

TAKING STOCK OF PROGRESS AND CHALLENGES

MASSACHUSETTS LIFE SCIENCES SUPERCLUSTER

Report to the Boston Foundation

Submitted by

*The Massachusetts Technology Collaborative/
John Adams Innovation Institute*

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Executive Summary

This report is part of the project supported by a grant from the Boston Foundation, to develop a collaborative for life sciences growth in Massachusetts, and create a framework for cross-sector strategy and action. The John Adams Innovation Institute, the economic development arm of the Massachusetts Technology Collaborative, has undertaken the effort to assess strengths and threats facing the super-cluster, identify sample initiative relevant to the growth and the needs of the different life sciences sectors.

The assessment was based on a review of economic literature and different studies relating to life sciences in Massachusetts primarily as related to the specific issues identified as priorities at the 2003 Life Sciences Summit (technology transfer and commercialization, clinical trials, workforce development [nursing and allied health], adoption of new medical technology and e-health, and capturing downstream manufacturing.)

For the last decade, the Massachusetts' Life Sciences cluster has proven to be the most consistent engine for growth of the Commonwealth's Innovation Economy. The preeminence of our teaching hospitals and research institutions is recognized throughout the world. They have been a magnet drawing to the Commonwealth the best and the brightest scientific minds and also many of the largest domestic and international pharmaceutical companies. These companies have established local research and development facilities in order to draw upon the remarkable aggregation of knowledge and experience and the potential for collaboration represented in our Life Sciences cluster. As a result, the Massachusetts Innovation Economy has benefited directly in the form of job creation, higher than average wages, and strong growth in sales and exports –all leading to significantly higher revenues for the state.

But, these positive outcomes of the Life Sciences cluster are tempered by some growing areas of concern. As detailed in the Report, employment growth in some parts of the cluster has been anemic in recent years. Some professional job categories are experiencing significant shortages: from entry-level support positions to nurses and in a number of physician specialties. Companies are reporting that the costs of doing business in Massachusetts are substantially higher than in some of our competitor states and in other regions of the world. The level, degree and aggressiveness of the competition has accelerated dramatically over the past several years; and, although we are making progress in a number of areas, our comparative position is negatively affected by the fact that Massachusetts is a complex place to do business, especially given inconsistencies in the local permitting process and the reputation for an unpredictable regulatory environment. As a result of higher labor and real estate costs, many companies that are founded here due to the wealth of talent and experience in research and development often do not locate their production facilities in the Commonwealth --- choosing instead to site manufacturing operations in lower-cost, more purportedly business-friendly locales. So, even while technology transfer, commercialization and new company formation are strong elements in the Commonwealth's Innovation Economy, we have not been successful in capturing a significant portion of the benefits and value of downstream production.

Industry representatives who have participated in colloquia and conferences on the Life Sciences, and most recently in the 2003 Life Sciences Summit, hosted by President Lawrence Summers of Harvard and former President Charles Vest of MIT, have identified consistently a

number of priority issues and concerns that need to be addressed in any initiative intended to promote the growth of the Massachusetts's Life Sciences cluster. These include: improving and accelerating the process of technology transfer, developing more efficient healthcare delivery systems through the application of new technologies, improving the curricula and engaging students more effectively in science and mathematics in K-16; expanding the skills training network and competencies of the labor force to meet the demands of growing life sciences companies, encouraging a closer working relationship between life science companies and teaching hospitals in order to increase the conduct of clinical trials in the Commonwealth; addressing the economic conditions that impede our ability both to capture downstream manufacturing of those companies that begin their businesses here and also to attract new life science companies to the state; creating uniformity and predictability in local permitting and regulatory review; and, exploring ways to expand the growth in Life Sciences to other regions of the Commonwealth.

There appears to be considerable current activity in many of these priority areas. We have attempted in this report to assemble examples of these important initiatives. Many have been undertaken independently by public and private institutions of higher education, industry and trade associations, or non-governmental organizations. Yet, many others have been collaborative efforts between state government, private industry, healthcare and research institutions and trade associations. Collaboration is especially notable in initiatives to capture downstream manufacturing, attracting new companies to the state, improving the permitting process and expanding regional economic development. However, an assessment of these initiatives and the competitive needs of the state indicates concerns:

- In many instances—even in those where collaboration has been evident—there has not been a mechanism to extend that collaboration beyond the initial partners. Often the joint efforts have been serendipitous and few have been coordinated either in terms of information transfer or economies of scale.
- The ongoing initiatives are predominantly aimed at improving the operational effectiveness of various elements of the cluster. In many cases, they are similar to or are based on, models utilized by other states. There is a lack of strategic and unique activities that can truly move the Massachusetts Life Sciences industry to a new level of operation and provide cluster members with a lasting competitive advantage.

So, while we have a strong Life Sciences innovation base, and there are certainly a variety of valuable and productive activities going on in many priority areas, they do not yet reflect an integration and coherency that can lead to a strategic direction for Life Sciences growth in the Commonwealth.

Competitive Advantages and Disadvantages of the Life Sciences Cluster

The Life Sciences Cluster has been studied extensively in recent years, and a wealth of information has been collected on the characteristics of the cluster. This document provides a synthesis of that information. Sources include: The 2005 Index of the Massachusetts Innovation Economy, Massachusetts Technology Collaborative, 2005; Massachusetts' Competitive Position in Life Sciences: Where Do We Stand?, Professor Michael Porter, Massachusetts Life Sciences Summit, September 12, 2003; Life Sciences Cluster Consolidated Findings, Professor Michael Porter, April 15, 2003; MassBiotech 2010: Achieving Global Leadership in the Life-Sciences Economy, Massachusetts Biotechnology Council and Boston Consulting Group, 2002; Medical Devices: Supporting the Massachusetts Economy, Alan Clayton-Matthews and Rebecca Loveland, Massachusetts Medical Device Industry Council and University of Massachusetts Donahue Institute, May, 2004; The Economic Contributions of the Health Care Industry to the New England Region, Ross DeVol and Rob Koeppe, The Milken Institute and the New England Healthcare Institute, February, 2003; On the Critical List: Health Care Job Vitality in New England, The Milken Institute and the New England Healthcare Institute, January, 2004.

Cluster Competitive Advantages/Strengths

Life Sciences Concentration and the Massachusetts Economy

A fundamental advantage of the Life Sciences Cluster in the Commonwealth is its sheer size and diversity. Hospitals, universities, research institutions and companies of all types and sizes comprise the cluster. While the number and diversity are significant in themselves, what also distinguishes our Life Sciences Cluster is the quality of the institutions and industry. Massachusetts is known throughout the world for its preeminence in life sciences. Over the past ten years, many of the world's largest pharmaceutical companies have migrated to the Commonwealth to establish basic research and development facilities in order to draw on the wealth of learning, discovery and experience represented in the cluster.

The concentration of Life Sciences industries in Massachusetts is significantly greater than in the U.S. as a whole. In 2001, 6.1 Massachusetts workers of every thousand were employed in the medical device industry, compared with 2.6 of every thousand U.S. workers.

Life science industries in Massachusetts have a strong multiplier effect: According to a report by the University of Massachusetts Donahue Institute for the Massachusetts Medical Device Industry Council (MassMEDIC), every dollar of medical device output in Massachusetts is associated with an additional 45 cents of output from other firms and every hundred jobs is associated with the creation of another 79 jobs in the Commonwealth. The Massachusetts Biotechnology Council (MBC) estimates that for every direct job created in biotechnology approximately two indirect jobs are created in support services and related consumer spending.

Average wages in the cluster are among the highest in the country and continue to grow. For example, the average wage for the Healthcare Technology cluster was \$70,467 in 2004, up from \$68,565 in 2001 (measured in 2004 dollars). The MassMEDIC report concludes that mean annual earnings of Massachusetts medical equipment workers in 1999 were approximately \$8,500 higher than earnings of U.S. medical equipment workers; approximately \$5,800 more than workers in all manufacturing categories in Massachusetts and approximately \$12,400 higher than all workers in Massachusetts. This difference can be attributed in part to superior productivity as a result of higher levels of education among medical equipment workers.

Demand drivers are predicted to be strong for the foreseeable future, including the aging of

the population and a growing international demand for sophisticated healthcare and medical technology.

The medical device industry is an important source of exports for the Commonwealth. In 2003, 10% of the state's exports were generated by medical device companies, increasing from 7.7% in 2001. Medical device exports grew 78% between 1998 and 2003, compared to 18% for all state merchandise exports. In 2003, the three top export destinations were Western Europe, Asia and Canada.

Corporate sales in the Healthcare Technology cluster (as defined by the Index of the Massachusetts Innovation Economy) expanded from \$4.8 billion in 2000 to \$12.6 billion in 2004, an estimated compound annual growth rate of 27%. Given the reduction in employment in the cluster, this indicates a high level of productivity.

Leadership in Innovation

Close relationships between research institutions and industry facilitate technology transfer opportunities. Universities and research institutions receive patents and either start new companies based on the patented discovery or license the discoveries to existing companies for development and commercialization.

Innovation is a strong feature of the Healthcare Technology cluster. Massachusetts publicly traded corporations make considerable investments in research and development (R&D) in healthcare technology - \$3.4 billion in 2004—which is the largest amount of all clusters and is the only one that is growing. Approximately 27% of all patents issued from 1994 to 2004 have been in healthcare.

In 2004 and for the period 2000 to 2004, Massachusetts ranks second only to California of the Leading Technology States (LTS- see 2005 Index for definition) in terms of the number of new approvals for biotechnology drugs. Massachusetts also ranks second to California in the total number of 510K approvals and third (after California and Minnesota) in the total number of pre-market approvals. Massachusetts is second only to California in terms of the value of National Institutes of Health-Small Business Innovation Research (NIH-SBIR) awards.

Companies based in Massachusetts generate approximately 8% of the world's pipeline of new medicines—pharmaceutical and biotechnology drugs.

In 2004, biotechnology received 26% and medical devices received 8.3% of all venture capital investments in the Commonwealth.

Employment Resources

The depth of the Commonwealth's educational resources from K-12 through higher education provides Life Sciences companies and institutions a stream of skilled workers. Massachusetts workers in Life Sciences have a significantly higher level of educational attainment than U.S. workers in the same industries. Specifically, 38.4% of Massachusetts medical equipment workers have a bachelor's degree or higher, versus 28.2% of U.S. medical equipment workers (See Exhibit 9).

In 1999 (most recent data available), Boston had the second-largest number of PhDs granted and the second-largest number of life scientists in the workforce after the New York/New Jersey region.

Cluster Competitive Disadvantages/Areas of Concern

Employment Concerns

Employment in the Healthcare Technology cluster is not growing. The cluster's total manufacturing employment declined 7.7% from 2000 to 2004. Employment in medical equipment and supplies manufacturing (51% of the cluster's total employment in 2004) declined 11.3% over the same time period, while medical and diagnostic laboratories (16% of total) rose 15.7%. Pharmaceutical manufacturing, 27% of total employment in the cluster, declined 9.5% from 2000 to 2004.

A report by the New England Healthcare Institute (NEHI) indicates that from 1999 to 2001 New England lagged other regions in the US in terms of health care employment. Many of the health-related occupations which experienced decline in absolute numbers are directly involved in patient care, including home health aides, nurses, radiology technicians as well as some types of medical specialists such as anesthesiologists, OB/GYN practitioners and family and general practitioners. According to the NEHI report, although Massachusetts accounts for nearly half of all healthcare employment in New England, it accounted for only 20% of the increase in health care positions since 1999.

The high cost of housing has made it difficult for mid-level employees to live in the Commonwealth. This may be contributing to shortages in some professional categories and the inability to attract and retain talent at all levels.

Impediments to Business Retention and Growth

- The high cost of doing business in Massachusetts, specifically the costs of labor and real estate, has been cited as an impediment to attracting new companies.
- The quality of the Commonwealth's transportation and communications infrastructure is perceived by some as weaker than what is available in competing states and regions.
- The complexity of doing business in Massachusetts, in particular the permitting process and the regulatory environment, are limiting factors. A consistent position of the industry members of the cluster is that the approval process needs to be simplified and accelerated in order for companies to bring their products to market in a timely fashion.
- Biotechnology companies locate their early stage activities in Massachusetts (initial development and pilot manufacturing) because it is proximate to their research facilities and research talent. However, a survey conducted by MBC finds that fewer and fewer companies locate downstream production and commercialization activities in Massachusetts. The more mature Life Sciences companies have a substantially smaller percentage of workers located in the Commonwealth than those companies at an earlier stage of development. The biotechnology executives interviewed by the MBC claimed that labor costs were not the key issue; rather, they pointed to the local regulatory and permitting environment as "unpredictable".

The Competitive Environment

Aggressive competition from other states represents a serious threat to the leadership position of the Commonwealth in life sciences. Other states are committing resources to recruiting talent and companies through investments in research and research facilities and by developing strategies to grow their position in life sciences. According to Porter, 41 states have launched life sciences initiatives, 16 states have appropriated funds for new biotechnology activities and ten states have explicit biotechnology strategies. Other countries are also competing in this area (See Exhibits 11 and 12).

The cost of manufacturing is relatively high in Massachusetts when compared both to other states in this country and also to other regions of the world. This leads to relocations and outsourcing of manufacturing operations and employment, which in turn reduces manufacturing employment in the Commonwealth.

Some states provide direct grants for companies to purchase buildings and/or equipment. Massachusetts has no program that does this.

Industry-Specific Issues

Life sciences research institutions in MA have recently shown only average performance on a number of technology transfer measures. According to Professor Porter's analysis of licenses and options exercised per patent—a measure of technology transfer—many key Massachusetts hospitals and universities are underperforming equivalent institutions in other states. While technology transfer still represents an advantage for the Commonwealth, other states have become more competitive.

There are specific industry issues impeding new product development, including the reimbursement environment and high medical malpractice costs.

According to MBC, though Massachusetts companies rank second only to California in developing products requiring clinical trials, Massachusetts hospitals lag several other states in the number of clinical trials performed. A conclusion drawn from Porter's study is that most companies conducting clinical trials believe that even with the large number of teaching hospitals in Massachusetts, it is difficult to perform trials here because hospitals appear disinterested in and unresponsive to the conduct of clinical trials. In addition, there are no mechanisms to facilitate the process of conducting clinical trials. Porter concludes that this is a lost opportunity for Massachusetts since clinical trials are a source of revenue for hospitals and a means to improve local health care delivery.

Life Science Cluster's Potential Priority Areas

The following have been identified over time by cluster members as being priority areas for future initiatives to enhance Life Sciences growth and competitiveness:

- Improving technology transfer
- Improving quality and efficiency by adapting Massachusetts-based technology to health care delivery systems
- Workforce recruitment, development and retention
- Expansion of clinical trials in the state
- Capturing more downstream manufacturing
- Attracting new life science companies to Massachusetts and improving the permitting process
- Life Sciences and regional economic development

IMPROVING TECHNOLOGY TRANSFER:

According to Porter (Source: Massachusetts' Competitive Position in Life Sciences: Where Do We Stand?, Professor Michael Porter, Institute for Strategy and Competitiveness, Harvard Business School, 2003) "Technology transfer performance is seen as lagging at some institutions, with cumbersome decision-making processes and inappropriate understanding of appropriate deal structures." MBC reports that improving technology transfer requires cluster members to increase the transparency of the processes involved—universities and companies need to let each know what technologies are available for licensing, and they should work to streamline, standardize, communicate and facilitate licensing procedures to make them more efficient.

Examples of Ongoing Initiatives

- The Massachusetts Technology Transfer Center was created in 2004 as a part of the Massachusetts Economic Stimulus Bill. Its goal is to support technology transfer activities from public and private research institutions to companies in Massachusetts. To accomplish this, the Center works with technology transfer offices at Massachusetts research institutions, university faculty and researchers who have ideas that could be commercially promising and companies throughout the Commonwealth.
- The Massachusetts Association of Technology Transfer Offices (MATTO) has 31 current member organizations and is open to all nonprofit research institutions in the Commonwealth. MATTO's mission is "to promote efficient and effective transfer of knowledge and technology developed at academic institutions in the Commonwealth of Massachusetts to companies that will develop and bring novel products to market for the public good". MATTO provides professional development training to professionals specializing in technology transfer, and gives them a forum to share their issues and concerns. Technology transfer professionals can also participate in events that showcase early-stage technologies developed at Massachusetts academic institutions.
- In November, 2005, Governor Romney signed a partnership agreement with Italian officials to facilitate joint research projects and funding for Massachusetts biotechnology firms that want to

do business overseas. The agreement will foster R&D collaboration between U.S. and Italian firms by establishing joint research centers and creating technology transfer centers to commercialize new research.

- The John Adams Innovation Institute (JAI), a division of the Massachusetts Technology Collaborative (MTC), has a Research Center Grant Fund that supports efforts to enable university-based research centers to develop and transfer technology to industry in the Commonwealth. Grants are provided to establish Centers of Excellence in key technologies such as nanotechnology and biotechnology as well as leverage federal funding for research considered critical to economic growth.
- University-based technology transfer offices play a major role in commercializing the discoveries coming out of academic laboratories. A leading example of an active university technology transfer office is MIT. MIT's Technology Licensing Office manages the intellectual property coming from the university's research and grant licenses to both existing and startup companies. This office catalyzes the startup of roughly 20 new companies per year. Amongst many different types of activities and initiatives supporting the office's mission is the Deshpande Center, which funds research projects for technologies that are closer to licensing. It matches projects with "catalysts"—advisors from the venture capital and business communities. Further, MIT is involved in the Cambridge-MIT Institute, a joint venture between MIT and Cambridge University in England. This venture creates and administers workshops for regional civic leaders to identify ways of expanding the development of "corridors of innovation" between hubs and regional centers (e.g. between Cambridge, Massachusetts and Worcester and Cambridge, England and Ipswich). This exchange program is part of a wider joint research project by the two universities to explore how regions can best enhance the development of their knowledge-based industry clusters.

IMPROVING QUALITY AND EFFICIENCY BY ADAPTING MASSACHUSETTS-BASED TECHNOLOGY TO HEALTH CARE DELIVERY SYSTEMS

According to Porter's research, in spite of Massachusetts' abundance of sophisticated companies, research institutions and medical practitioners, cost pressures and reimbursement structures can interfere with innovation in health care delivery systems. Creating a more advanced and innovative health care delivery system would involve: 1) creating an environment that facilitates the introduction of new technology and new treatments and 2) adopting new service delivery technology. The broad goal is to identify ways to create markets for Massachusetts information, communications and other technology products by facilitating joint efforts between companies and the institutions that constitute the health care delivery system to design and adapt technologies that improve the productivity, efficiency, quality and cost of health care services. This is an area where partnerships between members of the cluster, insurance companies and state government are important to reducing the risk of health care delivery being driven substantially by short-term cost reduction goals.

Examples of Ongoing Initiatives

- MTC and NEHI are working on the state-wide implementation of a health care delivery system called Computerized Physician Order Entry (CPOE). This is a computer application used by physicians to order clinical services for patients. It improves the accuracy of orders and reduces common medical errors, resulting in cost savings and improved patient care. The goal of the project is to implement CPOE in every Massachusetts hospital in four years. The project is now

in its second year, with 12 pilot sites enrolled and \$2 million in state funding. There is a coordinating council of payer and hospital executives and policymakers to create vendor standards and performance metrics.

- A number of projects are underway by other institutions in related areas. For example, with seed funding from Blue Cross/Blue Shield of Massachusetts, a number of the state's early leaders in healthcare information technology (including the Massachusetts Health Data Consortium, Partners HealthCare System and Beth Israel Deaconess Medical Center) have joined to form the Massachusetts e-Health Collaborative (MAeHC). The collaborative has brought a total of 34 organizations together to launch a pilot project it hopes will lead to statewide adoption of electronic medical records.
- The New England Healthcare EDI Network (NEHEN) is a consortium of regional payers and providers who have designed and implemented an e-commerce solution for reducing administrative costs in health care. NEHEN members provide electronic data exchange (EDI) capabilities to their trading partners. All intellectual property created for NEHEN is shared with the group and any solutions developed by individual members are donated to NEHEN. This helps members share costs, leverage experience gained by other participants and increase the benefits of "administrative simplification".
- The Massachusetts Health Data Consortium, founded by the state's major public and private health care organizations, collects, analyzes and disseminates health care information. The Consortium provides reports using industry data and technical consulting. It also works on special projects for use in health policy development, technology planning and implementation and improved decision-making in the allocation and financing of health care.
- In 2003, state government approved the use of electronic signatures. Electronic prescribing tools that provide up-to-date payer information at the time a physician writes a prescription and support the electronic transmission of a legible prescription to a pharmacy can reduce drug costs and improve patient safety.

WORKFORCE RECRUITMENT, DEVELOPMENT AND RETENTION:

There are shortages of healthcare professionals at all levels, and there is a need to provide training for a wide range of health care professions. In studies done in 1999-2001 and 2004, declines were observed in a variety of professional categories. These include nurses (RNs, LPNs and CNAs), radiology technicians, ultrasound technicians, nuclear medicine technicians and medical record coding professionals. The nursing shortage is especially significant: by the year 2010, the Board of Higher Education predicts that the 2003 shortage of 7,000 unfilled nursing positions will expand to 12,000. There were also shortages in post-secondary biology and health specialty teachers. Porter further noted shortages in eight medical specialties (as of 2002): anesthesiology, cardiology, emergency medicine, gastroenterology, orthopedics, neurosurgery, radiology and general surgery. Even though salaries are higher in Massachusetts than in some competing regions, the cost of living is higher (especially housing), which makes it difficult to retain existing workers and recruit from out of state.

Examples of Ongoing Initiatives

- MBC has a Biotechnology Education Foundation (MassBioEd) which offers classes in biotechnology project management and an overview of clinical research (e.g. an overview of the process for developing new medicines), as well as a class in mastering the skills of facilitation, team development and meeting effectiveness. MassBioEd and MBC offer a customized seminar

called “Physicians in Clinical Research” with the purpose of providing physicians with basic knowledge about clinical research and the drug development process.

- MassBioEd, in cooperation with biotechnology companies, state agencies, community colleges, community-based organizations and MBC, offers a program called BIOTRAIN Manufacturing and QC Training. MBC is the co-sponsor. It was developed with a \$500,000 grant from the Commonwealth Corporation as part of the state’s BEST Initiative. BIOTRAIN is involved in recruiting and training technicians for biomanufacturing and quality control. The program provides recruitment through Career Centers, screening, training developed and delivered by a collaboration of community colleges and industry and retention (follow-up services). During its first two years, BIOTRAIN worked with ten biotechnology companies to train over 157 employees and new hires for biomanufacturing jobs.
- Massachusetts General Hospital (MGH) runs a Clinical Research Program (CRP), whose purpose is to enhance the career development of clinical investigators and study coordinators. This also serves to improve the quantity and quality of clinical research undertaken at the hospital. Through the program, MGH offers seminar series and courses on relevant subjects, orientation classes, training seminars and handbooks and other materials. CRP faculty members are also available to consult with clinical researchers to develop ideas, identify sources of funding and assist with the start-up of a research program.
- One example of a university-based workforce initiative is the Harvard Integrated Life Science Program (HILS). This is a graduate program which oversees all PhD education in the life sciences. The goal is to encourage cross-disciplinary collaboration. HILS integrates 12 graduate programs across four Harvard faculties: Arts and Sciences, the Dental School, the Medical School and the School of Public Health. One result has been the introduction of new interdisciplinary programs such as chemical biology and systems biology. Students can receive a PhD or an MD/PhD.
- The Board of Education has been appropriated \$500,000 by the legislature in both fiscal years 2005 and 2006 to work with the Massachusetts Hospital Association and other health care stakeholders to develop the Massachusetts Public Higher Education Initiative on Nursing and Allied Health Education. The purpose of the initiative is to increase the number of nursing faculty and develop programs to increase the number of skilled nurses in the Commonwealth. While there are many students waiting for space in local nursing programs, there is a shortage of faculty and clinical sites and laboratory facilities are inadequate. In FY 2005, the Board funded projects in areas such as the expansion of nurse educator programs, improvement of nursing-student retention, enhancing the role of simulation technology in nursing education and facilitating the transition of nurses from other states and countries into Massachusetts’ workforce. This year’s grants are focused particularly on increasing the number of academic and clinical nursing faculty. This is being done through a joint proposal and funding program with the Massachusetts Hospital Association.
- The Commonwealth Corporation has a program to assist in career development for entry-level health care workers. The Extended Care Career Ladder Initiative, funded by the state, is targeted at workers in the long-term care industry, ranging from CNAs through LPNs.

- The BayStateWorks initiative is funded by the state and administered by Commonwealth Corporation for the purpose of helping employer-driven partnerships design and deliver projects that increase the skills, education and ability of workers. There were grants awarded to fund 20 projects which went to 18 Workforce Investment Boards and community-based organizations. Commonwealth Corporation provides technical assistance and oversight to the projects. Five of these projects in various parts of the state assist entry and mid-level healthcare workers. The programs work with schools and hospitals to provide education and training in health-related subjects.
- Dana Farber Cancer Institute partnered with Bunker Hill Community College to develop a Medical Coding certificate program to provide a career ladder for current hospital and healthcare employees.
- Citizens Bank, in conjunction with the Massachusetts Department of Business and Technology (DBT), has created a \$100 million fund to offer low-cost interest rate loans to companies that commit to creating or expanding jobs in Massachusetts. The terms of the loan will require that the specified jobs be created within three years after the funds are borrowed and that a minimum of one full-time job must be created for every \$40,000 borrowed. DBT will administer the loan program and market it both to companies already in Massachusetts and those considering relocating here. Targeted industries are manufacturing, information technology and life sciences.

EXPANSION OF CLINICAL TRIALS IN THE STATE:

In 2002, 2% of national clinical trial participants were from Massachusetts, with Massachusetts residents representing 2.2% of the nation’s population and 5.3% of life science employment. Recruiting costs are rising and the efficiency of carrying out clinical trials is declining. While many companies conducting clinical trials value the close proximity to leading research hospitals, according to Porter “there is widespread concern about the lack of responsiveness of teaching hospitals in conducting trials, and no mechanisms to facilitate the process of performing trials in the State”. A strategy is needed to address the barriers to conducting clinical trials, increase the number of hospitals doing trials and make the process more efficient. According to MBC, the process needs to be streamlined and standardized in order to bring in more trials to local institutions.

Examples of Ongoing Initiatives

- As described above, the MGH Clinical Research Program is working to train clinical trial investigators and study coordinators.
- In addition to education programs, MGH has a Clinical Research Support Office to help investigators with study design and implementation, including assistance with recruiting subjects. CRP offers mentoring for new investigators, access to industry for support of clinical research and partnerships to advance genetic research and coordination with Partners HealthCare System and Harvard Medical School.
- Partners HealthCare has a website, CRnet, which serves as a resource for clinical investigators, research sponsors and patients. It lists open trials by therapeutic area as well as providing information on other trials.
- Partners HealthCare operates a program, Research Study Volunteer Program—RSVP for Health— which is a registry where individuals who are interested in taking part in clinical trials can register to receive information about research studies currently taking place.
- MBC has a committee on clinical trials which “provides resources for professional development,

education, sound practices, mentorship and networking in support of clinical trials”. It serves as a resource for information about training programs for clinical research professionals, hosts presentations relating to current issues regarding clinical trials, shares information about industry issues and provides a network of local mentors for clinical trial professionals.

CAPTURE DOWNSTREAM MANUFACTURING:

Local biotechnology companies are projecting a significant increase in their product pipelines over the next several years. These companies will have to make decisions about where to locate their factories. Encouraging local manufacturing would bring new high-paying jobs into the state and result in benefits to cluster companies in the form of easier coordination, shorter reaction times and reduced complexity of management supervision. Competitive disadvantages that the Commonwealth needs to overcome include the high cost of doing business and unnecessary complexity and delays caused by an unpredictable local regulatory environment. This strategy cannot be implemented by members of the cluster alone—there has to be a partnership with state and local governments.

Examples of Ongoing Initiatives

- The Massachusetts Development Finance Agency (MassDevelopment) offers three tools to help technology companies finance their operations. The Emerging Technology Fund provides loans for facilities and guarantees for specialized equipment. Companies can use tax exempt bonds to purchase, renovate or construct facilities and finance equipment purchases. Finally, real estate loans provide borrowers with access to up to \$3 million for facility acquisition, renovation, construction and permanent financing.
- The Massachusetts Department of Economic Development, the Massachusetts Alliance for Economic Development (MAED), MTC and MassDevelopment have joined together to create a partnership called “Mass Means Business” (www.massmeansbusiness.com). The website has a group of online business tools to facilitate business development, including a site finder to help find a location for a new or existing business and a funding finder, which is a database for various funding sources. The site also has regional profiles to assist businesses in studying Massachusetts’ different regions to locate the one that is best for a given business. Mass Means Business maintains an online listing of the locations of teaching hospitals and biopharmaceutical companies throughout the Commonwealth. MAED also has site finder tools and information available on different regions.
- In 2004, MBC created an Industry Development program to promote economic development of biotechnology in Massachusetts. MBC offers a central point of contact for all biotech industry inquiries about opportunities in Massachusetts, with guidance on location, permitting, technical and funding requirements and resources. The program will work with state and local government to facilitate the growth of biotechnology companies within the Commonwealth.

ATTRACTING NEW COMPANIES TO THE STATE AND FACILITATING THE PERMITTING PROCESS:

State and local governments play a role in addressing many of the priority areas described above. For example, government can address weaknesses in infrastructure, create tax incentives and facilitate the building process. Two areas that have been identified by industry participants as being particularly important are the use of government resources to bring in new companies from out of state and the creation of a clear and speedy permitting process.

Examples of Ongoing Initiatives

- The MA Business Resource Team (BRT) provides a single point of contact for businesses looking to create and retain jobs in Massachusetts. The BRT is a one-stop shop which aggregates government and other economic development programs and services, making them easier to access and providing a higher level of service to businesses.
- The Governor’s Economic Stimulus Bill, signed in 2004, includes a special tax rebate to biotechnology, pharmaceutical and medical device companies that create new jobs in Massachusetts.
- The Emerging Technology Fund and the “Mass Means Business” website mentioned above are important tools for recruiting companies to the state.
- Two state agencies, the Massachusetts Export Center and the Massachusetts Office of International Trade and Investment (MOITI) are responsible for export promotion and attracting foreign companies to invest in Massachusetts. MOITI has offices in China, Europe and Mexico to help accomplish these missions. The Massachusetts Export Center provides services to local companies including export counseling, international business development and market research, training programs and technical assistance. MOITI promotes exports through five or six industry-specific European trade shows per year based on the Commonwealth’s industry clusters, including life science and medical instruments. These shows are promoted and marketed in collaboration with the Massachusetts Export Center and key industry trade associations such as MassMEDIC.
- MAED has worked with state and local economic development groups and industry associations on the recruitment of new life science businesses such as Straumann, Spherics, Organon, and Tissue Science Laboratories.
- The Governor, MBC, MAED and the Department of Economic Development all participate in BIO, the yearly global biotechnology industry trade show.
- The loan program from Citizens Bank described above can also be used to attract companies to the Commonwealth.
- There is a bill currently pending before the Massachusetts legislature that would create a streamlined permitting process through a state and local government partnership. The bill would allow cities and towns that adopt its provisions to opt-in on a project-specific basis if the municipality agrees to complete the permitting process within 180 days and allows for siting of companies in “traded clusters”. The municipality would identify priority development parcels and create a process to expedite the permitting process on those parcels. At the state level, an inter-agency permitting board will examine ways to expedite permitting within state agencies.

LIFE SCIENCES AND REGIONAL ECONOMIC DEVELOPMENT:

A majority of Massachusetts' life science companies are located in the Greater Boston region. However, other regions are interested in growing this cluster. While state agencies mentioned above provide information about the different regions as part of their site finder capabilities, the regions themselves are working on ways to attract new companies.

Examples of Ongoing Initiatives

- In the City of Boston, the Boston Redevelopment Authority has created a program called LifeTech Boston, with the purpose of fostering the growth of Boston's life science sector. LifeTech Boston assists companies with site selection, financing, permitting and zoning, workforce development and transportation.
- The Pioneer Valley Life Sciences Institute (PVLISI) was created in 2003 as a joint venture of Baystate Medical Center and the University of Massachusetts at Amherst, with dual missions of biomedical research and economic development. PVLISI is working with the Massachusetts Technology Collaborative to establish a Center of Excellence in Apoptosis Research, which will represent collaboration between academic institutions, industry and the public sector for the purpose of doing research that can be commercialized, thus strengthening the regional economy.
- The Greater Fall River Technology Loan Fund is offered in partnership with the Greater Fall River Development Corporation. The program makes loans of up to \$500,000 to purchase equipment, acquire or renovate real estate, or make leasehold improvements. The purpose is to support the attraction and retention of life science and other technology companies in the Fall River area (Fall River, Freetown, Somerset, Swansea and Westport). MassDevelopment administers the program.
- The Massachusetts Biomedical Initiatives (MBI) is an independent, tax-exempt corporation whose purpose is to support the expansion of biotechnology and medical device companies throughout the Worcester region. MBI has two major initiatives: the MBI Incubator Centers, which are incubator facilities for start-up biomedical companies and the Central Massachusetts Biomedical Initiatives (CMBI), which promotes the growth of life science companies in Worcester and Central Massachusetts.
- The John Adams Innovation Institute, a division of MTC, operates a Regional Fund that supports technology-based economic development initiatives across the Commonwealth. Grants are provided to public and nonprofit organizations to enable them to undertake initiatives that are intended to create and maintain a favorable environment for the establishment, attraction, retention and expansion of technology-intensive businesses.

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