

Growing 100K Tech Jobs: Trends, Insights, and Opportunities within the 2020 Challenge

State of Technology Report
2015

Looking Back, Looking Ahead



Halfway through the decade, 2015 is a remarkable hinge year. It's both the midpoint of the 2020 Challenge, to create 100,000 new tech jobs this decade, and a watershed changing of the guard in public and private leadership across our Commonwealth. Consider:

We have a new Governor, and with him comes new administrative leadership and an expressed willingness to continue to explore technologies that can improve the delivery of government services.

In the State Legislature, we have a new Senate President and some 60% of State Senators and Representatives who have served for six or fewer years.

At the national level, we have several relatively new and energetic U.S. Senators and U.S. Representatives advocating for our state.

The City of Boston has its first new mayor in 20 years, which has brought new emphasis and leadership to key positions such as Chief Information Officer and Chief Digital Officer, and support for the innovation sector and startups in Boston.

A new president will take the helm at the University of Massachusetts, bringing to a half dozen the number of new presidents across our 29 public colleges and universities.

This unprecedented transition in leadership creates great optimism and opportunity to accelerate the momentum that's generating fresh ideas like the inaugural HubWeek celebration—a collaboration of *The Boston Globe*, MIT, Harvard, Mass General Hospital, and many civic organizations—aimed at “harnessing curiosity to create the future.”

Five years into MassTLC's 2020 Challenge, we can see what's working and what needs adjustment. MassTLC and other leaders from across the technology community have identified three major areas where concerted effort will significantly contribute to Massachusetts' momentum: talent; competitiveness and business certainty; and innovation, investment, and infrastructure.

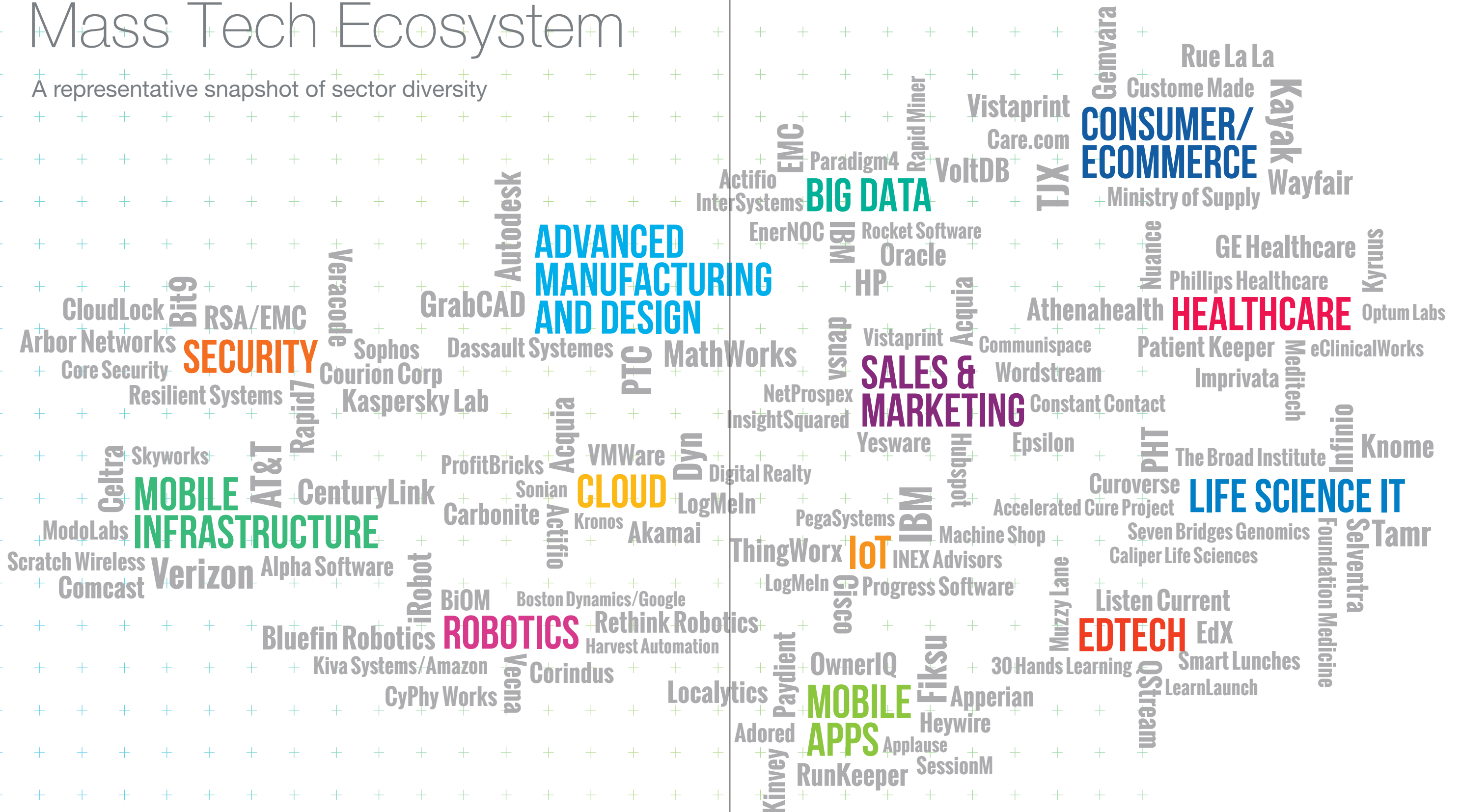
With another five years to go, we have time to calibrate our efforts toward reaching the 2020 Challenge goal of creating—and perhaps more importantly, filling—100,000 new tech sector jobs in Massachusetts, and of realizing the tech sector's potential across the Commonwealth.

Massachusetts gained its technology leadership through our unique intersection of size, density and creative energy, supported by a wide and deep industry, academic sector and social fabric. In the march toward 2020, we're optimistic about the Commonwealth's ability to strengthen its technology leadership, inclusiveness, and economic outlook.

Looking ahead, the signs are good that we'll extend our leadership as we traditionally have, by building on our laurels rather than resting on them.

Tom Hopcroft, President & CEO, MassTLC

A representative snapshot of sector diversity



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The Final Word

Technology in Massachusetts remains very strong and is a prime source of vibrancy in the state's economy.

The 2020 Challenge: A Midpoint Assessment



In March 2010, the Mass Technology Leadership Council (MassTLC) issued a challenge to its members, the greater tech community, and state government leaders: Let's work together to realize the tech community's potential to drive growth in the broader economy, and to create 100,000 new tech jobs by the year 2020.

At the midpoint of the decade, where do things stand?

From 2010 to 2013 (the latest figures available), Massachusetts technology companies created about 17,650 new jobs against a Challenge goal of 25,820 for that period. By the end of 2013, the Commonwealth had 214,650 technology jobs, up from 197,000 when we issued the Challenge. However, creating jobs is one thing; filling them is another.

While multiple factors impact Massachusetts' ability to further solidify our technology leadership, availability of talent is among the most significant. There are three sources for regional talent development:

- Further developing our pipeline of young, home-grown talent
- Retaining more emerging graduates from our colleges and universities
- Attracting more career-oriented individuals from outside the region or sector

Some of the talent-pool development opportunities are under our direct influence—for example, exposing and inspiring our homegrown female and male K-12 talent to computer science and tech-industry professions, and investing in a world-class public higher education system that prepares talent, predominantly local, for careers in our local knowledge-intensive economy.

Others we can indirectly influence—for example, making sure that our many two- and four-year college graduates are inspired by, and made aware of, the vast and unique career opportunities that Massachusetts offers them. Additional leverage can be gained through agile curriculum development and employer collaboration with higher ed. For example, several of our community colleges collaborate with employers to identify and develop programs that meet rapidly shifting employer needs. Designed to teach marketable entry level skills and matriculate to four-year degree programs, such programs establish clear career pathways for students and serve to expand the pipeline of talent that is so needed in the Commonwealth.

Still others need to be tackled at the national level, where Massachusetts is disproportionately affected by federal immigration policy. We educate people from across the world, only to send them away to start their businesses, create economic value, and employ people elsewhere. Their companies not only compete with domestic companies, but have an advantage of being able to hire the best talent from around the world, including the United States.

Other regions aggressively compete to attract these same talented people, so our investments in training, attracting and retaining talent will require a sustained commitment. Because we have more technology jobs than people to fill them, we need to maintain our resolve to increase both the talent population and the visibility of Massachusetts as a premier career, research, innovation and business destination.

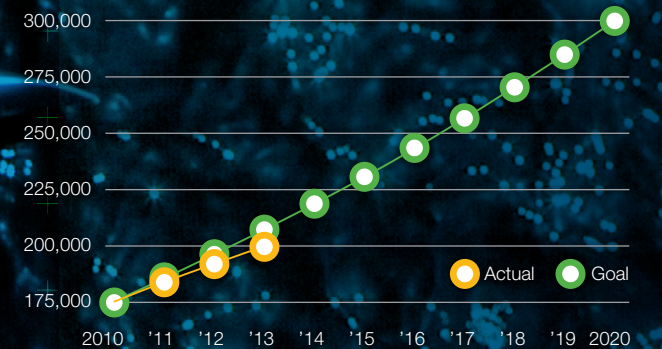
Where are we today in creating jobs and powering growth?

The tech sector continues to significantly drive jobs, wages and economic output.*

Because the tech industry is varied and dispersed, whereas BioPharma is more homogeneous and more concentrated, a common mis-perception is that BioPharma is the bigger sector. In fact, the Massachusetts tech cluster is more than three-and-a-half times larger than BioPharma.

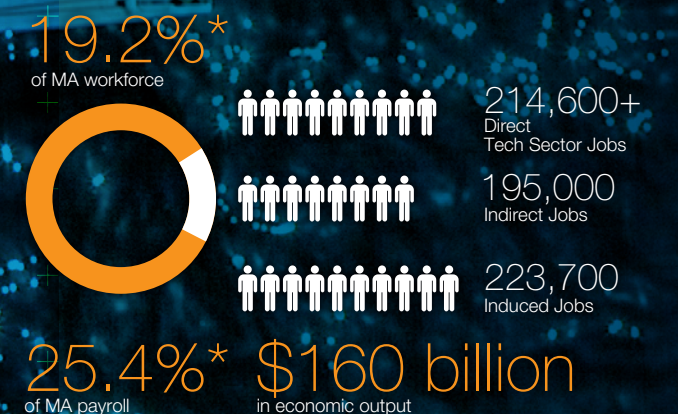
Tech underpins nearly 20% of the workforce (including direct, indirect and induced jobs), and a quarter of the wages paid in Massachusetts. Additionally, tech companies contribute \$7B in state and local taxes, and \$93B of added economic value.

Strong Tech Sector Growth Nearly on Track for 2020 Challenge of 100K Jobs This Decade



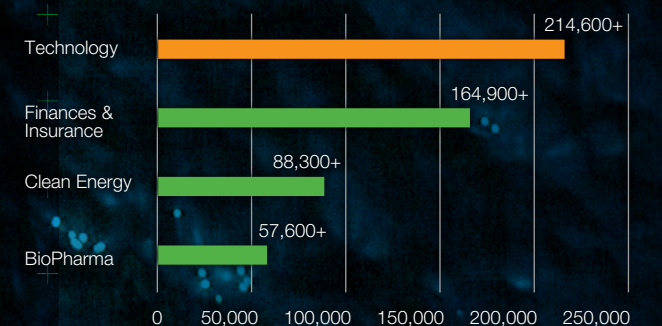
Source: U.S. Bureau of Labor Statistics; MassTLC 2020 Challenge

Tech is a Leading Job Engine with Significant Economic Impact



Source: Calculations by UMass Donahue Institute from IMPLAN economic model
* Workforce based on total direct, indirect, and induced jobs
* Payroll based on total direct, indirect, and induced payroll

Tech Sector is a Leader in Massachusetts Employment



Sources: BioPharma: MassBio; Clean Energy: Massachusetts Clean Energy Center; Finance & Insurance: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages; Technology: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

* MassTLC commissioned the University of Massachusetts' Donahue Institute to conduct key benchmarking research on the technology sector and technology occupations. Except where otherwise noted, all charts and data contained in this report are based on their research and analysis of available data (2013), conducted between November 2014 and February 2015.

What a Difference Five Years Makes



The Massachusetts technology ecosystem accelerated out of the Great Recession more vibrant and connected than ever, with unmatched possibilities for both intentional and opportune chance encounters.

Nowhere else in the world matches the unique combination of strengths found here in terms of the density of the technology ecosystem; the intensity of research, development, investment and growth; and the variety of disciplines, institutions, and initiatives.

In the close quarters of our Commonwealth, this combination gives our technology ecosystem high bump factor—that is, the easy, regular, planned or impromptu “bumping” into people whose different areas of concentration and experience open novel lines of thinking, beneficial introductions, and access to extraordinary facilities.

Massachusetts truly is one of the few places in the world where both organized gatherings and chance encounters regularly create openings among industry, commerce, finance, academia and government.

Given the intensity and variety of the Massachusetts tech community and its focus on creating the future, the overall picture of recent progress sometimes escapes notice. But the past five years have seen significant developments, as well as movement toward longer-term goals.

In the Past Five Years in Massachusetts...

Many startup accelerators launched, including Mass-Challenge (the world’s largest accelerator program), Bolt, Dogpatch Labs, Greentown Labs, Healthbox, InnoLoft, LearnLaunch, TechStars, and Venture Development Center.

Among the innovation districts established are the 1,000-acre Boston Innovation District, the Cambridge Kendall Square district, the Route 3 Tech Corridor, the N² Corridor (Newton/Needham), the Worcester Incubator; TechSpring (Springfield), and the Holyoke Innovation District (anchored by the Green High Performance Computing Center).

Major companies opened or expanded their research centers, including Amazon, Dassault Systemes, Facebook, Google, IBM, J&J, Microsoft, Paypal, and Verizon.

The Commonwealth created a \$50 million Collaborative Research and Development Matching Grant Program to support large-scale, long-term research projects that have a high potential to spur innovation, cluster development and job growth in Massachusetts. (For example, the Woods Hole Marine Robotics Center mentioned below recently received a \$5 million grant from this program.)

The New England Robotics Validation and Experimentation (NERVE) Center opened for business at UMass Lowell. It provides National Institute of Standards and Technology (NIST) Standard Test Methods for Robots, water test areas designed in collaboration with the Army, an indoor rain area, NERVE-specific apparatuses, and the ability to simulate a variety of operational scenarios and experiment set-ups. It’s within an hour’s drive of 80 robotics companies and 10 universities that conduct robotics research.

The Massachusetts Green High Performance Computing Center went live in Holyoke. It is a research computing and data center that supports the growing needs of five of the most research-intensive universities in the Commonwealth: Boston University, Harvard University, MIT, Northeastern and UMass. It was funded with corporate (Cisco and EMC), academic, and public money, and the universities fund its ongoing operation.

In 2012, the Mass Big Data Initiative launched to expand the Commonwealth’s position as a world leader in the sector. Simultaneously, MIT launched a big data research center at its Computer Science and Artificial Intelligence Laboratory to focus on data collections that are too big for current information technology systems, as well as to conduct research for which Intel committed to fund \$12.5 million over five years.

The Commonwealth launched the three-year Massachusetts Open Cloud project with a \$3 million capital investment. The project is a university/industry collaboration designed to create a new public cloud-computing infrastructure to spur big data innovation.

Hack/reduce, a jointly funded nonprofit community workspace where people working with big data can share infrastructure, resources and knowledge, launched in Cambridge’s Kendall Square. Hack/reduce provides free access to big data storage and processing for people working with large datasets in novel ways.

The Federal Aviation Administration (FAA) established a testing facility at Joint Base Cape Cod for the development of safe standards for integrating unmanned aircraft systems into the National Airspace System. Named NUAIR, and jointly run with New York, it’s one of only six test sites in the United States.

The Massachusetts Broadband Institute at the Massachusetts Technology Collaborative completed Mass-Broadband 123, a 1,200-mile fiber-optic network bringing high-speed Internet access directly to 1,200 key facilities in more than 120 western and central Massachusetts communities. MassBroadband 123 is a critical component of the Commonwealth’s strategy to invest in innovation infrastructure to create growth and economic opportunity in every corner of the Commonwealth.

In 2011, the Massachusetts Digital Games Institute (MassDiGI) launched at the Worcester campus of Becker College. The result of creative collaboration among academia, state government and industry, it is a state-wide center for academic cooperation, entrepreneurship and economic development across the Massachusetts digital and video games ecosystem. In addition, MassDiGI is a US Department of Commerce Economic Development Administration (EDA) University Center and member of the MA Creative Economy Network.

The Advanced Cyber Security Center (ACSC), a non-profit consortium launched in 2011 and supported by Mass Insight Global Partnerships, brings together industry, university, and government organizations to address the most advanced cyber threats. ACSC focuses on sharing cyber threat information, engaging in next-generation cybersecurity research and development, creating education programs to address the shortfall in cyber talent, and advancing public policies that will enhance security.

The MassRobotics incubator, developed by the Mass Robotics Cluster with key leadership from Draper Labs and Vecna Technologies, will open in Cambridge, and is aimed at furthering Massachusetts’ leadership position

as a thriving hub of robotics, automation, and autonomous vehicles. MassRobotics will mentor robotics startups in all aspects of their business, from concept to product launch.

Leveraging a \$5 million state grant with \$15 million in nongovernment matching funds, Woods Hole Oceanographic Institution will build new marine-robot testing facilities that include a rapid prototyping center, advanced pressure test facility, indoor robotic test tank facility, and in-ocean test environment. Our marine robotic cluster includes companies such as Bluefin Robotics, whose Autonomous Underwater Vehicles were deployed in the Gulf Oil spill.

Recently in Massachusetts...

196

Acquisitions and mergers by MA companies 2010-2014

587

Acquisitions and mergers of MA companies 2010-2014

9

MA company IPOs 2010-2014

\$4.86B

Value of technology investments in MA companies 2011-2014 Source: PwC

103,610

Number of 2014 tech job postings in MA Source: Burning Glass

\$121,000

MA average annual tech wage #2 nationwide*

722

Technology investments in MA companies 2011-2014 Source: PwC

8.4%

Tech growth rate 2009-2013

20+

Industry incubators and accelerators in MA including MassChallenge, Bolt, Dogpatch Labs, Greentown Labs, Healthbox, LearnLaunchX, TechStars, and Venture Development Center

25.4%

Tech underpins one-quarter of 2014 payroll in MA*

20+

University incubators and accelerators in MA including Babson College, Boston College, Boston University, Framingham State, Harvard, MIT, Northeastern, UMass and WPI

Innovation Districts in MA include the Boston Innovation District, the Cambridge Kendall Square district, the Route 3 Tech Corridor, the N² Corridor (Newton/Needham), the Worcester Incubator; TechSpring (Springfield), and the Holyoke Innovation District.

Media: John Henry's purchase of The Boston Globe restored local ownership; WGBH launched and syndicated the Innovation Hub radio show; WBUR launched Radio Boston.

Transportation: The MBTA extended late night service; JetBlue established a new Worcester hub; Logan direct air service extended to 75 domestic and 44 international destinations; Hubway bike sharing and Uber came to MA.

Research Centers opened or expanded by Amazon, Dassault Systemes, Facebook, Google, IBM, J&J, Microsoft, Paypal, Verizon.

High Bump Factor: Continually expanding workspaces, meet-ups and organizations, e.g., WorkBar, Bolt, TechSand-box, LearnLaunch Campus, WebInno, Mobile Monday, Tech in Motion.

* 2014 Computing Technology Industry Association Cyberstates: State-by-State Analysis of the U.S. Tech Industry report.

Looking to the Future

3

Accelerating momentum will drive greater innovation and growth in every technology sector during the second half of this decade. The Massachusetts technology ecosystem with its combination of research, academia, industry, finance, investment and supportive government will fuel much of it.

It's been said that Massachusetts predominantly works on technology that is crucial to creating and advancing the state of the art as opposed to entertaining people. As evidence, consider three emerging technology areas that are poised to profoundly impact people worldwide, and that Massachusetts has the potential to dominate: the Internet of Things, Security, and Healthcare & Life Sciences Information Technologies.

Technology Clusters

Transforming Industries



Internet of Things

Experts predict that the connection of more than 50 billion “things” over the next decade will unleash as much as \$6.2 trillion in new economic value. The Internet of Things (IoT) is forming as products evolve from items made of mechanical and electrical components to complex systems of hardware, software, electronics, sensors, and data that can be generated, stored, and analyzed.

IoT is launching an unprecedented wave of innovation that will fundamentally transform the creation, operation and servicing of products, and disrupt the basic structure of industries as products become components of much broader systems—thermostats as components of smart homes, tractors as components of smart farms...

A whole new set of strategy choices will be necessary, especially for product companies.* For most businesses, IoT is not just about “connecting” new products, but also about how these connections will completely transform the way companies engage with their customers, and the types of opportunities that open up through this deeper relationship. In many ways, virtually every product company will become a tech company.



Professor Michael E. Porter,
Harvard Business School:

I believe Massachusetts is uniquely positioned to be a leading global hub in this next phase of technology-driven economic transformation. Massachusetts already has a strong cluster in this field, with the opportunity to be the global leader. We have a wide array of companies in areas like IoT platforms, data, analytics, applications, networks and embedded software and hardware.

MassTLC is playing a crucial role in convening and supporting this emerging cluster. Harvard and MIT can become even more integral parts of the cluster, and we look forward to collaborating with MassTLC in this effort.

* The Harvard Business Review article How Smart, Connected Products Are Transforming Competition by Professor Michael Porter and Jim Heppelmann offers a framework for understanding what is different about smart, connected products and how they impact competition and strategy. It is accessible at www.isc.hbs.edu/strategy/related-topics/pages/strategy-and-it.aspx



Jim Heppelmann,
CEO, PTC:

Massachusetts is a natural fit for IoT because we already have all the key parts of that ecosystem.

The state is filled with major players in the communications and computing infrastructure that IoT requires. Companies such as Sensata Technologies are delivering the sensor and control technology needed to generate vast new amounts of machine data. Massachusetts is already recognized as the epicenter of the big data industry with companies like EMC providing the technology needed to capture and secure all that new data.

We also have a heavy concentration of companies such as PTC that develop the technology and applications to design, connect, and service the new generation of smart, connected products. Those include devices from global companies with a massive local presence, such as Philips Healthcare, Schneider Electric, and even Waste Management with its BigBelly connected trash compactor.

Several IoT industry consortia are based in the state, including the Industrial Internet Consortium and the International M2M Council. Our leading education institutions, such as Harvard and MIT, are staking out leadership positions. And MassTLC’s important work helps foster the ecosystem to grow even more broadly.



Michael Simon,
CEO, LogMeIn:

Massachusetts has a rare opportunity to become the epicenter of IoT activity, with great academic institutions and great technology companies coming together to enable IoT. But enabling it is just a piece of why Massachusetts will be at IoT’s center. The real power will come in the businesses of Massachusetts that are best positioned to leverage IoT to change the way they engage with their products, customers and the world around them.

At LogMeIn we see industries like manufacturing, health and life sciences leading the way in IoT innovation; industries that are the lifeblood of the Massachusetts economy. Massachusetts will lead the way not just through creating the technology behind IoT solutions, as we are doing at LogMeIn, but also through companies like New England Biolabs who embrace IoT solutions. Bringing real IoT solutions to life, their CIO says, has already brought New England Biolabs much closer to their customers.

Security

High-profile breaches coupled with the dramatic rise in mobile devices, digital applications and the vast amount of electronic data available for exploitation have raised cybersecurity to the forefront of technology, from the boardroom to the end user. It's no longer a matter of if you will be breached, but when. Information sharing is critical to addressing the complex standards and threat environment, and an essential component of an information security strategy.

The role of security intelligence is evolving and changing. Companies must optimize response efforts and implement dynamic strategies to maintain their IT security in the coming decade.



Corey Thomas,
CEO, Rapid7:

The security industry is headed for a major upheaval. We believe three key areas will experience dramatic change:

1. Organizations will shift security investment dollars to analytics and detection in order to better align resources with threats and reduce the risk of loss that results when the inevitable breach occurs.
2. National governments will have to overhaul their cyber-security and digital information laws. Current regulations are outdated and law enforcement is not prepared to deal with the state of technology and economics driving growth in attacker populations and capabilities.
3. The proliferation of the Internet of Things will drive increasing urgency in building security and resiliency into our software.

Massachusetts is uniquely positioned to lead these changes. The analytics solutions needed to drive



Bruce Schneier,
CTO, Resilient Systems:

better security require a blend of knowledge across networking, security, big data and business intelligence. We have universities churning out talent in all of these areas, as well as a history of success in building networking, big data, business intelligence and security companies.

Local talent makes Massachusetts the ideal place to launch the most innovative and successful security companies for this new era. We also have a growing population of IoT innovators and dozens of startups.

Lastly, Massachusetts innovation in these areas is supported by forward thinking legislators who are working to foster these industries. A good example is former Governor Deval Patrick's IoT Week held last spring. We have no doubt that Governor Charlie Baker's new administration will continue to support technology and innovation across the state.

Security has always been a combination of protection, detection, and response. All three are required because no individual capability can stand on its own, and the only way to achieve true resilience is to have all of them working together. This is true in the physical world—think door locks, burglar alarms, and guards that come running—just as it's true in cyberspace.

Computer and network security has been a series of waves. In the '90s, it was prevention, when firewalls and anti-virus became standards. They were all that was available, and many thought they would suffice. In the 2000s, it was detection, as organizations started realizing that prevention alone wasn't enough. Now it is response. In the coming years, incident response products and services will become a robust business, and organizations will finally have the ability to counter the myriad threats.

Expertise and innovation tend to accrete and the Boston area has long been an important geographical technology cluster. For all the reasons that this has been true for decades, it is likely to remain true for the foreseeable future.

Healthcare/ Life Science



Naomi Fried, PhD,
Vice President Medical Informa-
tion, Innovation, and External
Partnerships, Biogen Idec:

There is no better time than now to effect change in health-care discovery and delivery. The ability to collect, store, and analyze massive amounts of data—coupled with the emergence of the cloud, sophisticated robotics and advanced manufacturing—is catalyzing major breakthroughs in life sciences research and development, and revolutionizing patient care every step of the way. The result is a new patient-centric paradigm in which technology is powering the new future of human health.

The Internet of Things is beginning to offer unique opportunities to improve healthcare. This revolution will unfold in three phases:

1. In the first phase, which is almost complete, conventional hospital-based medical devices such as pumps and scanners have become Internet enabled.
2. In the second phase, which is now underway, IoT is moving into patients’ homes, where a growing number of new health monitoring devices can collect vital signs.
3. The third phase, which is only just beginning, will involve everyday items such as clothing, dishes, and automobiles. These objects will quietly and non-invasively collect and process clinically useful data for maintaining health and wellbeing. Collected outside of a clinical setting, the data will be communicated to patients and clinicians.

Why is Massachusetts well-positioned to lead? Because of its unique combination of talent, resources, and infrastructure.

The Commonwealth hosts the country’s largest concentration of high-powered academic medical centers, which foster a culture of research and inquiry where innovation flourishes. It is also home to leading universities where scientists are doing cutting edge work.

Many successful technology and bio-technology companies, including Biogen, Genzyme, and Vertex, were founded and continue to thrive in Massachusetts, contributing to an innovation-friendly environment.

The state’s incubators, accelerators and dense networks of angels and venture capitalists help translate new discoveries into successful companies. It is not surprising that Massachusetts has given birth to some of the world’s leading life-science and healthcare companies over the last several decades.

In my view, there is no better place in the US to be a healthcare entrepreneur than here in Massachusetts.



David Judge, MD,
Chief Medical Officer, Iora
Health:

As we continue to shift toward payment-for-value nationally, technology innovation in healthcare and life sciences will increasingly support and reflect a move away from a system that is reactive and heavily focused on sickness to one that is proactive and focused on achieving wellness and reducing the longterm burden of chronic illness.

Providing and experiencing high-quality care delivery in this new paradigm requires proactive, continuous relationships with patients and populations, and resource-sensitive coordination across the entire care network. Technology innovation that enables all of this will support these most critical trends:

- Increasing transfer of medical knowledge and diagnostic/therapeutic capabilities along a continuum to the patient from physician to nurse to non-clinical extenders such as health coaches and medical assistants.

- Recognition that excellent customer service experiences for patients navigating the health-care system translates to better health (patients are more likely to engage with care teams when there is good access to timely care, information and support).
- Growth of “virtual” care that occurs outside of the medical office to support synchronous patient visits and asynchronous monitoring in the home or while the patient is mobile.
- Need for business and clinical intelligence that provides real-time analytics to enable the best use of an organization’s resources in caring for a population.
- Increasing investment in primary care as the locus of accountability in the provision and coordination of care across any system or network.

With its long tradition as a leader in healthcare and life sciences innovation, Massachusetts is also a national leader in taking accountability for the health of its entire population. A strong coalition already exists here of patients, providers and payers

who can work with the richly talented innovators in the academic and private institutions of our state to design the care systems of the future.

In addition, there is a strong national movement to revitalize the field of primary care that is largely growing here in Massachusetts, where students and training physicians, nurses and other healthcare professionals are seeking and finding sustainable, rewarding careers as primary care providers in innovative new care models.

Efforts to accelerate clinical systems development and implementation will be key. I believe that within each of the large healthcare organizations that exist throughout Massachusetts, significant development work is already underway.

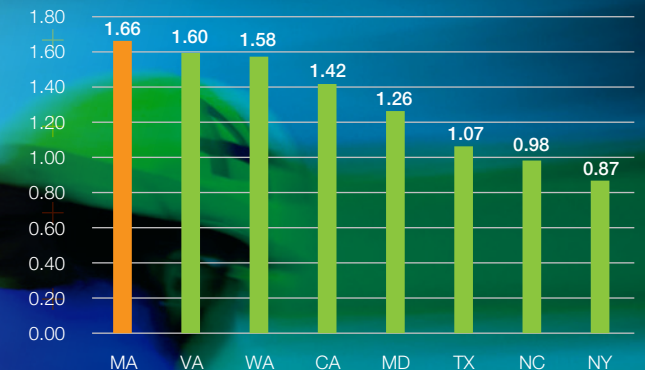


Where are we today in relation to other states?

In 2013, Massachusetts became the nation's most concentrated tech sector and posted the third-highest* average tech salary after California and Washington.

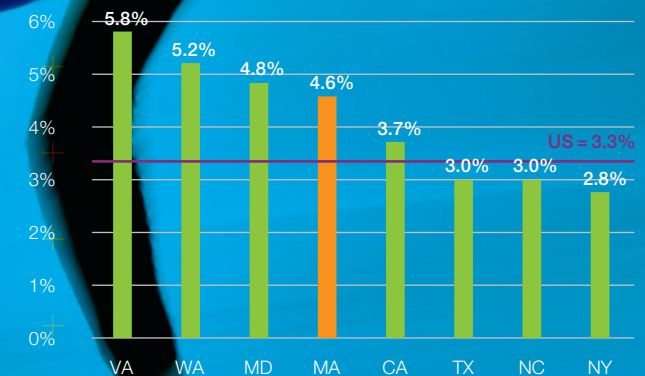
Concentration of jobs is measured using Location Quotients (LQ) which compare an industry size (share of total jobs) within a state to the same industry's size relative to the nation; LQ greater than 1.00 indicates a concentration.

Massachusetts Now Leads as Most Concentrated Tech Sector



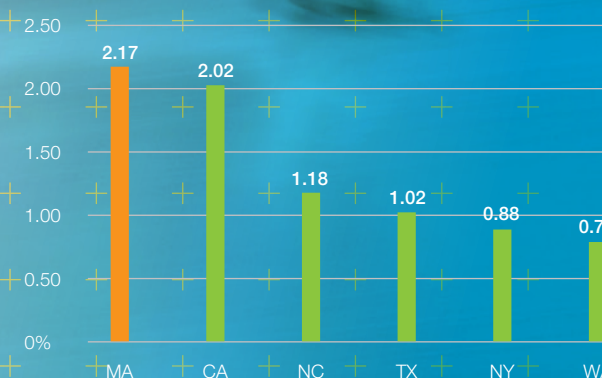
Source: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

Tech Jobs Vital to Many Sectors of Massachusetts Economy; Share of Workers in Tech Occupations Across All Sectors



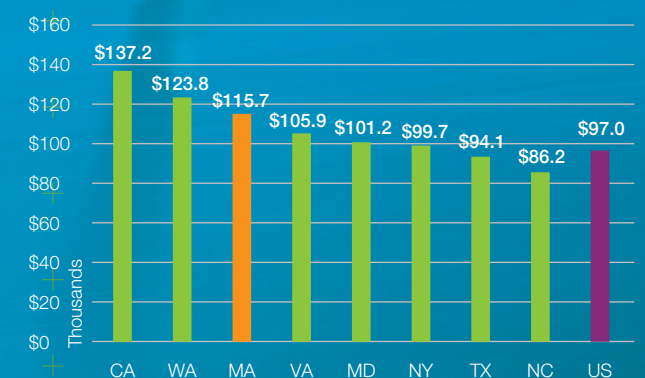
Source: U.S. Bureau of Labor Statistics, U.S. Department of Labor, Occupational Employment Statistics

Greatest Concentration of Tech Manufacturing Jobs



Source: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

Massachusetts Ranks Third for Highest Wages Paid in the Tech Sector



Source: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

* More recent data from the 2015 CompTIA Cyberstates report puts Massachusetts' average tech salary at \$122,000, second nationwide after California's \$139,000.

Forging the Road Ahead



Massachusetts enjoys a strong leadership position across a range of technology and technology-enabled interdisciplinary clusters, supported by fundamental and durable strength in academia, an enlightened and motivated government, and strong quality of life.

But technology advances quickly, and there are many regions around the country competing with smart investments for a chance to lead in the next major technological era. To accelerate growth and remain a dominant leader, we must be smart and play to our strengths.

A sense of urgency is critical. Technologies and industries are transforming at a pace never before seen. Massachusetts has to quickly pivot to align its policies and resources to regain and maintain a lead ahead of other areas of the country and globally.

Public and private sector leaders must come together to develop smart initiatives that enhance our world-class talent advantage, develop our competitive position, and invest in our innovation infrastructure. As an active leader in the Mass Tech Collaborative's Tech Hub Policy Working Group and the Technology Councils of North America, MassTLC is working to develop and advocate for the following recommendations.

Talent

One of the biggest inhibitors of growth in a modern, knowledge-based economy is the availability of job-ready talent at all levels. As a state known for its brainpower, we need to continually invest, innovate, and cultivate this precious resource. To be a leader in the 21st Century, industry, academia, and government need to work together to prepare our young adults to be successful while developing and retaining the talent that will spur innovation and growth in our region.

We must develop a pipeline of “innovation-ready” workers through programs and public-private initiatives that develop, attract and retain talent capable of participating in the knowledge economy. Particular emphasis should be given to inspiring and engaging underrepresented groups, such as women, minorities and geographically dispersed populations, as we cannot afford to leave any talent on the sidelines.

Working together, the Legislature, industry and educational leaders must develop policies that focus on fostering a robust pipeline of students inspired and educated for 21st Century careers; retaining graduates of Massachusetts public and private educational institutions; and attracting and connecting workers to innovation clusters across the Commonwealth.

At the state level, Massachusetts should, for example, develop talent through integrated K-12 computing education, create pathways for middle-skilled workers at vocational technical high schools and in public higher education, explore ways to retain qualified international students upon graduation, and support internships, adjuncts, co-ops, and other ways to connect students with industry.

While the industry currently remains divided on the issue of non-competes, MassTLC will engage with lawmakers to continue cross-sector dialogue and help develop appropriate policies that represent the interests of the tech sector.

At the federal level, Massachusetts should continue to advocate for Congress to pass immigration reform for high skilled workers.

*MassTLC conducted an informal review of board composition at 70 public and private Massachusetts-based technology companies. Sources include company websites as well as data collected by Bentley University for the *2015 Census of Women Directors and Executive Officers in Massachusetts*.

Women & Minorities

Massachusetts technology companies are creating more jobs than they can fill due to a shortage of job-ready talent. Women and minorities are two obvious and talent-rich pools of resources that, while relatively strong in Massachusetts, remain under-represented in technology.

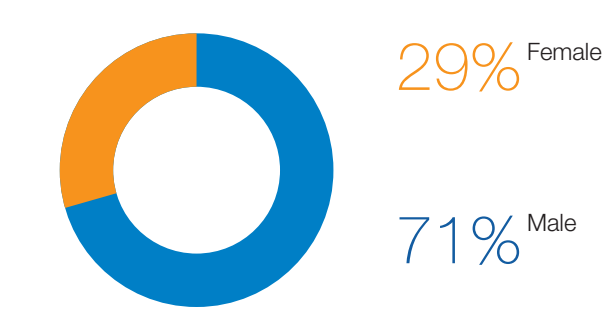
Women in tech occupations in Massachusetts represent a larger share than in most competing technology states, and is growing faster. Massachusetts’ growth rate of 21.4% from 2009 to 2013 was the second-highest for women among competing tech states.

Major racial minorities in Massachusetts tech occupations represent a larger share than in most competing technology states. At 19.2%, Asian workers compose the largest share. From 2009 to 2013, Hispanic or Latino workers had the second-highest growth rate (69.2%) among competitor tech states.

Women and minorities represent groups with a significant number of potential workers left on the sidelines of potential careers that might inspire them and that pay about twice the state average.

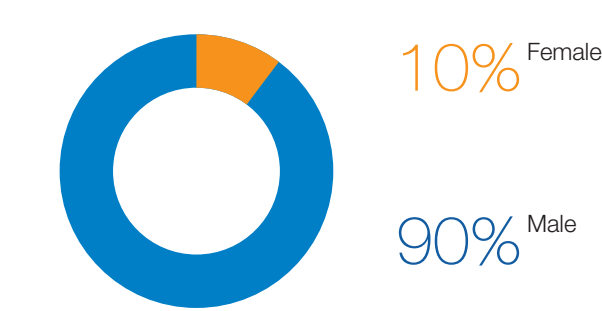
How would this change if more girls, young women and minority students, as well as those looking to make a career change, knew of the opportunities, were inspired and supported, and could see themselves in those roles?

Women Comprise 29% of Computer & Mathematical Occupations Across All Sectors in Massachusetts



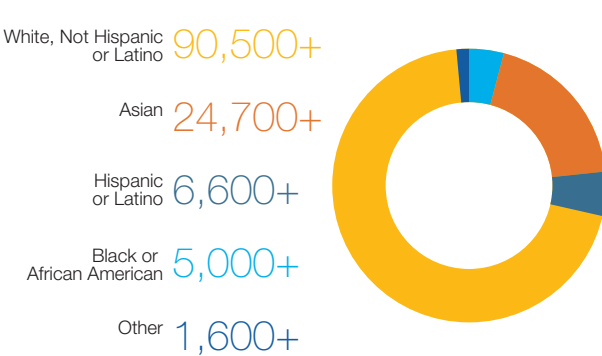
Source: U.S. Census Bureau, American FactFinder, ACS Services B2410 (Sex Occupation for the Civilian Employed Population 16 Years and Over)

Women Comprise 10% of Massachusetts-based Tech Company Board Seats



Source: MassTLC (2015)*

Massachusetts Workers in Computer & Mathematical Occupations by Race, 2013



Source: U.S. Census Bureau, American FactFinder, ACS Series B24010 (Sex Occupation for the Civilian Employed Population 16 Years and Over)

Competitiveness and Business Certainty

Tech leaders and policy makers have a mutual interest in identifying and resolving legal, regulatory and cost hurdles that inhibit growth and innovation for businesses in Massachusetts.

Working together, the Legislature and industry leaders can develop a policy agenda that provides a platform to improve the state’s competitiveness in areas such as tax policy, regulatory and legal reform, and energy and healthcare costs that would improve growth opportunities for technology companies, enhance the competitive position of Massachusetts, and support efforts to market the state globally.

At the state level, Massachusetts should, for example, reform the independent contractor law to make it easier for companies to utilize expertise offered by non-employees; adopt the Uniform Trade Secrets Act; develop balanced tax policy that makes the state’s tax structure simpler, more predictable, and more competitive; continue and expand existing efforts to contain the increasing costs of healthcare while protecting access and quality; explore ways to reduce energy costs while creating a diversified energy portfolio that balances competitive pricing with sustainability; and investigate ways to make housing more affordable and transportation more reliable and efficient.

At the federal level, to ensure greater business certainty, Massachusetts should urge Congress to adopt the Internet Tax Freedom Act, Federal Data Breach Notification Law, and Patent Litigation Reform; to pass Tax Reform, and to expand International Free Trade Agreements.

Innovation, Investment and Infrastructure

Massachusetts is a leader in the nation’s innovation economy in rapidly growing technologies such as big data, cloud computing, health & life science technology, Internet of Things, mobile communications, robotics, security, and more. Through initiatives like the legislative Tech Hub Caucus, tech leaders are working with policy makers to understand and support the innovation ecosystem across the state. Such collaborations result in opportunities to support regional economic development through targeted public policies and investments, and to streamline opportunities for companies to locate and expand in Massachusetts.

To improve state and local government and the delivery of public services, Massachusetts should leverage the use of technology and expand and enhance IT talent within government. Policy-makers should leverage technologies and techniques like open data exchanges, data analytics, mobile workforce applications, and cloud computing to improve citizen engagement and the cost, efficiency, and effectiveness of state and local services in key areas such as energy management, public safety, transportation, healthcare, and education.

To advance innovation across all sectors of the economy, the Commonwealth should pursue novel public-private partnerships to generate new ideas and strategic investment opportunities, facilitate greater university-industry collaborations for research and technology commercialization, and encourage platforms that strengthen entrepreneurial ecosystems across all regions of the state.

At the state level, to encourage further growth in innovation, infrastructure and investment, policy makers should, for example, encourage private investment in information, broadband and wireless networks statewide by streamlining local permitting for new broadband networks and upgrades to existing wireless networks; allow local tax incentives for broadband networks; prioritize state and local investments in transportation and technology infrastructure, such as statewide high-speed broadband, that support private sector growth and investment; examine the impact of current rules and regulations on the tech and innovation economy; develop programs to recruit and develop emerging and seasoned IT managers to state government through pilot and/or sustainable programs such as internships, fellowships, mentoring, co-op programs, and other training programs; leverage the experience and knowledge of local tech company experts to provide strategic review, best practices, and performance measurement for state IT projects; and support a dedicated state innovation function for developing new thinking and enabling new approaches to strengthening conditions for economic growth across the state and in existing and emerging industry clusters.

At the federal level, Massachusetts should urge Congress to adopt cybersecurity and threat data-sharing policies, promote rules to protect an Open Internet, and free up more spectrum for innovation and rural broadband.



Where are we today in setting the pace of growth?

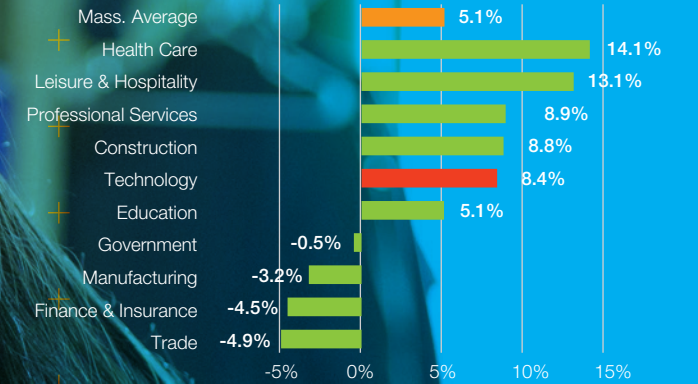
Massachusetts tech-sector executives expect strong job and economic growth.

Three-quarters of surveyed Massachusetts technology companies plan increases in investment in new products/business lines, 67% plan increases in technical and nontechnical staffing, and 51% plan increases in marketing and in technology expenditures.

Massachusetts' tech executives' perception of factors contributing to a healthy tech sector far exceeded national averages in entrepreneurship/innovation ecosystem, skilled workforce, research universities, university alignment with industry needs, and financing capacity across all life stages.

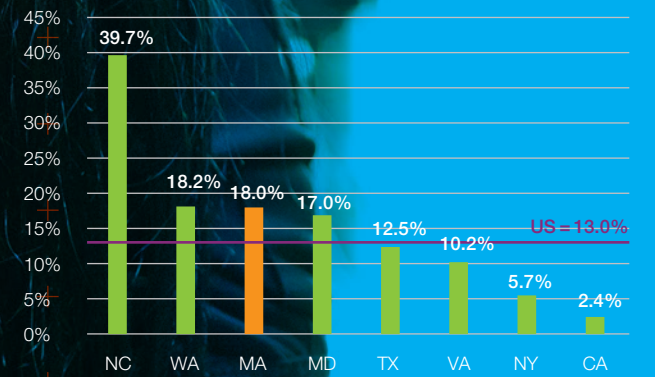
Source: Technology Councils of North America (TECNA) 2014 National Survey of Technology, Policy and Strategic Issues.

Setting the Pace for Growth
Percent Change in Jobs (2009-2013)



Source: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

Massachusetts Added Tech Firms at the Third-Fastest Pace Among Comparison States Since the Recession (2009-2013)



Source: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

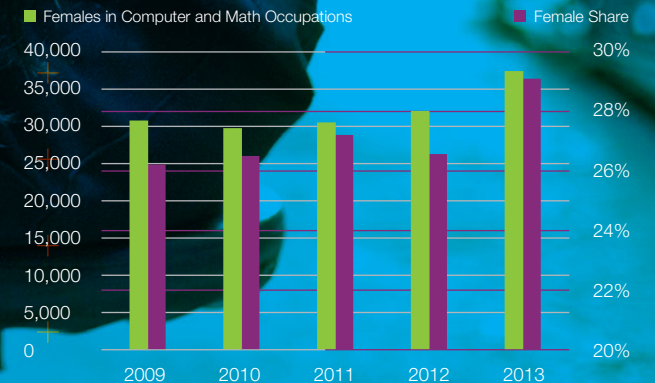
Rising Need for College-Educated Workers

Current ratio of Massachusetts information technology & computer science job openings to recent graduates holding degrees and certificates



Source: Massachusetts Department of Higher Education Vision Project: Degrees of Urgency Report, October 2014

Women in Computer and Mathematical Occupations Growing but Still Account for Less than One-Third



Source: U.S. Census Bureau, American FactFinder, ACS Series B24010 (Sex by Occupation for the Civilian Employed Population 16 Years and Over)

The Final Word

A large, white, stylized number '5' is centered on the left page. The background is a solid orange color with a subtle grid of small white plus signs.

The state of technology in Massachusetts remains very strong, and is the key driver of vibrancy in the state's economy. We stand poised as a region to lead in the emerging technologies that will define the future of humanity. The stakes are high and the leadership position is ours to lose. With smart investments, the Commonwealth can continue to be an engine that drives innovation and that attracts the best and brightest from within our own communities, from the nation, and from around the world.

History is littered with leaders who slid into mediocrity by resting on their laurels. While Massachusetts has not done that, we must always be vigilant to ensure the Commonwealth remains focused on the challenges ahead rather than the accomplishments of the past.

With an energetic partnership between our public and private sectors working to keep us all focused on moving forward, we're confident that Massachusetts will capitalize on both the short and long-term opportunities facing us, and that our future remains very bright.

About the Mass Technology Leadership Council

With about 500 member companies, the Mass Technology Leadership Council (MassTLC) is the region's leading technology association and premier network for tech executives, entrepreneurs, investors and policy leaders. Mass TLC's mission is to accelerate innovation and growth by connecting people from across the technology landscape, providing access to industry-leading content and ideas, and offering a platform for member companies to collectively advance their interests. For more information, please visit www.masstlc.org.

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