy rather than driving it.

Local Industry Performance

The professional services cluster grew by 22% between 2005 and 2015, comprising a total of 2,255 jobs in 2015. Management consulting services, and specifically its marketing consulting services sub-industry, drove the majority of this growth. Marketing consulting services doubled its employment over this period, adding 370 jobs.

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[22] Morgan 2015.
[23] http://sandhill.com/article/huge-cybersecurity-market-protecting-cars-from-being-hacked/
[24] Morgan 2015.
[25] Definitions are modified from IBIS reports for the associated NAICS code.
[26] U.S. Census definition for 2012 NAICS.

The “other scientific and technical services” category, which includes specialty consulting activities primarily focused in the areas of economic, energy and mineral, security, and agricultural analysis, also experienced significant growth, doubling and adding over 100 jobs.

Average earnings for these industries collectively are about 36% higher than the economy-wide average wage of $74,467 for Newton and Needham.[27]

Newton and Needham’s strength in this cluster represents an asset for the prospects of young tech companies that require management expertise, sometimes from consultants, to grow successfully.

Professional, Scientific, & Technical Services Cluster, Newton and Needham

NAICS	Description	2005 Jobs	2015 Jobs	2005–15 Change	2005–15 % Chg.	2015 Nat'l LQ	2015 Avg. Earnings*
54161	Management Consulting Services	1,562	1,873	311	20%	2.96	$98,398
541611	Administrative Management and General Management Consulting Services	820	722	(98)	(12%)	2.23	$100,896
541612	Human Resources Consulting Services	114	100	(14)	(12%)	2.11	$124,401
541613	Marketing Consulting Services	361	731	370	102%	5.04	$92,759
541614	Process, Physical Distribution, and Logistics Consulting Services	233	291	58	25%	4.58	$96,722
541618	Other Management Consulting Services	34	29	(5)	(15%)	0.56	$105,777
54169	Other Scientific and Technical Consulting Services	107	214	107	100%	1.52	$125,771
54172	Research and Development in the Social Sciences and Humanities	174	169	(5)	(3%)	5.23	$109,729
	Total	1,843	2,255	412	22%		$101,605

*Includes wages and supplements

Source: EMSI Complete Employment 2015.3

Local Companies

SocialMadeSimple, with about 18 employees, is a seven-year-old social media marketing consulting firm in the Wells Avenue Office Park. SnapApp, located outside the Corridor but in Newton, is a content marketing startup that made headlines when it raised $12 million in funding in November.

Strategy Analytics, a firm in the Wells Avenue Office Park that at one point reported 50 employees at the location, is also in

Example Companies

- SocialMadeSimple
- SnapApp
- Strategy Analytics
- Cambridge Technology
- American Liver Foundation
- Adelson Medical Research Fund
- Education Development Center

[27] *EMSI Complete Employment 2015.3*. Average earnings include wages, salaries, supplements (additional employee benefits), and proprietor income.

the management consulting industry focused on tactical marketing and technology issues for a range of businesses.

Cambridge Technology is an example of a firm in the "other scientific and technical consulting services" industry, although it is not within the Corridor. Its founders invented galvanometer scanning 40 years ago and designs laser scanning systems for a range of markets, including biomedical, materials processing, and military applications.

The American Liver Foundation, located just inside the Corridor with about six employees, belongs to the "R&D in the social sciences and humanities" industry; they facilitate, advocate, and promote education, support, and research for the prevention, treatment, and cure of liver disease. The Adelson Medical Research Fund is also in the Corridor, with about seven employees. The Education Development Center, a global nonprofit organization with 1,400 employees globally and about 10-19 in Newton (outside the Corridor), conducts health and human development work with funding from a number of government agencies and private foundations.

Camoin Associates considers the Lewis Institute at Babson College, which "activates unexpected and fruitful collaborations and integrative designs for action" with the goal of business prosperity and societal improvement, to be relevant to the "R&D in the social sciences and humanities" industry.

In addition, there are 2,002 self-employed individuals in Newton and Needham in the Professional, Scientific and Technical Services fields, comprising a potential pool of entrepreneurial firms in this sector.

Industry Overview

The overall positive forecast for the U.S economy is beneficial to the consulting industry, as companies who are able to capitalize on the rebounding and growing economy will look to invest their profits in consulting in various subsectors to increase their competitiveness. The following text examines the sub-industries within the defined professional, scientific & technical services cluster, surveying general outlook, industry drivers, and emerging opportunities.

Management Consulting and Human Resources Consulting[28]

General Outlook and Life Cycle Position

The industry outlook is positive over the next decade for management consulting firms, particularly as a result of overall economic growth prospects. Due to its dependency on macroeconomic conditions, the consulting industry's profits fell during the 2008 recession and the subsequent years, though it maintained some demand from companies that still had any funds to expend on consultants who could find efficiencies and alternative revenue streams in hopes of mitigating the financial downturn. The overall management consulting industry is projected to grow at an average annual rate of 3.6% over the coming five years. Although the industry features a vast portion of self-employed individuals, IBISWorld predicts that a majority of new contracts will be concentrated in "prestigious" consulting firms like KPMG, PricewaterhouseCoopers and Deloitte. Management consulting is considered a mature industry, as it largely tracks GDP growth, is experiencing an intensification of merger and acquisition activity (especially through acquisition of smaller firms), and provides a set of services that are widely accepted among consumers.

Like other management consultants, business for human resources (HR) consultants has been boosted by the economy's recovery. Additionally beneficial to HR consultants is the degree to which the entire US economy

[28] IBISWorld Industry Report 54161: Management Consulting in the U.S., May 2015.

increasingly depends on service-oriented jobs, arguably raising the importance of employee relations and employee retention within firms. The HR consulting subsector saw annualized growth of 7.1% over the past five years, and is projected to see 3.2% annual growth over the next five, however it is generally considered mature. Newer areas of demand for HR consultants include professional development and nontraditional work arrangements, as the creation of such opportunities becomes more important to businesses needing to attract and retain a highly skilled workforce. The future outlook for the HR consulting sub-industry involves a continued and larger number of mergers and acquisitions, so that larger companies can offer a greater number of services all under one umbrella.

Industry Drivers and Performance Factors for Management Consulting

Corporate profit is the greatest driver of the management consulting industry. Currently, financial services firms are the largest market for HR consultants, so economic recovery translates directly into increases in business for management and HR consultants. Corporate profits have been on the rise in the last five years, however dropping oil and energy prices are a major variable for financial industry profits in coming years. Additional factors that contribute to the stability and growth of the management consulting industry include private investment in physical structures, equipment and software; these are overall indicators of greater investments in businesses' future and tend to be expended alongside additional consulting services to help manage expansion plans.

Although a majority of management consulting revenue is derived from the private sector, public sector clients are also an important source of demand. But public spending on private consultants has been limited in the past five years due to concerns about the federal deficit and state budget woes, and although government consumption is expected to trend upwards, the government will remain vigilant as to the optics of expenditures on consulting services.

Emerging Technologies and Opportunities in Management Consulting

In Management Consulting, increasing digitization of work processes will require management consultants to be called in by companies looking for maximum efficiency. The increased use of technology in business, especially on mobile phones with Internet capabilities, has led many firms to seek the help of management consults to understand how to weave technology into their everyday service lines. Consultants that can offer solutions for the efficient and effective use of technologies will be valuable to companies large and small. However, there will also be greater competition from other more specialized technology industries, like IT Consulting (discussed elsewhere in this report). Larger consulting firms will look to acquire smaller firms with specializations in IT or other valuable fields, to add to their portfolio of services.

While a majority of revenue for U.S. management consultants is earned within the U.S., expansion to emerging markets in regions like the Asia Pacific and Middle East will be a source of additional revenue. Larger corporations have been opening local offices in these regions to take advantage of growing demand.

In a tie-in to biotechnology, IBISWorld predicts that high merger and acquisition activity in the health care and life sciences fields will help drive growth for management consultants that assist in that activity. Healthcare industry restructuring in the wake of the Affordable Care Act will also continue to offer a source of demand for management consultants.

Scientific and Economic Consulting[29]

General Outlook and Life Cycle Position of Scientific and Economic Consultants

According to IBISWorld, the scientific and technical subsector of consulting is relatively well positioned to withstand economic instability because it covers a wide range of markets, protecting it from major losses in any one area. In the last five years, the industry's revenue grew by an average annual rate of 5.0%; in the next five, above-GDP growth is expected to continue at an average annual rate of 3.8%. Revenue has performed well because demand for services in the industry have risen, while wages have not grown as quickly.

Markets that have contributed most strongly to the industry's growth in recent years include energy and mining firms, which are frequently required to conduct feasibility or safety studies pertaining to their work. While revenue in the industry grew in the last five years, the total number of firms in the industry has fallen at an annualized rate of 1.3% per year, and 80% of those losses were "non-employers"—typically self-employed individuals. In the same time frame where smaller companies were exiting the industry, the number of large firms increased, albeit slowly, at an annualized rate of 0.5% per year. Merger and acquisition activity is therefore changing the landscape of this subsector, a trend that is expected to continue, yet small scale establishments are expected to remain numerous.

IBISWorld considers scientific and economic consulting to be a growth-stage industry, mostly because it is expanding at a rate almost double that of the overall economy. Other factors that contribute to its classification as a growing industry include a projected increase in the number of establishments due to increased demand, and the continual offering of new services to meet the technological changes common to its markets.

Industry Drivers and Performance Factors for Scientific and Economic Consultants

Like in management consulting, corporate profit levels greatly dictate the market for scientific and economic consultants. Businesses need to have the financial stability and willingness to hire outside firms to assess and report on their standings.

Successful consultants in this field manage their operating costs so they are able to stay competitive in the market but still able to remain flexible and adapt to changing business landscapes. Consultants must strive to stand out among the crowd, through name recognition or specializing in niche markets, all while keeping a pulse on the next direction of business needs. To provide competitive services, consultants in this field must also have access to, and be able to retain, the best workforce available to them.

Research and development (R&D) spending is another driver of this subsector. Although the subsector covers a wide range of markets, energy and mining and agricultural sectors make up a combined quarter of services in this industry. Scientific exploration into alternative energy sources and agribusinesses trickle down to consultants in this field.

Technological and scientific progress has driven industry performance over the last decade and will continue to be a strong determinant of demand. Government-derived demand has been important to the economic consulting segment of the industry during periods like the Great Recession, when such consultants were retained to calculate stimulus package and realign budgets, however this is not expected to provide a stable source of demand going forward.

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[29] IBISWorld Industry Report 54169: Scientific & Economic Consulting in the U.S., April 2015.

Emerging Technologies and Opportunities for Scientific and Economic Consultants

R&D in the biotechnology-related fields of genomics and pharmaceuticals will benefit the scientific and economic consulting industry. So too will the growing fields of public safety and national security, even as overall government spending slows. Growth in renewable energy fields will also be a boon to the industry, providing opportunities to consulting firms that can offer expert advice and be flexible and keep up to date with new energy technologies. All of these opportunities for consultants in this field will be somewhat dependent on the level of R&D invested in each subject.

R&D in the Social Sciences & Humanities

Revenues for this industry increased by an annualized 4.4% from 2010-2015, with growth projected to slow to an annual rate of 1.2% between 2015 and 2020.[30] Market research information regarding this industry is difficult to obtain. For purposes of studying the N^2 Corridor, we have separated this industry from its scientific research and development corollary because of the latter's high relevance to biotechnology. With a strong location quotient of 5.23 in Newton and Needham, social sciences R&D is also an area of relevance to the innovation economy: It employs highly educated people in key knowledge economy occupations, attracts research funding from outside the community, has strong creative elements, is often cross-disciplinary, and in some cases intersects strongly with technology development in pursuing solutions to health, economic, social, and other problems.

Biotechnology and Life Sciences

IBISWorld defines the biotechnology industry as consisting of companies that primarily use living organisms or molecular and cellular techniques to provide chemicals, food and services that meet human needs; but excludes companies primarily involved in developing small-molecule pharmaceuticals, performing contract research or manufacturing biological equipment.[31]

Camoin Associates, for purposes of analyzing the biotechnology and life sciences cluster in the N^2 Corridor, has adapted this definition to consist of medical equipment and supplies manufacturing; pharmaceutical manufacturing; and all R&D in the physical, engineering, and life sciences. Pharmaceutical manufacturing is not studied here because it is not present in the Corridor and because of the low competitiveness of Corridor properties for significant new manufacturing operations. Health care, while clearly related to the biotechnology field, is not studied as a part of the cluster; although it is an important source of jobs and a high-growth industry, it is not an innovation industry except in places that are home to a research hospital.

Local Industry Performance

Employment in the Biotechnology and Life Sciences cluster in Newton and Needham remained stable over the last ten years, growing by a modest 4%, or 34 jobs. Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology) added 88 jobs over this period, tempering losses in Biotechnology Research and Development and also Surgical and Medical Instrument Manufacturing, both of which lost about 30 jobs.

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[30] "Forecast: Revenue of Social Science and Humanities R&D (NAICS 54172) in the U.S. from 2008-2020," Statista.com.
[31] IBISWorld Industry Report NN001: Biotechnology in the U.S., November 2015.

Although Biotech R&D lost employment, it still remains highly concentrated in the two communities, with a location quotient over 5, the highest within the cluster.

Average earnings for these industries collectively are about 66% higher than the economy-wide average wage of $74,467 for Newton and Needham.[32]

Biotechnology & Life Sciences Cluster, Newton and Needham

NAICS	Description	2005 Jobs	2015 Jobs	2005–15 Change	2005–15 % Chg.	2015 Nat'l LQ	2015 Avg. Earnings*
33911	Medical Equipment and Supplies Manufacturing	182	145	(37)	(20%)	0.86	$139,836
339112	Surgical and Medical Instrument Manufacturing	168	136	(32)	(19%)	2.11	$144,821
339113	Surgical Appliance and Supplies Manufacturing	<10	<10	Insf. Data	Insf. Data	0.03	Insf. Data
339114	Dental Equipment and Supplies Manufacturing	0	0	0	0%	0.00	$0
339115	Ophthalmic Goods Manufacturing	0	0	0	0%	0.00	$0
339116	Dental Laboratories	<10	<10	Insf. Data	Insf. Data	0.27	Insf. Data
54171	Research and Development in the Physical, Engineering, and Life Sciences	518	575	57	11%	1.83	$131,614
541711	Research and Development in Biotechnology	437	406	(31)	(7%)	5.11	$134,970
541712	Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology)	81	169	88	109%	0.72	$123,530
	Total	700	720	20	3%		$135,725

*Includes wages and supplements

Source: EMSI Complete Employment 2015.3

Local Companies

Verastem and Karyopharm Therapeutics are new biotech arrivals in the Corridor, having come from Cambridge and Natick respectively. A research lab for Celldex Therapeutics is in the same complex on Kendrick Street as Verastem. These companies' primary industry identification is "pharmaceutical and medicine manufacturing," although their facilities in Newton and Needham are also headquarters with R&D laboratories.

Beltronics is a medical equipment and supplies manufacturer in Needham, near but not in the Corridor. It may employ about eight

Example Companies

- Verastem
- Karyopharm Therapeutics
- Celldex Therapeutics
- Beltronics
- Abbott Laboratories
- Knoll Environmental
- Miraca Life Sciences

[32] *EMSI Complete Employment 2015.3*. Average earnings include wages, salaries, supplements (additional employee benefits), and proprietor income.

people. Bird's Hill is a compounding pharmacy outside the Corridor in Needham and also falls into this industry category.

Abbott Laboratories, the pharmaceutical, medical advice, and diagnostics company with 73,000 employees worldwide, has a location just a block or two outside the Corridor in Newton, listed under the "R&D in biotechnology" industry.

Miraca Life Sciences is a Texas pathology laboratory and R&D firm with a presence in the Corridor of perhaps between 10-19 employees.

Regional Ecosystem

Massachusetts is home to 6.3% of biotechnology industry firms nationwide, second only to California's 22.6%, and they are concentrated in the Boston metro.[33] The Boston metro earned Jones Lang LaSalle's ranking as the top life sciences cluster nationally.[34] It is home to many elite academic and research institutions (including Harvard and MIT) and world-class medical facilities, including the top three NIH-funded hospitals in the U.S.[35] There is a Massachusetts Biotechnology Council based in Cambridge with over 650 member organizations that advocates for the cluster.

BIO considers the Boston metro area to have specialized employment concentration in three difference bioscience subsectors—drugs and pharmaceuticals, medical devices and equipment, and research, testing, and medical laboratories. It named Massachusetts as one of the top leading states for academic bioscience research and development expenditures, which totaled over $1.4 billion in 2012—putting it 8th in the nation, or 3rd in terms of per capital investment. Massachusetts and its significant biomedical research infrastructure has been awarded $356 in NIH funding per capita, or more than 5 times the national average. And it is second only to California in terms of attracting biotech venture capital, and well outperforms California on a per capita basis. Massachusetts topped the list for bioscience-related patents per capita between 2009 and 2013.[36]

According to Jones Lang LaSalle's research, Greater Boston is home to the largest concentration of life sciences researchers in the U.S. and has over 3.75 million square feet of requirements. Moreover, it suggests that life science tenants have recognized the added value the suburbs provide, and that "in contrast to older stock available in Cambridge, the suburbs have afforded occupants the opportunity for office-to-lab conversions as well as brand new development projects, at lower cost."[37]

Biotechnology (General)

Industry Overview for Biotechnology (General)[38]

Biotechnology is a high-growth industry with a wide array of diverse fields, markets, and applications. For example, major sources of demand for biotechnology products and services include agriculture (e.g. to increase crop yields) and heath care (as an aging population requires more pharmaceutical products with biotechnology inputs). The human health technologies segment constitutes the largest share of the biotechnology industry's products and services (65.8%), according to IBISWorld, followed by the agriculture/aquaculture segment (12.8%), industrial segment (9.2%), environmental remediation segment (6.1%), and animal health, marine, and terrestrial

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[33] IBISWorld Industry Report NN001: Biotechnology in the U.S., November 2015.
[34] Jones Lang LaSalle Life Sciences Outlook, United States, 2015.
[35] Jones Lang LaSalle Life Sciences Outlook, Boston, 2015.
[36] Battelle/BIO State Bioscience Jobs, Investments and Innovation, June 2014.
[37] Jones Lang LaSalle Life Sciences Outlook, Boston, 2015.
[38] IBISWorld Industry Report NN001: Biotechnology in the U.S., November 2015.

microbial technologies segment (6.1%). Over the past five years, industry revenue has grown an annualized rate of 4.0%, and IBISWorld expects that rate to be 8.3% over the next five years.

There is a trend of vertical integration in which biotechnology companies are being acquired by pharmaceutical manufacturers as the latter face patent expirations and seek new cutting-edge drugs, and as the former seek stable resources for R&D endeavors.

Industry Drivers and Performance Factors for Biotechnology (General)[39]

According to the Biotechnology Innovation Organization (BIO), the global trade association representing biotech organizations, the five conditions required for future industry growth are technology transfer, specialized facilities, venture/discovery funds, bioscience workforce initiatives, support business climate incentives.

Venture capital, federal funding, and R&D tax exemptions are important sources of investment into this industry, which has high start-up costs and R&D requirements. Biotechnology firms are benefitting from the Affordable Care Act, which provides tax breaks for smaller biotech firms and offers long market exclusivity rights that are attractive to potential investors. The Renewable Fuel Standard that requires ethanol to be blended in to the fuel supply is an example of another federal law that heavily impacts the biotechnology industry: With perhaps 40% of the U.S. corn crop now going toward ethanol production, high demand and prices for corn mean there is a premium on biotechnologies that can increase crop yields. Energy Independence and Security Act of 2007 similarly reinforce demand for sustainable energy, some of which can be provided through biotechnology. And the industry will continue to benefit from federal funding for biological defense.

According to IBISWorld's analysis, six major factors work to promote the development of a biotechnology presence in a geographic area:

- "Availability of venture capital and local entrepreneurship;
- Availability of federal and state government funding and the level of industry regulation and taxes;
- Access to research through universities and government agencies;
- Proximity to a pool of highly skilled personnel;
- Proximity to large private enterprises in many related industries; and
- Proximity to subject of research (i.e. rural areas for agricultural studies and oceans for marine and aquatic studies)."

The Massachusetts biotech industry therefore benefits from the state's high concentration of large pharmaceutical and chemical manufacturing companies. But in addition to the Bay Area and San Diego regional biotech clusters in California, it faces competition from emerging hotbeds of biotech activity in Maryland (home to NIH), the Research Triangle area (NC), and Atlanta, home to the U.S. Centers for Disease Control and Prevention and related higher education research assets.

Emerging Technologies and Opportunities for Biotechnology (General)[40,41]

Substantial advancement in the knowledge of biological processes and systems, enabled by technological progress in imaging, genomics, informatics, nanotechnology and other tools of modern science, continue to create an environment in which bioscience innovation flourishes. Emerging opportunities are vast, especially as

[39] IBISWorld Industry Report NN001: Biotechnology in the U.S., November 2015.
[40] IBISWorld Industry Report NN001: Biotechnology in the U.S., November 2015.
[41] Battelle/BIO State Bioscience Jobs, Investments and Innovation, June 2014.

biotechnology becomes increasingly able to solve new problems, and as public acceptance of biotechnology solutions grows.

The following are key examples of emerging or fast-evolving opportunity areas for the biotechnology industry. The pace of several of these developments will depend on public attitudes and regulatory regimes where ethical concerns exist.

- Production of sustainable energy through bio-refinery facilities and technologies
- Developments in gene therapy: This potential application of DNA science could be used to treat diseases using normal genes to replace or supplement defective genes. In a precursor to this, biotech researchers are now creating drugs based on gene sequence that target specific sites in the body.
- Pharmacogenomics, the study of how an individual's genetic inheritance affects the body's response to drugs, will enable people to understand, monitor, and respond to their susceptibility to certain diseases, and could enable people to be treated with more powerful medications that are targeted to their illness and are within the limitations proscribed by their genetic profile.
- Genetically modified or biotech crops will continue to be developed, both in the food and non-food (cotton, trees for paper) categories.
- Rapid prototyping has provided a means for accelerated and affordable design and development of complex components and systems within the industry. Together with flexible manufacturing methods and equipment, this could enable the transition to agile manufacturing systems that will facilitate the development of global biotechnology enterprises with components more easily specified and manufactured across the globe.

Wherever technological advancements can address global challenges there is typically a robust economic opportunity. And biotechnology has bearing on a variety of global challenges, from food security to human health to sustainable industrial production to the environment. The growth of the global and domestic bioscience industry reflects this economic reality with dramatic advancements in fundamental biological knowledge and bioscience technologies being applied to the development and production of novel products and innovative services. Since the turn of this century, biotechnology has been a consistent producer of innovation-driven economic growth, generating jobs, income and output growth for those regional economies with key bioscience assets.

The biotech industry's contribution to U.S. innovation is evident in the fact that the industry has experienced a compound annual growth rate in patent activity of 16.9% over the five years from 2009 to 2013—exceeding the overall rate of 11.9%.

The software and computer services sector is increasingly overlapping with biosciences as bioinformatics, big data analysis, image processing, precision agriculture, and other IT and computing-intensive applications facilitate modern bioscience discoveries and uses. This overlap is expected to continue to grow further.

Medical Equipment & Supplies Manufacturing[42]

This industry primarily researches, develops and produces nonelectronic medical, surgical, dental and veterinary instruments and apparatus, such as syringes, anesthesia apparatus, blood transfusion equipment, catheters,

[42] IBISWorld Industry Report 33911a: Medical Instrument & Supply Manufacturing in the U.S., November 2015.

surgical clamps and medical thermometers. It is defined as excluding manufacturers of electromedical and electrotherapeutic apparatus, X-ray apparatus, nonmedical thermometers or ophthalmic goods.

General Outlook and Life Cycle Position for Medical Equipment & Supplies Manufacturing

This is industry is more mature than many of the other industries associated with the biotechnology and life sciences sector, having grown an annualized rate of 1.1% over the five years to 2015 and undergoing consolidation. However it is, like the others studied here, being propelled by the ongoing aging of the population and the health care needs associated with longer life expectancy and increased obesity, and is characterized by a high degree of innovation and product development. It is expected to grow at an annualized pace of 5.3% over the next five years.

All medical equipment manufacturing in Newton and Needham is in the category of “surgical and medical instrument manufacturing,” the segment that includes surgical dressings, crutches, surgical sutures and prosthetics. Surgical instruments and supplies account for 19.0% of nationwide industry revenue, and the development of next-generation instruments based on new technologies and improved materials will drive segment growth in coming years. Moreover, shortcomings in existing drug therapies will promote the use of surgery in the treatment and management of cardiovascular, neurological, ophthalmic and various other chronic disorders. As demand for surgery increases, so will demand for this segment's products.

Industry Drivers and Performance Factors for Medical Equipment & Supplies Manufacturing

The favorable demographic trends mentioned above are being complemented by healthcare reforms that are expanding access to health insurance coverage, thereby boosting demand for medical supplies. Government and private funding of medical-related research and development is an industry driver. International trade is robust in both directions, and a slight trade deficit might widen as the U.S. dollar gains in relative strength, making U.S. exports more expensive abroad. The future of an excise tax on medical device manufacturing that is part of the Affordable Care Act, but currently suspended, is a threat to profit margins and a strain on firms’ drive to innovate, potentially hindering investors' willingness to back start-up companies seeking to commercialize new medical technologies.

Emerging Technologies & Opportunities for Medical Equipment & Supplies Manufacturing

The “surgical and medical instruments” sub-industry is responsible for the largest segment of biomedical patents issued in recent years.[43]

R&D budgets are expected to remain strong, bringing new products to market that tackle complicated medical needs. Continued industry consolidation will give many smaller manufacturers access to substantial R&D budgets, driving innovation. The expanding home healthcare market is one area that is providing opportunities for new product development. With Massachusetts’ strong past performance in bioscience R&D as well as high concentrations of medical devices employment, which cited earlier from the Battelle study, it can be assumed that the Boston area is playing host to substantial portions of this investment and will be the site of related future growth.

[43] Battelle/BIO State Bioscience Jobs, Investments and Innovation, June 2014.

Pharmaceutical Manufacturing[44]

Although Camoin's employment data sources do not show employment in the pharmaceutical manufacturing industry, we know that highly innovative local biotech firms like Verastem and Karyopharm are involved in such manufacturing. This may be the case with other biotechnology and medical research companies in Newton and Needham, or with biotech companies that would be appealing industry attraction targets for the N^2 Corridor.

Camoin Associates has focused its research on the brand name segment of this industry, since it is characterized by patent protection, while generic pharmaceutical manufacturers typically are not significantly engaged in the research and development of new drugs.

General Outlook and Life Cycle Position for Pharmaceutical Manufacturing

This industry grew at an annualized rate of 0.5% from 2010 to 2015, a low growth period that was largely attributed to the "patent cliff." We are in the midst of one of the largest waves of drug patent expirations in history, which greatly intensified intensifying competition and cut into revenue growth as low-price generic drugs were allowed to inundate the market.

However over the next five years to 2020, industry revenue is forecast to grow at an annualized rate of 6.2%. In 2015 alone, revenue was anticipated to grow 3.7%, driven by robust demand for biologic drugs as well as companies' recovery from the patent cliff.

Industry Drivers and Performance Factors for Pharmaceutical Manufacturing

As is the case for the other medical-related industries researched here, the aging U.S. population and the increasing number of people with access to health care are drivers of demand for the pharmaceutical manufacturing industry's goods. Relatedly, Medicare and Medicaid are important facilitators of demand. However, growth from these sources of demand is also shaped by government and private health insurance providers who, concerned with mounting healthcare costs, have attempted to stimulate generic drug use by setting favorable reimbursement rates for generic drugs, threatening overall industry growth. Disease rates and prevalence of chronic illness are also determinants.

R&D investments, since they lead to new drugs being released, are a key ingredient in future growth. In addition to private investment, federal research funding—most of it through the National Institutes of Health—is therefore a driver of the industry's performance.

The U.S. is a net importer of manufactured pharmaceuticals, but foreign demand is an important component of overall demand, accounting for an anticipated $39.3 billion in sales in 2015. The European Union and Canada are top destinations for U.S.-manufactured pharmaceuticals. According to IBISWorld, location decisions by the industry for clinical trials appear to align more closely with pharmaceutical sales than with available patient populations; strong pharmaceutical sales in the United States have caused many manufacturers to invest in R&D and drug testing domestically.

To cut costs and have the resources necessary to invest in R&D-related expenditures, the industry will continue to consolidate. As a result, the number of industry employees is expected to decline somewhat over the next five years even as the number of operators increases, as small biologic drug makers enter the market.

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[44] IBISWorld Industry Report 32541a: Brand Name Pharmaceutical Manufacturing in the U.S., November 2015.

The recent proliferation of small biotechnology companies suggests that the barriers to entry are falling. These companies benefit from government tax incentives, which target small pharmaceutical manufacturers in particular. Nonetheless, major players control a significant share of high-value global products, and new industry entrants will grapple with matching the level of R&D-related expenditures needed to succeed in this industry. Significant capital investments are required to establish manufacturing plants geared to produce drugs.

The West and Mid-Atlantic regions are the most prominent pharmaceutical and drug manufacturing regions in the United States, comprising 22.4% and 20.5% of total establishments, respectively. Pfizer, Merck and GlaxoSmithKline are all located in the Mid-Atlantic region. Geographic clustering of industry operators yields benefits for pharmaceutical manufacturers in terms of a local specialized workforce, experienced business services, and availability of facilities that are often highly specialized and expensive to build.

Emerging Technologies and Opportunities in Pharmaceutical Manufacturing

The industry relies on advances in medical technology to develop new products that address unmet needs; nevertheless, the pace of development has slowed considerably, while the cost of R&D has risen dramatically. The development of blockbuster drugs has been slowing, making it difficult for research-intensive pharmaceutical companies to recoup their R&D costs with multibillion-dollar products as in the past. Consequently, R&D focus is shifting to less lucrative products or those that occupy niche product segments.

Many brand-name manufacturers have included biotechnology, particularly biologic drugs, in their product portfolio. Biologics are biologics, which develop immunizations and vaccines. Biologics are genetically-engineered proteins derived from human genes—they are “manufactured” in a living system, often using recombinant DNA technology. They often represent the cutting-edge of biomedical research and, in time, may offer the most effective means to treat a variety of medical illnesses and conditions that presently have no other treatments available. Pharmaceutical manufacturers invested R&D resources into biologics during the patent cliff, and they represent a key growth area for the industry; however, over the next five years, patents in that category will begin to expire and open the door for “biosimilars” (their generic counterpart). In anticipation of this, brand-name pharmaceutical manufacturers will move toward including both biologic and biosimilar production in their product portfolio. The timing of market exclusivity regulations will significantly shape this industry’s growth.

Bioinformatics, a branch of biotechnology using information technologies to work with biological data like DNA, is a particularly dynamic new area of work.

Investments in R&D for orphan drugs—pharmaceutical agents developed specifically to treat a rare medical condition—are expected to generate high returns for the industry and constitute an increasing portion of companies’ drug pipelines.

IBISWorld expects that manufacturers will undergo a continued shift in focus toward patients, such as by providing streamlined patient care from drugs to technological applications; an example of this is applications that assist users with blood glucose management.

R&D in the Physical, Engineering, and Life Sciences[45]

This industry only includes companies and organizations whose primary purpose is R&D and excludes players such as pharmaceutical or manufacturing companies that may undertake R&D to support their primary operations. Government entities, though they may contract and fund such research, are also excluded.

Biotechnology is one of the most active fields of research and development (R&D). Investment in R&D promotes new drugs and vaccines, disease-resistant crops, enzymatic manufacturing processes and methods of dealing with hazardous materials.[46]

General Outlook and Life Cycle Position for Physical, Engineering, and Life Sciences R&D

This is a mature industry whose growth is largely tracking the overall economy. In the five years to 2015, industry revenue is estimated to have grown at an average annual rate of 3.0%; it is projected to continue to grow at an average annual rate of 2.8% over the next five.

Industry Drivers for Physical, Engineering, and Life Sciences R&D

Increasing R&D expenditure across the economy generally leads to more business being outsourced to companies in this industry. Federal government funding is a major industry driver; stimulus spending provided several years' boost to the industry, but a reduction in that funding due to sequestration and a decrease in troops stationed overseas (reducing demand for new defense technologies required for military occupation) has hurt industry growth. Private investment is predicted to increasingly fill in this investment gap and enable long-term growth despite weak government funding.

The healthcare sector represents a significant source of demand for industry services. A rapidly aging population and rise in obesity-related chronic illnesses spurs demand for new healthcare and social-assistance products and services.

Low interest rates are an important ingredient for stimulating investment into physical, engineering, and life sciences R&D, as it encourages private investment outside low-yield bank accounts, and makes it cheaper for the industry to borrow. With interest rates expected to rise, this growth factor will be dampened.

Increased R&D expenditure in biotechnology, specifically, encourages new industry biotechnology product development, which in turn boosts overall biotechnology industry revenue. R&D expenditure is expected to increase in 2015, which may present an opportunity to industry operators.[47]

Emerging Technologies & Opportunities for Physical, Engineering, and Life Sciences R&D

In recent years, government funding specifically for biotech R&D has risen, for example on stem-cell research and biofuel initiatives intended to develop alternative energy sources. In general, strong biotechnology growth has led to increased demand for scientific R&D related to biotechnology.

The rise in share of private funding for this industry has led to some fragmentation, with private investors more willing to invest in niche, start-up enterprises than the government.

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[45] IBISWorld Industry Report 54171: Scientific Research & Development in the U.S., November 2015.
[46] IBISWorld Industry Report NN001: Biotechnology in the U.S., November 2015.
[47] IBISWorld Industry Report NN001: Biotechnology in the U.S., November 2015.

Government funding for environmentally friendly technologies has increased significantly over the past five years and represents a major growth area for the industry. Work in this area includes the development of production techniques and goods that reduce the speed of climate change, as well as the development of renewable energy sources.

Nanotechnology will be one of the most important sectors of research over the next ten years. This technology has the potential to revolutionize a wide array of fields, including medicine and other fields in this R&D category. IBISWorld notes the example of the recent development of the 3D particle tracking microscope, which is facilitating breakthroughs in microbiology and immunology.

Medical diagnostic imaging R&D is another growing field for the industry; related equipment is also linked to bio and nanotechnology research.

The industry's materials-technology segment, which deals with the development of materials that can survive extreme environments, is another emerging opportunity area. Materials-technology R&D also involves developing products that have greater strength-to-weight ratios (e.g. carbon fiber). Energy-saving applications and environmentally beneficial developments often come out of this research and may stimulate substantial funding for the industry in the future.

Priority Industry Real Estate Needs

According to Jones Lang LaSalle's research, technology companies have been responsible for the largest share of leases 20,000 square feet or larger across the U.S. in recent quarters, and 73 percent of those leases represented occupancy growth. It also notes that start-up founders and mature companies alike are increasingly considering the viability secondary and tertiary markets as a business location instead of moving to, for example, East Cambridge, where the average asking rent for 2015 Q3 was $67.21 per square foot. It cites high rent costs in the hottest tech neighborhoods as the primary driver of this reconsideration.[48]

JLL considers Boston to present both high start-up opportunities (in terms of concentration of innovation, talent, and existing tech) and high costs, putting it in the same quadrant of the JLL "locator matrix" as New York City and Silicon Valley, though not as extreme by either metric.[49]

JLL's research indicates that Greater Boston's life sciences industry has over 3.75 million square feet of requirements. In addition to acknowledging the attractiveness of Cambridge and Boston's downtown, JLL reports that life science tenants have recognized the added value the suburbs provide, and that "in contrast to older stock available in Cambridge, the suburbs have afforded occupants the opportunity for office-to-lab conversions as well as brand new development projects, at lower cost."[50] Increasingly tight conditions in Kendall Square and the Seaport submarkets are leading smaller tech companies to "stretch the traditional boundaries to find locations to grow as larger, more established companies quickly snap up space."[51]

However, JLL's report regarding suburban real estate availability for the life sciences sector is focused on Waltham, Watertown, Bedford, Lexington, Beverly, Woburn, Medford, and Wilmington.[52]

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[48] Jones Lang LaSalle Technology Office Outlook, United States, 2015.
[49] Ibid.
[50] Jones Lang LaSalle Life Sciences Outlook, Boston, 2015.
[51] Jones Lang LaSalle Technology Office Outlook, United States, 2015.
[52] Jones Lang LaSalle Life Sciences Outlook, Boston, 2015.

Also of note, JLL reports that life sciences firms are trying to foster innovative environments by modifying traditional lab configurations to provide more options for teamwork and collaboration. Firms are also investing in more state-of-the-art lab space to conduct highly specialized biopharma research. JLL reports that the large cost of developing in core markets like the Boston area will inspire firms to rent more space in the future, rather than construct new buildings. It also states that landlords of second-generation and older lab facilities will need to invest in renovations and upgrades to attract tenants and maintain occupancy levels. And as consolidation occurs in the life sciences, with big pharma continuing to acquire small new firms, companies will seek to renovate older facilities to meet the needs of younger employees or seek out new space that does.[53]

[53] Jones Lang LaSalle Life Sciences Outlook, United States, 2015.

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Appendix E: Real Estate and Land Use Analysis

April 2016

The N^2 Corridor is made up of about 500 acres straddling the Newton/Needham border near I-95/Route 128. It is principally comprised of two business parks, Needham Crossing in Needham and Wells Avenue Office Park in Newton, and the Highland Avenue/Needham Street commercial corridor. The N^2 Corridor, much like Newton and Needham overall, is significantly built out, but many redevelopment opportunities exist. A number of recently completed projects have helped to diversify the mix of uses within the area, and several other projects are planned or underway. This analysis details the physical assets of the N^2 Corridor by subarea and land use type.

Needham Crossing

Situated between I-95/Route 128 and the Charles River, Needham Crossing is the Town of Needham's main business park, featuring residential, hotel, retail, and restaurant space in addition to office space. Key developable parcels within the N^2 Corridor are concentrated in Needham Crossing, where the new state-of-the-art TripAdvisor headquarters is located and where additional commercial office and mixed-use developments are anticipated.

Needham Crossing offers considerable redevelopment opportunities. Slated for development is the 27-acre former General Dynamics site, which together with TripAdvisor and other adjacent properties, comprises the Center 128 project being undertaken by Normandy Real Estate Partners. Once complete, the development will total 1.8 million square feet, including 1.3 million square feet of office, retail, and hotel, as well as approximately 400 residential units. This "superpark," as it has been called, would be able to accommodate another large company seeking a built-to-suit headquarters, as well as smaller office tenants.

Wells Avenue Office Park

Wells Avenue Office Park is located off of Nahanton Street in the City of Newton. Many structures in the economically and fiscally important park are considered prime contenders for updating and in some cases updates and expansions are already planned. The park will also benefit from other possible improvements, especially a second access road and dining, retail, or other amenities. This is part of a national trend of suburban commercial landlords facing the need to reimagine existing office parks and to adopt mixed-used and smaller tenant leasing strategies. Updating and improving the park will be critical for attracting larger tenant companies in the future.

A recent market study[1] showed that Boston's Metro West/South sub-region could support a great deal of additional office development. Based on current development proposals in the region, there is room for additional office growth in and around Wells Avenue. That study determined that spec office development in the larger sub-region is now supportable for the first time in almost a decade, with several projects in the pipeline.

[1] Wells Avenue Market Study, prepared by the Metropolitan Area Planning Council for the City of Newton, March 2015.

Highland Avenue / Needham Street Corridor

The corridor of Highland Avenue and Needham Street, stretching northeastward from Webster Street in Needham to Winchester Street and Route 9 in Newton, is characterized by ad hoc, principally highway commercial style development, with a mix of office and retail space. Major retailers along this corridor include Marshalls, HomeGoods, Modells, Michaels, TJ Maxx, Eastern Mountain Sports, Staples, and Petco. Restaurants include primarily quick-service chains, such as Chipotle, Starbucks, New England Soup Factory, Panera, and McDonalds, as well as a handful of local establishments. The Newton-Needham Regional Chamber is located in this area.

This strip also includes limited industrial properties. Smaller industrial spaces, particularly in the Charles, Wexford, and Gould Street areas, are home to a handful of entrepreneurial companies. Despite expected growth in demand for industrial space throughout the region, the high cost of land in Newton and Needham largely precludes new industrial uses in these communities.

The soon-to-be-vacated site in Newton that is currently occupied in part by Clarks is a key property in the N^2 Corridor's development pipeline. Situated on the northwest corner of Needham and Oak streets, the site is a slated to become a mixed-use development. Northland Development's master plan for the property is nearing completion is likely to include a combination of multifamily residential, retail, and office space. This will be a critical project for the N^2 Corridor, as it has the potential to serve as a key activity node, featuring high-quality amenities, communal gathering places, and multi-modal transportation connections that serve to foster a true sense of place.

Office Space

The commercial office space inventory within the N^2 Corridor is approximately 2.9 million square feet spread throughout almost 40 buildings. Of this amount, approximately 2 million square feet is located in the Town of Needham, dispersed among Needham Crossing, the Highland Avenue corridor, and the Gould Street area. The remaining 900,000 square feet is located in the City of Newton, split between Wells Avenue Office Park and the Needham Street corridor. Class A space tends to be more common in Needham, while Newton has more Class B and Class C space.[2]

Commercial Office Space Inventory, N2 Corridor

Class	Needham	Newton	N2 Corridor
A	1,484,396 SF	330,439 SF	1,814,835 SF
B	464,972 SF	566,573 SF	1,031,545 SF
C	16,800 SF	21,000 SF	37,800 SF
Total	1,966,168 SF	918,012 SF	2,884,180 SF

Source: JLL Research, Q1 2016

The direct vacancy rate[3] for the N^2 Corridor is 9.7%, which is lower than that of the Boston Metro overall (11.5%), and significantly lower than that of the suburbs (15.0%). The N^2 Corridor has higher vacancy compared to Boston and Cambridge, and is especially cost competitive when compared to these cities. Average asking rents in the corridor of $33.68 per square foot are substantially less than rents in Boston ($55.97 per SF) and Cambridge ($61.01 per SF). However, when comparing to the Boston suburbs overall, rents in the Corridor are almost $10 per square foot higher.

[2] JLL Research

[3] Considers vacant space currently offered for lease or sale directly by the landlord; excludes space for sublease

Commercial Office Space, Class A, B, & C, Boston Metro

	Metro	Boston	Cambridge	Suburbs	N2 Corridor
Inventory	165.5 MSF	65.5 MSF	10.8 MSF	89.1 MSF	2.9 MSF
Direct Vacancy Rate	11.5%	7.8%	4.7%	15.0%	9.7%
Average Asking Rent ($/SF)	$33.60	$55.97	$61.01	$24.04	$33.68

Source: JLL Research, Q1 2016

Similar trends apply when examining Class A office separately, though differences in asking rents between the Corridor and Boston/Cambridge are even greater.

Class A Office Space, Boston Metro

	Metro	Boston	Cambridge	Suburbs	N2 Corridor
Inventory	90.5 MSF	37.1 MSF	7.5 MSF	45.8 MSF	1.8 MSF
Direct Vacancy Rate	11.4%	8.3%	3.3%	15.2%	8.1%
Average Asking Rent ($/SF)	$38.66	$61.17	$69.01	$27.20	$36.16

Source: JLL Research, Q1 2016

Housing

While the Corridor consists primarily of commercial properties, there are some key residential developments that have introduced housing into the area within close proximity of office and retail establishments. Housing is a critical element in bolstering the Corridor's mix of uses, while contributing to the vibrancy of the area outside of standard office hours. Two large residential rental developments within the Corridor are Charles River Landing and Avalon at Newton Highlands. The Charles River Landing development is located within Needham Crossing and includes 350 units, of which 88 are affordable units. Avalon at Newton Highlands is located on Needham Street and consists of 294 units, of which 74 are affordable units. The Village Falls complex at the corner of Oak Street and Needham Street contains 123 condominium units.

The residential component of the Center 128 development in Needham Crossing will feature a number of rental housing units, as will the proposed Northland development along Needham and Oak streets. Just beyond the corridor, a 136-unit project on Greendale Avenue in Needham is planned.

Large Residential Developments, N2 Corridor and vicinity

Development	Location	Status	Market-Rate Units	Affordable Units	Total Units
Charles River Landing	300 2nd Ave, Needham	Occupied	262	88	350
Avalon at Newton Highlands	99 Needham St, Newton	Occupied	220	74	294
Village Falls Condominiums	183 Oak St, Newton	Occupied	123	-	123
Second Avenue Residences	2nd Ave & A St, Needham	Approved	292	98	390
Modera Needham*	Greendale Ave, Needham	Approved	102	34	136
Northland property	Needham St & Oak St, Newton	Planned	TBD	TBD	TBD

*Outside corridor

Transportation

Considerable roadway improvements that are planned or under construction, particularly the new dedicated exit ramp off of I-95/Route 128 at Kendrick Street, will significantly improve the Corridor's accessibility. Needham Crossing's visibility from the interstate, as well as the increased height and density of the development now allowed there, will be an attractive visual signal to lure high-profile firms. Other planned improvements include adding a new traffic signal at First Avenue and Highland Avenue, which will allow traffic exiting the Needham Crossing area to easily access I-95/Route 128.

Pedestrian and bicycle infrastructure connecting the various parts of the Corridor is limited. A number of trails and paths exist within the Corridor, but they are generally disjointed. These include the Upper Falls Greenway, a trail along the Needham side of the Charles River, and various trails in Nahanton Park and Cutler Park. Streetscape work along Highland Avenue and Needham will roll out in the next year or two and include pedestrian improvements and bicycle lanes.

Public transit serving the Corridor is also limited. There are no light rail or commuter rail stations within the Corridor itself. The Eliot and Newton Highlands stations on the Green Line are the nearest T stations, each about 2 miles from the center of the Corridor. Needham Heights is the nearest commuter rail station, about 1.5 miles from the Corridor's center. MBTA bus routes 59 and 52 serve portions of the corridor and provide connections to rail.

While public transit options are scarce, several private shuttle options exist. The 128 Business Council operates the Needham Shuttle between the Newton Highlands T station and seven companies located in or near the Needham Crossing area, running during morning and afternoon commuting hours. It is available to employees and tenants of member companies at no charge, and charges a fare of $4.00 per ride for non-members. In addition, TripAdvisor operates its own private shuttle, and a possible shuttle servicing Wells Avenue Office Park is currently under discussion.

Other Amenities

Other amenities within the Corridor include two higher educational institutions, Mount Ida College and William James College, which are both located in or near the Wells Avenue Office Park. In addition, the Jewish Community Center (JCC) on Nahanton Street offers a variety of fitness and educational facilities and programming.

Appendix F: Peer Set Analysis

March 2016

Camoin Associates conducted a peer analysis for Newton and Needham in order to understand how the study area compares to relevant communities across the United States from an economic development perspective.

In many ways, the N^2 Corridor is breaking new ground as a suburb of a major innovation city that is seeking to become a destination for innovation-driven industries. To choose the peer communities, we went through the following steps.

1. We identified major U.S. cities that are similar in population size to Boston: Memphis, TN, Seattle, WA, Denver, CO, Washington, DC, Nashville, TN and Baltimore, MD. However, neither Memphis nor Nashville are as strong in innovation as the other cities, so they were then excluded from the list. We then added Austin, TX, Raleigh, NC, and San Diego, CA to our list of considerations, because they are identified as core cities in strong-innovation regions.
2. We then identified suburbs of each of these cities that are affluent, with strong school systems and high average incomes, and added Burlington, MA to the list as a local comparison and potential competitor.

Peer Selection

Core City	Suburb(s)
Boston, MA	Newton, Needham, Burlington, MA
Austin, TX	Wimberley, TX
Baltimore, MD	Ellicott City, MD
Denver, CO	Boulder, CO, and Aurora, CO
Raleigh, NC	Cary, NC
Seattle, WA	Bellevue, WA
Washington, DC	Alexandria, VA, and Bethesda, MD
San Diego, CA	Escondido, CA

3. Initial data collection revealed that Austin's and San Diego's suburbs did not include communities that offered valuable comparisons to Newton and Needham. Wimberley, TX and Escondido, CA were dropped from the peer list.

We then selected a number of demographic, economic and socio-economic indicators related to innovation economies and collected this data for each of the peer communities. Our findings are summarized below, and the supporting data tables follow.

- Newton and particularly Needham are less racially diverse than the peers. The peers, on average, have populations that are on average 35% nonwhite and/or Hispanic, while Newton's figure is 25% and Needham's is 13%.
- Newton and Needham's population is older than that of the peers. The peers, on average, have a median age of 37.3, while Newton and Needham are 40.2 and 42.9, respectively. The growth of Newton and Needham's working-age populations from 2010 to 2014 was also considerably slower than the peer average of 3.9%.
- Newton and Needham have dramatically higher education attainment than the peers do on average. Across the peer communities, about 60% of residents have a bachelor's degree or higher. This figure is 75.9% for Newton and 74.1% for Needham; among the peers, only Bethesda, MD, at 82.2%, has a higher percentage.
- Home prices are much higher in Newton and Needham than in the peer communities, again with the exception of Bethesda. The same is true of median household income. When comparing home values to income, however, the ratios in Newton and Needham are roughly comparable to the peer set. The biggest outliers for this ratio are Cary, NC, where the ratio of median home value to median income is lowest, and Boulder, CO, where that ratio is highest.
- Median household income is much higher in Newton and Needham than in the peer communities, again with the exception of Bethesda.
- Newton and Needham have very strong relative patent intensities. The peers, on average, have a rate of 5.28 patents per 1,000 residents, while Newton's figure is 10.91 and Needham's is 7.35.
- Newton performs very highly in comparison to the peers in terms of number of venture capital deals and the average size of those deals. Only Boulder, CO had a larger value of deals than Newton, while the next most competitive peer had less than half that value. Needham only had two deals and a very low average deal size; in this respect, Needham is more comparable to Ellicott City, MD, and Alexandria, VA, where venture capital activity is also quite low.
- The concentration of STEM jobs in the Boston metro is 60% higher than the concentration of jobs in the same occupations in the nation overall. However, compared to the peer metros, the location quotient of STEM occupations in the Boston metro is slightly below average. While the Boston metro has a higher concentration of STEM jobs than the Denver and Baltimore metros, it has a lower concentration than the Seattle and Washington, DC metro areas.
- Compared to the peer metros, the Boston metro has a very high number of completions in educational fields related to STEM occupations. With over 33,000 STEM-related completions, Washington, DC is the only metro with a higher number of STEM-related completions than the Boston metro.
- Newton and Needham's 8% employment growth over the past 5 years is a slightly lower rate of growth than the peer average of 10%. Cary, NC had the sharpest jump of 25%

employment growth over that period, and Bellevue, WA, Boulder, CO, and Aurora, CO also had faster growth than the study area. But Newton and Needham's employment growth did outpace that of Burlington, MA (7%), Ellicott City, MD (6%), Bethesda, MD (3%), and Alexandria, VA (-2%). As for the metropolitan areas that these suburbs belong to, Boston's 9% employment growth puts it above Washington's (5%) and Baltimore's (7%) but below the double-digit growth seen in the Seattle (14%), Denver (15%), and Raleigh metros (15%).

- When looking at employment in the priority industries studied for the N^2 Corridor,[1] Newton and Needham have a solid national location quotient of 3.20. But six of the eight comparison geographies had even higher location quotients, with Burlington, MA and Bellevue, WA both exceeding an LQ of 6.
- Commercial real estate inventory in Boston's downtown is comparable to the average for the peers' commercial business districts. However, in comparing inventory for these metros' suburbs, the Boston suburban market (about 113 million square feet) is somewhat tighter than the peer average (about 142 million square feet).
- Commercial real estate prices for the Boston area exceed those of the peers for almost every category of office space. However, the gap is much less pronounced when comparing only suburban commercial space. Suburban Boston commercial space prices are competitive with prices in the suburbs of Seattle and Washington, DC.
- In terms of commute patterns, with the exception of the Colorado cities, Newton and Needham are ahead of the pack in terms of the proportion of residents that are also employed within the community, as well as the proportion of workers also residing within the community. This indicates slightly lower rates of in- and out-commuting relative to peers.

[1] The priority industries studied included relevant industries within the Information Technology sector; the Professional, Scientific, and Technical Services sector; and the Biotech and Life Sciences sector. See the Priority Industry Analysis appendix for further detail.

Peer Analysis: Socio-Demographics

Location	Population	White & Nonhispanic Population	% Nonwhite and/or Hispanic	Median Age	Working Age Population Growth (Ages 20-64, 2010-2014)	% of 25+ Popn. With Bachelors or Higher	Median Value of Owner-occupied Units	Median Household Income	Ratio of Median Home Value to Median Income
Newton, MA	86,945	65,327	25%	40.2	0.4%	75.9%	$715,000	$118,639	6.03
Needham, MA	29,540	25,559	13%	42.9	1.4%	74.1%	$668,900	$129,154	5.18
Burlington, MA	25,190	19,670	22%	41.8	2.1%	47.3%	$419,000	$95,465	4.39
Boulder, CO	102,002	84,317	17%	28.3	2.7%	71.5%	$499,200	$58,062	8.60
Cary, NC	146,041	96,737	34%	36.9	8.3%	61.8%	$301,600	$91,481	3.30
Bellevue, WA	132,268	75,179	43%	37.9	9.4%	62.1%	$538,300	$92,524	5.82
Alexandria, VA	146,422	77,220	47%	35.8	4.0%	61.5%	$494,400	$87,319	5.66
Bethesda, MD	62,024	47,606	23%	43.2	0.0%	82.2%	$821,000	$145,288	5.65
Aurora, CO	339,480	157,084	54%	33.4	3.1%	27.1%	$179,300	$52,275	3.43
Ellicott City, MD	68,507	41,060	40%	40.7	1.7%	65.3%	$507,300	$114,694	4.42

Demographics source: 2014 ACS 5-yr estimates, 2010 ACS

Peer Analysis: Economy and Sources of Innovation

Location	Patents	Patent Intensity (Patents per 1,000 Residents)	Number of VC Deals	Total VC Dollars ($000s)	Average Deal Size ($000s)	STEM Occupation Concentration (LQ) for MSA	STEM Related Completions for MSA	Employment Growth (2010-2015)	LQ for Priority Industries
Newton, MA	949	10.91	9	$125,250	$13,917	1.60	30,519	8%	3.20
Needham, MA	217	7.35	2	$3,060	$340				
Burlington, MA	--	--	6	$30,070	$3,341	1.60	30,519	7%	6.88
Boulder, CO	857	8.40	16	$189,106	$21,012	1.56	14,154	12%	3.89
Cary, NC	1,120	7.67	5	$59,000	$6,556	1.60	6,951	25%	4.38
Bellevue, WA	2,046	15.47	10	$32,228	$3,581	1.80	13,305	18%	6.14
Alexandria, VA	182	1.24	2	$1,500	$167	2.02	33,072	-2%	3.36
Bethesda, MD	54	0.87	4	$53,850	$5,983	2.02	33,072	3%	3.45
Aurora, CO	128	0.38	2	$21,200	$2,356	1.56	14,154	13%	1.31
Ellicott City, MD	203	2.96	1	$1,000	$111	1.38	12,821	6%	1.57

Patents source: USPTO, number of patents issued in 2015 with at least one inventor residing in this locality

VC Deals and Total Dollars source: Crunchbase (www.crunchbase.com). Companies with HQs in these localities with seed, angel or venture investments in calendar year 2015. Does not include any debt. Newton and Boulder each include one deal where amount is undisclosed.

STEM Occupations LQ Source: EMSI 2015.3 - QCEW Employees, Non-QCEW Employees, and Self-Employed

STEM Related Completions Source: EMSI 2015.3 - QCEW Employees, Non-QCEW Employees, and Self-Employed

Priority Industry LQ Source: EMSI

Employment Growth Source: EMSI

Peer Analysis: Economy and Sources of Innovation, Continued

Location	"Meds and Eds"	Major Employers
Burlington, MA	Lahey Hospital	Oracle, Avid Technology, Genesis HR, In Ventiv Health
Boulder, CO	UC Boulder, many research institutes	IBM, Ball Corp, Oracle, Emerson Process Management, Qualcomm
Cary, NC	WakeMed	SAS Institute, Fidelity Investments, Verizon, Siemens Medical Solutions
Bellevue, WA	Overlake Hospital Medical Center	Boeing, Expedia, Microsoft
Alexandria, VA	Inova Healthy, Institute for Defense Analyses, branches of VA Tech, VCU, GWU	Grant Thornton LLP, Oblon
Bethesda, MD	National Institutes of Health, Walter Reed	DMI (IT services), Cambridge Information Group
Aurora, CO	UC Anschutz Medical Campus, Children's Hospital, Med. Center of Aurora	Raytheon, Kaiser Pemanente, ADT Security, Northrop Grumman
Ellicott City, MD	Johns Hopkins U. Applied Physics Laboratory nearby	Not determined; unincorporated community

Peer Analysis: Real Estate

Location	Real Estate Market Area	Commercial Space Inventory (SF) - Market Area Downtown	Commercial Space Inventory (SF) - Market Area Suburban	$/SF - Commercial Space - CBD Class A	$/SF - Commercial Space - CBD Class B	$/SF - Commercial Space - Suburban Class A	$/SF - Commercial Space - Suburban Class B
Newton, MA	Boston	63,372,134	113,055,189	$59.00	$40.00	$32.00	$24.00
Needham, MA	Boston	63,372,134	113,055,189	$59.00	$40.00	$32.00	$24.00
Burlington, MA	Boston	63,372,134	113,055,189	$59.00	$40.00	$32.00	$24.00
Boulder, CO	Denver	35,797,612	107,777,130	$35.00	$23.40	$26.00	$23.00
Cary, NC	Raleigh	15,199,346	68,090,140	$25.30	$20.20	$22.70	$18.80
Bellevue, WA	Seattle	57,464,088	73,672,731	$40.90	$27.50	$36.90	$25.00
Alexandria, VA	Washington	143,666,947	289,611,256	$54.40	$41.90	$31.50	$25.70
Bethesda, MD	Washington	143,666,947	289,611,256	$54.40	$41.90	$31.50	$25.70
Aurora, CO	Denver	35,797,612	107,777,130	$35.00	$23.40	$26.00	$23.00
Ellicott City, MD	Baltimore	28,819,747	90,182,424	$30.00	$19.50	$26.00	$21.00

Commercial Space Inventory source: Colliers 2015Q3 Report

Lease Rates source: 2016 IRR Viewpoint regional office market reports

Peer Analysis: Commute Patterns

Location	Count of Employed Residents	% Employed in Community	Count of Workers	% Residing in Community
Newton, MA	42,684	26%	53,272	21%
Needham, MA	14,015	25%	19,292	18%
Burlington, MA	13,120	25%	37,088	9%
Boulder, CO	36,264	54%	83,871	23%
Cary, NC	69,347	19%	78,003	17%
Bellevue, WA	60,005	24%	126,383	12%
Alexandria, VA	67,727	16%	84,726	13%
Bethesda, MD	25,231	15%	69,140	6%
Aurora, CO	143,919	21%	115,356	26%
Ellicott City, MD	31,592	9%	19,906	14%

Appendix G: Survey and Results

June 2016

In April 2016, Camoin prepared a survey instrument that was shared with individuals who are on the Newton-Needham Regional Chamber's electronic newsletter mailing list. Links to the survey were shared four times in various newsletter communications. Forty-six respondents shared their input through this process.

The survey's intent was to test the draft goals and strategies to see how well they were liked and accepted by the Chamber membership. This test was a proxy for potential acceptance by the broader Newton and Needham community.

For each of the goals and strategies, respondents were asked how much they liked the concept on a 0-10 scale where 0 = Don't like at all and 10=Like Very Much. In addition, respondents were asked how important they thought the concept was, also on a 0-10 scale, with 0=Not important at all and 10=Extremely important.

For each goal and concept, Camoin calculated the average score, and then combined the score for "like" and the score for "importance," weighting the first 60% and the second 40%. This methodology follows significant research into the testing of new ideas that describes a score or 7.0 or higher as an inflection point where word of mouth support for a concept is high enough to substantially increase the diffusion of an idea.

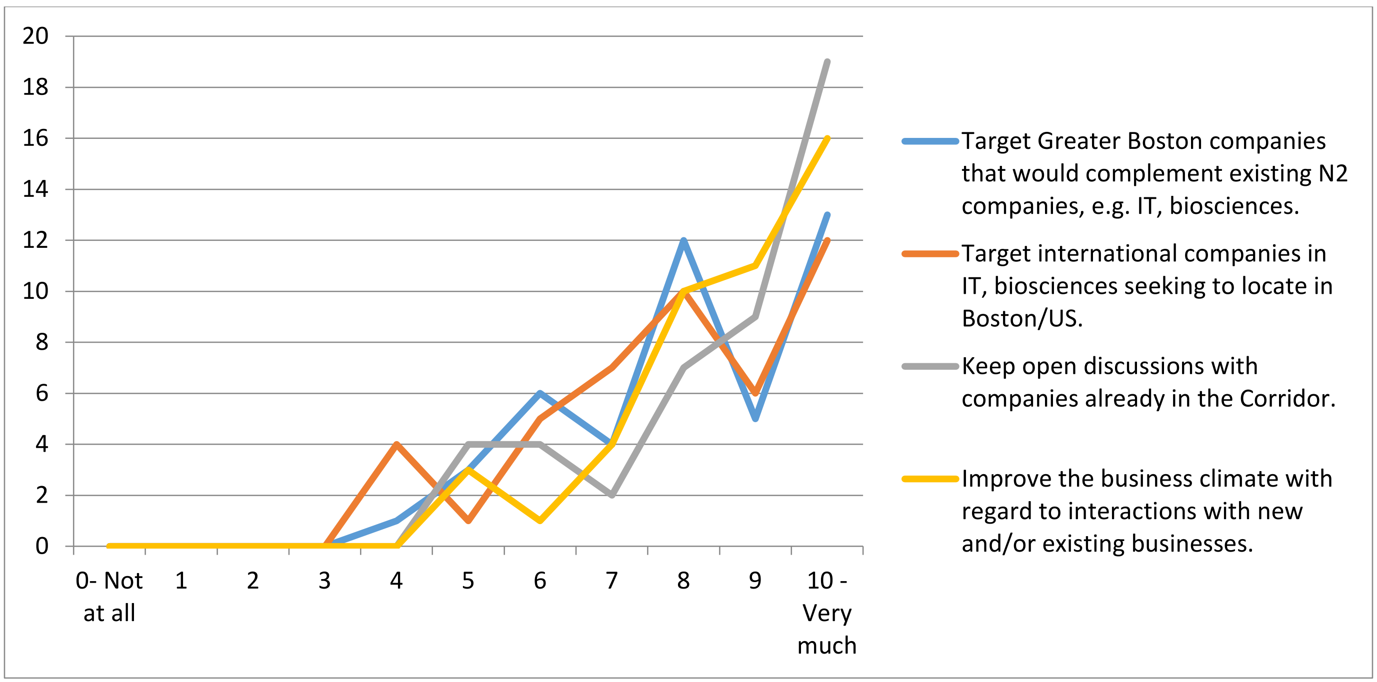
For the six goals, the results were overwhelmingly positive, and give us confidence to move to the next step. In the comments section, some concerns were raised that need to be addressed when developing the ideas and communicating them.

Goals	Like	Importance	60/40
Goal 1: Attract and retain innovative and growing companies	9.20	8.35	8.86
Goal 2: Encourage entrepreneurship	9.45	8.82	9.20
Goal 3: Attract or partner with research entity	8.77	8.07	8.79
Goal 4: Create a mixed use community	9.57	9.15	9.40
Goal 5: Forge an innovation identity	9.03	8.13	8.67
Goal 6: Build capacity to accomplish the vision	9.51	8.56	9.13

Camoin also analyzed the support for various draft strategies that support 5 of the 6 goals. For each strategy, Camoin plotted the average score on the “like” question. Almost all of the strategies also exceeded the 7.0 cutoff, and demonstrated support for the concepts, with results extremely skewed toward the right. These results are shown below.

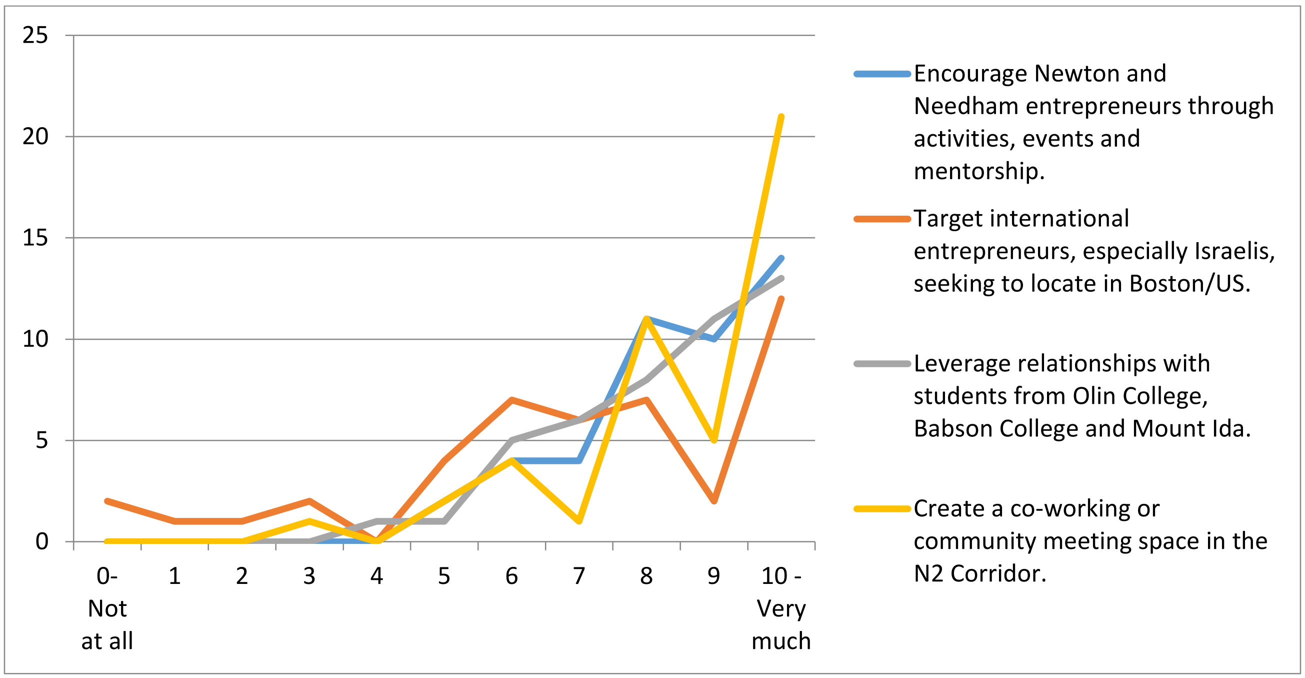
Goal 1: Attract and retain innovative and growing companies in IT/life sciences to the N^2 Corridor.

Goal 1 Strategies	Like	Importance	60/40
Target Greater Boston companies	8.05	7.63	7.88
Target international companies	7.87	7.67	7.79
Keep open discussions with existing companies	8.56	7.77	8.24
Improve the business climate	8.62	7.98	8.36



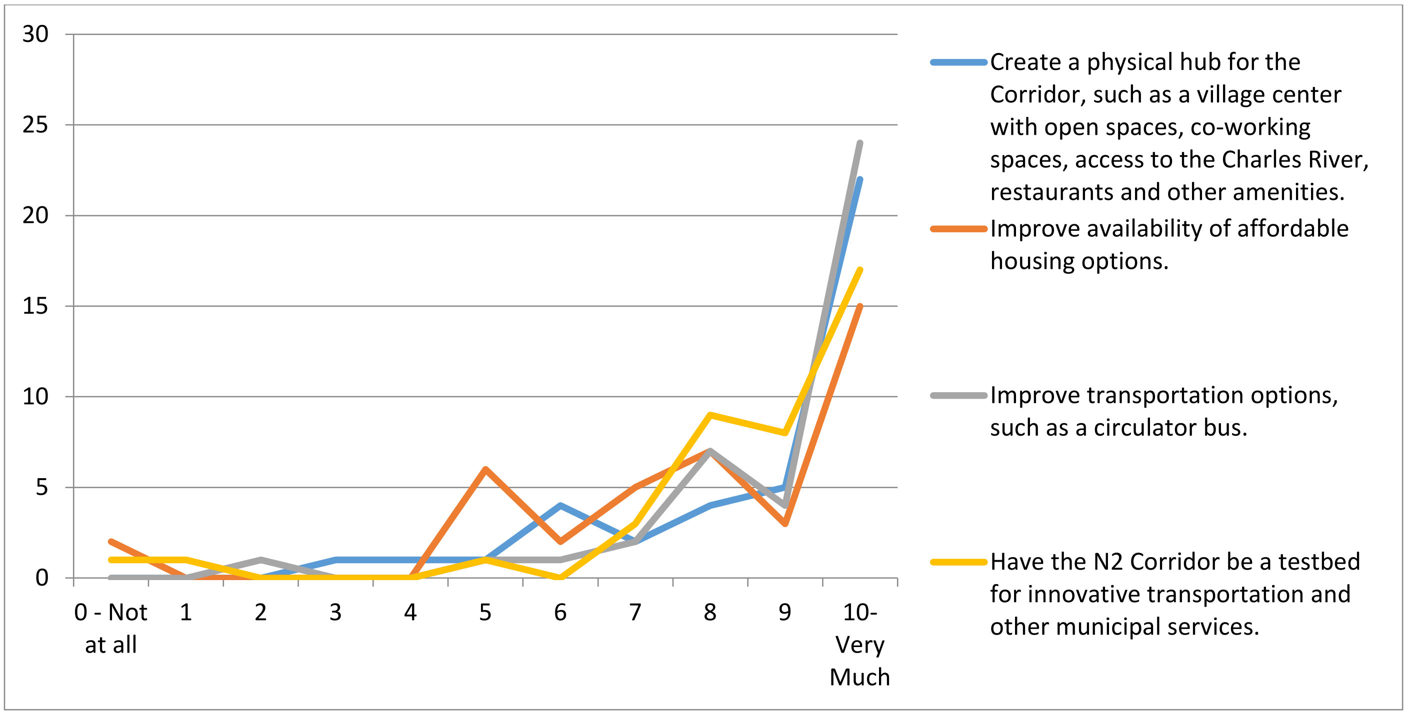
Goal 2: Encourage entrepreneurship within the N² Corridor.

Goal 2 Strategies	Like	Importance	60/40
Encourage NN entrepreneurs	8.44	7.87	8.21
Target international entrepreneurs	6.98	6.62	6.84
Leverage students	8.31	7.98	8.18
Co-working space	8.60	8.18	8.43



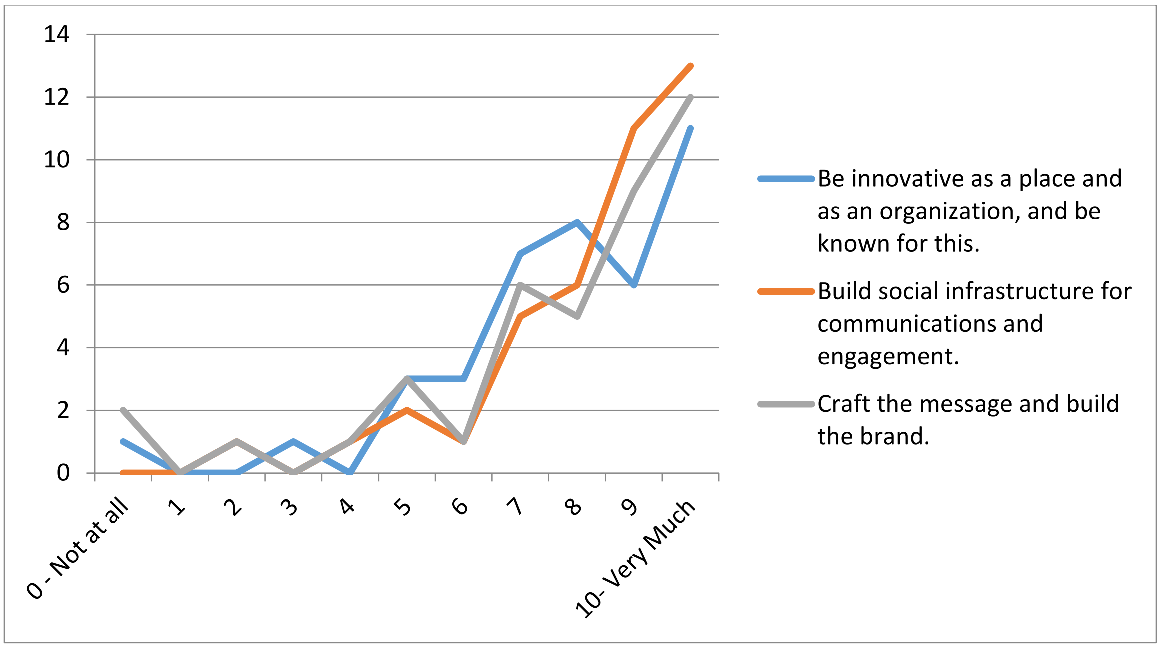
Goal 4: Create a mixed use community with infrastructure and amenities.

Goal 4 Strategies	Like	Importance	60/40
Create a physical hub for the Corridor	8.68	8.35	8.55
Improve availability of affordable housing options	7.75	6.60	7.29
Improve transportation options	8.98	7.97	8.57
Have the Corridor be a testbed	8.53	7.85	8.26



Goal 5: Forge an innovation identity

Goal 5 Strategies	Like	Importance	60/40
Be innovative as a place and as an organization	7.83	7.30	7.62
Build social infrastructure for communications and engagement.	8.35	7.88	8.16
Craft the message and build the brand.	7.75	7.38	7.60



Goal 6: Build capacity to accomplish the vision and the goals.

Goal 6 Strategies	Like	Importance	60/40
Develop the internal capacity of an N^2 organization	7.46	7.05	7.30
Develop collaborative partnerships with stakeholders	8.08	7.74	7.94
Hire a Chief Innovation Officer	6.79	6.10	6.51