

BOSTON MSA BIOPHARMACEUTICAL CLUSTER
United States Massachusetts Boston
Cluster Description and Evaluation

CLUSTER (Name)	Scale	Evaluation	Estim.	Comments, Explanations
BIOGRAPHICAL INFORMATION (Primary Citations:)	Text	Boston MSA biopharmaceutical		Boston MSA biopharmaceutical cluster
Study/ Initiative Name	Text			Biopharma cluster - Boston
Number of data points (quant. & qual.)	No.			
Number of data points (quant. only)	No.			
Done	1 Yes 0 No		1	
Data entry by	Text			J Stewart
Last change (date)	yy/mm/dd	9/9/2004		
Issues raised in study which are not in template	Text			
Research Note	Text			
DESCRIPTIVE INFORMATION	n/a			
Extractive / Natural Resource Industry	1 Yes 0 No		0	
Generic Cluster (Primary Association)	Please scroll down for list!	BioPharma		
Generic Vertical Stage (Primary Association)	1 Primary Goods 2 Primary Serv. 3 Machinery 4 Inputs 5 Support Serv. 6 Multiple		1	
Number of Vertical Stages in Cluster and Product / Service Description	1 1 Stage 2 2 Stages 3 3 Stages 4 4 Stages 5 5 Stages		4	Research , Development, Manufacturing, Commercial
Number of Companies in Cluster	No.	57 pharma mfg, 185 biopharma		
Cluster Employment	No.	8322		
Other Notable Cluster Info and Statistics	Text			
LOCATION (Nation)	Text	United States		
Region	Text	Massachusetts		
City	Text	Boston		
GEOGRAPHIC SPAN	3 city 2 metropolitan area 1 part of state 0 state -1 across state borders -2 nation -3 across national borders		2	
Size of Country	sq. km	9,629,091 sq. km		
Geo. Lat. and Lon. of Cluster Center	dd mm, dd mm	42 21; 71 5		
Cluster Area Size	sq km	1,350.00		
REGIONAL ECONOMIC DEVELOPMENT	n/a			
National Per Capita GDP	U.S. \$ (1993/90)	36361		BEA 2002 GDP per capita
Cluster in OECD Area	1 Yes 0 No		1	
Regional Per Capita Income	U.S. \$ (1993/90)	\$42,436		BEA 2002 personal income per capita Boston MSA
COMPETITIVENESS	3 world's strongest cluster 2 among world's top 3 1 among world's top 10 0 internationally significant -1 nationally significant -2 rather weak -3 uncompetitive		2	
INDICATORS OF COMPETITIVENESS (Change in Competitive Position)	3 rapidly gaining 2 modestly gaining 1 gaining compet. position 0 holding compet. position -1 losing compet. position -2 modestly losing -3 rapidly losing		3	
Cluster's National Share of Production Exports (against competing clusters in the nation)	3 predominant (>50%) 2 dominant (<50%) 1 major (<20%) 0 significant (<10%) -1 visible (<5%) -2 insignificant (<1%) -3 invisible (<0.1%)		0	\$1.8B - 1997 Economic Census generated 7.5% of world's pharmaceutical pipeline, second largest cluster in US behind California
Cluster's National Economic Importance	3 predominant (>50%) 2 dominant (<50%) 1 major (<20%) 0 significant (<10%) -1 visible (<5%) -2 insignificant (<1%) -3 invisible (<0.1%)		-1	3.2% of national employment
Cluster's Local Economic Importance	3 predominant (>50%) 2 dominant (<50%) 1 major (<20%) 0 significant (<10%) -1 visible (<5%) -2 insignificant (<1%) -3 invisible (<0.1%)		1	5,819, 000 total Boston MSA population - 24% of employment in life sciences is in biotech/pharma. the Massachusetts lifesciences cluster accounts for approximately 13% of the state's employment
Annual Cluster Growth	3 rapid (>+10% p.a.) 2 fair (<+10% p.a.) 1 slightly (<+5%) 0 neutral (+/- 2%) -1 slightly (<-5%) -2 fair (<-10% p.a.) -3 rapid (>-10%)		2	CAGR 1990-2001 employment = 9.37
Annual Export Growth	3 rapid (>+10%) 2 fair (<+10% p.a.) 1 slightly (<+5%) 0 neutral (+/- 2%) -1 slightly (<-5%) -2 fair (<-10% p.a.) -3 rapid (>-10%)		3	Total exports 2003 - \$1.3B a 58% increase from year before
World Export Share of Core Industry in Cluster	3 > 85% 2 > 70% 1 > 55% 0 45-55% -1 < 45% -2 < 30% -3 <15%		-3	7.5% of world pharmaceutical pipeline

Local Firms Have own Foreign Market Organizations (vs OEM)	3 almost always 2 vast majority 1 majority 0 50% have -1 minority -2 small minority -3 almost never		Boston life sciences cluster is dominated by SME's - slightly above average establishment growth
Local Firms Sell Primarily under own Brand (vs. Unbranded Commodities)	3 almost always own brands 2 often have own brands 1 sometimes have own brands 0 don't have own brands -1 market under foreign brands -2 often sell commodities -3 almost always commodities	2	develop proprietary processes and drugs http://www.massbio.org/members/ generics account for 50% of total US market
Local Firms Pioneer New Products or Processes (vs. Imitate)	3 usually pioneer 2 often pioneer 1 somet. pioneer 0 pioneer&imitate -1 somet. imitate -2 often imitate -3 usually imitate	2	specialized in medical and surgical equipment, and electromedical and electrotherapeutic instruments
Local Firms Compete Primarily within the Cluster's Industry (vs. Unrelated Diversification)	3 almost always 2 vast majority 1 majority 0 50% do -1 freq. related diversific. -2 freq. unrelated diversific. -3 frequently highly diversif.	1	estimate
Local Firms Compete Primarily on ...	3 factors oth. than diff/cost 2 diffn. cost is insignificant 1 differentiation, less on cost 0 differentiation and on cost -1 cost, less on differentiation -2 low cost due to innovation -3 inherited low input costs	2	compete on innovation using cutting edge science
Foreign Direct Investment by Local Firm (% who do)	3 > 85% 2 > 70% 1 > 55% 0 45-55% -1 < 45% -2 < 30% -3 < 15%	0	estimate
Foreign Firms in the Cluster do more than just Marketing or Manufacturing (% who do)	3 > 85% 2 > 70% 1 > 55% 0 45-55% -1 < 45% -2 < 30% -3 < 15%	3	Amgen, Astra Zeneca, Merck& Co, Novartis and Pfizer all have world research operations in Boston
DIAMOND ANALYSIS Primary reason behind competitiveness (+ order of importance)	1 FC 2 DC 3 R&S 4 FSR 5 Other	2,3,4,1,5	
FACTOR CONDITIONS	3 strong adv. 2 advantage 1 weak adv. 0 no effect -1 weak disadv. -2 disadvantage -3 decis. disadv.	1	
General Factors	3 strong adv. 2 advantage 1 weak adv. 0 no effect -1 weak disadv. -2 disadvantage -3 decis. disadv.	2	strong K-12 education system
Geographic Location	3 strong adv. 2 advantage 1 weak adv. 0 no effect -1 weak disadv. -2 disadvantage -3 decis. disadv.	3	largest world market
Cost of Production Inputs (Wages, etc.)	3 among world's lowest 2 very low 1 below average 0 world average -1 above average -2 very high -3 among world's highest	-2	high cost of doing business - high wages and cost of living - impacts the ability to recruit and retain personnel and influences non-research locational decisions
General Physical Infrastructure (Roads, Ports, Airports, Telecom)	3 world's best 2 among world's best 1 above world average 0 world average -1 below world average -2 among world's worst -3 inexistant	0	weak physical infrastructure (logan), congested cit centre with Big Dig construction
Local Stock Markets Open to New and Medium-Sized Firms	3 strong adv. 2 advantage 1 weak adv. 0 no effect -1 weak disadv. -2 disadvantage -3 decis. disadv.	3	good venture capital environment (Porter), high availability of risk capital and federal research funding - biopharmaceuticals receive 6% of 8.84B in 2000
Government: Macro-Economic Conditions such as Exchange Rates (effect on costs, prices)	3 strongly positive 2 moderately positive 1 slightly positive 0 no effect -1 slightly negative -2 moderately negative -3 strongly negative	2	Taking the case of the large biopharmaceutical manufacturer as an example, this cost comparison shows that even though the corporate tax rate in Massachusetts is higher than in four of the other five states, the Massachusetts Single Sales Factor method of tax apportionment effectively reduces the company's state tax to the point that Massachusetts becomes the most competitive of the six states regarding state tax burden.
Other	3 strong adv. 2 advantage 1 weak adv. 0 no effect -1 weak disadv. -2 disadvantage -3 decis. disadv.		

Specialized Factors	3 strong adv. 2 advantage 1 weak adv. 0 no effect -1 weak disadv. -2 disadvantage -3 decis. disadv.		3	
Cluster-Specific Natural Resources (Raw Materials, Energy)	3 among world's best 2 very good 1 possibly good 0 general purpose -1 possibly gen. purpose -2 poor general purpose -3 among world's worst	n/a		
Cluster-Specific Human Resources (Skilled Labor)	3 among world's best 2 highly specific skills 1 some specific skills 0 general skills -1 primarily unskilled -2 among world's worst -3 impossible to obtain		3	As can be seen from the tables below, Massachusetts compares very well with other top biopharmaceutical states in regard to educational attainment in the populace. In fact, Massachusetts ranks first in two important categories – percentage of labor force age 25 and over with a four-year degree and the percentage of those with a graduate or professional degree. In addition to the high percentage of degree earners in general, Massachusetts also excels in producing science and engineering PhDs. According to the National Science Foundation, Massachusetts ranked fourth in the nation in Science and Engineering PhDs earned in 2001. However, on a per-capita basis, Massachusetts produces more Science and Engineering PhDs than any other state, a testament to the quality and breadth of our institutes of higher learning. However, there is a shortage of mid-level professionals
Cluster-Specific Knowl.- Transfer Resources (Vocat., Univ. Training)	3 among world's best 2 highly specific 1 some specific 0 general purpose -1 poor general purpose -2 among world's worst -3 none available		3	good commercialization environment, but not a lot of local sharing (Porter), frequent tech and knowledge transfer from research to industry but lagging other important regions
Cluster-Specific Scientific Infrastruct. (Research Institutes & Univ., Testing Labs)	3 among world's best 2 highly specific 1 possibly specific 0 general purpose -1 possibly gen. purpose -2 poor general purpose -3 among world's worst		3	strong science base of leading researchers and leading academic research centres, frequent tech and knowledge transfer from research to industry, but lagging other important regions 65 colleges and universities
Cluster-Specific Capital Resources (Venture Cap., Knowledgeable Lenders)	3 among world's best 2 highly specific 1 possibly specific 0 general purpose -1 possibly gen. purpose -2 poor general purpose -3 among world's worst		2	high availability of risk capital and federal research funding \$600M in biopharma VC 2000, second behind Sar Francisco >40 VC/Investment banks in Boston with interest in biopharma
Cluster-Specific Physical Infrastructure (Specialized Facilities, Labs., etc.)	3 among world's best 2 highly specific 1 possibly specific 0 general purpose -1 possibly gen. purpose -2 poor general purpose -3 among world's worst		3	3 world famous hospitals. First and foremost, biopharmaceutical companies take advantage of the region's high concentration of healthcare-related industries, most notably the Boston Area's numerous teaching and research hospitals. Scientists and physicians in our hospitals inspire the development of innovative solutions to the problems encountered by healthcare givers worldwide. Researchers in our hospitals lend their expertise in guiding the development of new therapies and treatments.
Cluster-Specific Administr. Infrastruct. (Legal System, Business Regulation)	3 among world's best 2 highly specific 1 possibly specific 0 general purpose -1 possibly gen. purpose -2 poor general purpose -3 among world's worst		0	
Cluster-Specific Info (Bus. Info, Corp. Disclos., Internet Access)	3 easily available 2 available 1 above world average 0 world average -1 below world average -2 hard to access -3 does not exist		3	
Local Cluster-Specific Trade Show	3 world's premier 2 world known 1 nation's premier 0 nationally known -1 regionally known -2 exists -3 does not exist		2	Drug Discovery Technology World Congress, bioLOGIC USA 2004, Association For The Advancement of Medical Instrumentation (AAMI), IBC's Inaugural BioProcess International Conference & Exhibition, The ManuPharma Congress
Prestige, Tradition, or Pride Allow Attraction of Best People in Cluster Area	3 most celebrated 2 prestigious 1 above average 0 national average -1 below average -2 low prestige -3 disdained		2	estimate
Government: Subsidies	3 usually 2 often 1 sometimes 0 world cluster ave. -1 seldom -2 very seldom -3 never		-1	\$8M from Massachusetts Biomedical Initiative and some state-fund pension investment
Government: Impact from Spillovers (e. Military)	3 very high positive 2 high positive impact 1 some positive impact 0 none or no impact -1 some negative impact -2 high negative impact -3 very high negative		0	no impact
Government: Financed Research	3 ample, specialized 2 ample, general 1 some, specialized 0 some, general -1 seldom, specialized -2 seldom, general -3 none		3	\$1.215M in National Institute of Health Research funding 2001, 2nd behind california
Impact of Selective Factor Disadvantages on Segment Focus or Innovation	3 major & beneficial 2 substantial, & benefi. 1 some & benefi. 0 none or no impact -1 some & harmful -2 substantial, & harmf. -3 major & harmful		-1	high cost of doing business in state - therefore ver few firms choose to manufacture in MA

Other	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.			
DEMAND CONDITIONS	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.	3		
Local Demand Size	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.	3		
Domestic Per Capita Consumption	3 among world's top 10 2 very high 1 > neighbor countries 0 world average -1 < neighbor countries -2 very low -3 among world's lowest	3		
Domestic Private Sector Demand (% of Cluster Sales)	3 > 85% 2 > 70% 1 > 55% 0 45-55% -1 < 45% -2 < 30% -3 < 15%	3	\$ 674 on pharmaceuticals	Total PhRMA domestic sales to private sector = \$133, 504M of total sales \$139,136M in 2002 (US total) HMOs use several measures to control either directly or indirectly their expenditures on prescription drugs. They negotiate price discounts with drug companies and reimbursement rates with retail pharmacies; and they also use prescription drug capitation programs. 76 In addition to bargaining for discounts from drug companies, HMOs also control drug costs by negotiating discounts on reimbursements to retail pharmacies.
Other	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.			
Local Demand Qualities	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.	3		
Soph. / Demanding / Knowledg. Local Customers / Distrib. Channels	3 world's most soph. 2 sophisticated 1 above world ave. 0 world average -1 below world ave. -2 unsophisticated -3 world's least soph.	3		sophisticated local medical practitioners
Timing of Local Demand (Trend Setting vs. Trend Adoption)	3 pioneers trends 2 adopts trends easily 1 earlier than average 0 world average -1 later than average -2 adopts trends late -3 lags behind most	3		high medical malpractice costs in MA may deter new treatments
Disproportionate Local Demand in Specialized Segments	3 leads world trends 2 fosters innovation 1 attracts attention 0 no impact -1 diverts attention -2 retards innovation -3 opposes world trends	2		Cluster has specialty in surgical and medical devices - maybe a result of demand by world class hospitals in cluster
Government: Stringent Regulatory Standards (Product, Energy, Safety, Enviro.)	3 triggers innovation 2 stringent 1 above world ave. 0 world average -1 below world average -2 lax -3 retards innovation	2	in 2000, average FDA approval time was 15.6 months	Hatch-Waxman Act in 1984 weakened patent law for pharmaceuticals and made it easier for generic companies to enter the market
Government: Consumer Information Laws and Consumer Recourse Laws	3 world's strongest 2 strong 1 above world ave. 0 world average -1 below world average -2 weak -3 inexistant	2		direct to consumer advertising is legal in US. In 2000, 2.5B was spent on DTC advertising. Americans in general are more prone to launching legal actions
Government: Demanding / Sophisticated Public Procurement	3 among world's most demanding 2 demanding 1 above world ave. 0 world average -1 below world average -2 undemanding -3 among world's least	2		reimbursement environment does not foster the adoption of product and process innovations in health care delivery (Porter) changes to Medicaid system - preferred drug list - only drugs on this list are fully reimbursable unless physician gets approval first Medicaid drugs are listed at huge discounts to government - private HMO's also negotiate significant price discounts
Other	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.	-2		barriers to performing clinical trials with local institutions

RELATED & SUPPORTING INDUSTRIES	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.	2	demanding and sophisticated customers
Suppliers	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.	2	life science VC market second only to California
Degree of Local Sourcing	3 > 85% 2 > 70% 1 > 55% 0 45-55% -1 < 45% -2 < 30% -3 < 15%	2	presence of instrument companies and other equipment suppliers just an estimate
Local Components or Materials Suppliers	3 2&assist developm. 2 int'lly competitive 1 nat'lly competitive 0 many present -1 some present -2 uncompetitive -3 not locally present	-1	not known for manufacturing capabilities
Local Process Equipment (Machinery) Suppliers	3 2&assist developm. 2 int'lly competitive 1 nat'lly competitive 0 many present -1 some present -2 uncompetitive -3 not locally present	0	no information found on competitiveness of local suppliers
Local Services Suppliers	3 2&assist developm. 2 int'lly competitive 1 nat'lly competitive 0 many present -1 some present -2 uncompetitive -3 not locally present	1	presence of specialized service providers such as law firms (22) and consultants (38) - frequent interaction
Government: Economy is Open to Importing Supplies	3 very open, much choice 2 open, limited choice 1 possible to import 0 neutral -1 difficult to import -2 almost impos. to import -3 closed, no choice	3	most open economy in world
Other	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.		
Related Industries	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.	2	
Competitive Related Industries That Share Common Inputs/ Skills / Technologies	3 very advantageous 2 strong links 1 exist, but few links 0 exist -1 absent, but no harm -2 absence is harmful -3 decis. disadv.	2	The medical device industry is also prominent in Massachusetts, and thrives on the interplay between Massachusetts' traditional manufacturing know-how and innovations produced by our life sciences community.
Compet. Complementary Related Industries (Services, Reputation, Channels)	3 very advantageous 2 strong links 1 exist, but few links 0 exist -1 absent, but no harm -2 absence is harmful -3 decis. disadv.	3	Another industry prominent in Massachusetts is plastics. Several of the companies identified as life sciences related are actually producers of plastic products designed and manufactured specifically for biotechnology laboratories. This kind of synerg further strengthens the case for Massachusetts, expanding its role as a biopharmaceutical manufacturing center. Creators of new technology requiring specialized equipment will find a large community of suppliers nearby. Massachusetts is a leader in the financial services industry. Locating near this regional center gives biopharmaceutical companies immediate access to capital, as well as financial and business advice, important considerations for young technology-driven companies and manufacturers alike.
Other	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.		
FIRM STRATEGY & RIVALRY	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.	0	
Rivalry	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.	2	generic share represents 47% of prescriptions (2000) increase in part as result of HMO generic substitution mandate
Vigorous Competition among Local Companies	3 drives innovation 2 strong, multidimensional 1 same as against foreign 0 primarily on price -1 sometimes lacking -2 collusive behavior? -3 cartel or monopoly	3	strong base of local companies that compete on innovation using cutting edge science
Government: Strong Antitrust Laws	3 among world's strictest 2 well enforced 1 above OECD average 0 around OECD average -1 below OECD average -2 seldom enforced -3 among world's laxest	0	branded firms have ability to make small modifications to products to extend patents to prevent generic market share take over
Government: Cluster's Economy is Open to Import Competition/ Foreign Direct Investments (FDI)	3 open imports, open FDI 2 economy almost open 1 decreasing restrictions 0 considerable restrictions -1 increasing restrictions -2 economy almost closed -3 no imports, no FDI	3	few headquartes of large international companies

Other	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.	-1	limited manufacturing in the State
Cooperation			
Cooperation among Local Companies	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.	3	local companies compete and cooperate intensively, come together to lobby for regulatory reform and legislation
Local Industry Association (in Core Industry)	3 joint labor / infrastr. upgrading 2 joint research in outside labs 1 vertical subcontracting 0 no cooperation -1 help each other in emergencies -2 horizontal subcontracting -3 outright collusion	3	Mass Biotech Council, MassMedic, Massachusetts Hospital Association, Mass Tech Collaborative, Mass Alliance for Economic Development and at MassDevelopment, Massachusetts Medical Device Industry Council
Relationship Among Cluster Participants who Know Each Other	3 strong social/family ties 2 sense of trust 1 promote cluster 0 compete and talk -1 cluster awareness -2 some cluster awaren. -3 distrust	2	"we were left with the impression that the life-sciences cluster had reached a stage in its evolution where its size and complexity have outgrown the traditional mechanisms for interaction. The cluster has relatively little formal organization and few permanent clusterwide institutions, and this makes it difficult to take advantage of potential synergies and address common issues. To some degree, the cluster is a victim of its own success. The very strength of its dominant institutions sometimes makes it difficult for those institutions to work together." (MassBiotech 2010).
Other	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.		
Strategy and Structure			
Unique Local Strategies	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.	3	specialize in niche market - focus on medical device research, limited manufacturing
Other Unique Local Structures	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.		
Local Investment Context			
Government: Tax and Regulatory Environment	3 encourages risk inv. 2 encour. long-term inv. 1 encour. short-term inv. 0 neutral -1 discour. long-term inv. -2 discour. short-term inv. -3 discour. any investing	-1	R&D tax credits are not well structured to benefit research companies. lack of consistent, predictable process for site regulation especially at the local level, lack of overall responsiveness and a coordinated approach to support the cluster by state government
Economic Stability	3 lowers hurdle rates 2 encourages invest. 1 above average 0 OECD average -1 below average -2 increases hurdle rates -3 discourages invest.	2	
Government: Intellectual Property Protection	3 encourages investm. 2 is usually enforced 1 sometimes enforced 0 possibly enforced -1 seldom enforced -2 is not enforced -3 no protection	3	average patent growth (Porter), comparable with Europe, ahead of Canada
Corporate Governance (Accountability to Shareholders)	3 mgt accountable 2 usually accountable 1 increasingly account. 0 OECD average -1 decreasingly account. -2 almost unaccountable -3 mgt not accountable	0	no evidence to the contrary
Government: Targeting	3 does not occur 2 occurs seldom 1 occurs decreasingly 0 occurs -1 occurs increasingly -2 occurs often -3 distorts inv. patterns	3	if anything the MA government, doesn't support the industry
Other	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.		

OTHER ADVANTAGES		2	
Chance	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.	0	
Individual Entrepreneurs	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.	3	strong presence of academics and research facilities
Early Mover Advantages	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.	0	
Government: Other Influence	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.		
Other	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.		
CLUSTER EVOLUTION			
Evolutionary stage of cluster	n/a 3 among world's top 3 2 highly developed 1 critical mass present 0 partly developed cluster -1 critical mass lacking -2 rudimentary -3 unclear if even a cluster	3	
BIRTH			
Primary reason behind cluster birth (+ sequence of events)	1 FC 2 DC 3 RSI 4 FSR 5 Other	1	
Birth of Cluster (Year)	Year	1731	<p>Massachusetts Board of Health established and since then, the city has been on the forefront of medical research and health care.</p> <p>After more than twenty-five years of inventiveness and investment, the Massachusetts biotechnology industry is positioned at the brink of a new age of explosive prosperity, according to MassBiotech 2010: Achieving Global Leadership in the Life-Sciences Economy, a joint report of the Massachusetts Biotechnology Council (MBC) and Boston Consulting Group (BCG). Specifically, breakthroughs in basic sciences at Massachusetts universities and academic medical centers have spawned an enterprising life-sciences economy, thereby "making the state a magnet for public and private investment in life-sciences research."</p>
1 Birth due to Unique Factor Conditions	3 sole factor 2 main factor 1 major factor 0 contrib. factor -1 minor factor -2 minusc. factor -3 no factor	2	trained workforce and significant educational and research capacity
2 Birth due to Unique Domestic Demand Conditions	3 sole factor 2 main factor 1 major factor 0 contrib. factor -1 minor factor -2 minusc. factor -3 no factor		
3 Birth due to Related Industry or Suppliers	3 sole factor 2 main factor 1 major factor 0 contrib. factor -1 minor factor -2 minusc. factor -3 no factor		
4 Birth due to Firm Strategies, Structure or Rivalry	3 sole factor 2 main factor 1 major factor 0 contrib. factor -1 minor factor -2 minusc. factor -3 no factor		
5 Government: Birth due to Initiative or Policy Shift	3 sole factor 2 main factor 1 major factor 0 contrib. factor -1 minor factor -2 minusc. factor -3 no factor		
5 Birth due to Isolated Company or Plant (i.e. Chance)	3 sole factor 2 main factor 1 major factor 0 contrib. factor -1 minor factor -2 minusc. factor -3 no factor		
5 Birth due to Other Reasons (Chance, Isolated Innovation /Entrepreneurism)	3 sole factor 2 main factor 1 major factor 0 contrib. factor -1 minor factor -2 minusc. factor -3 no factor		

DECLINE		n/a	n/a		
Primary reason behind cluster decline (sequence of events)	<ul style="list-style-type: none"> 1 FC 2 DC 3 RSI 4 FSR 5 Other 				
Begin of Decline (Year)	Year				
1 Decline due to Change in Factor Conditions	<ul style="list-style-type: none"> 3 sole factor 2 main factor 1 major factor 0 contrib. factor -1 minor factor -2 minusc. factor -3 no factor 				
2 Decline due to Shift in Buyer Needs or Other Change in Demand Cond.	<ul style="list-style-type: none"> 3 sole factor 2 main factor 1 major factor 0 contrib. factor -1 minor factor -2 minusc. factor -3 no factor 				
3 Decline due to Loss of Suppliers or Related Industry	<ul style="list-style-type: none"> 3 sole factor 2 main factor 1 major factor 0 contrib. factor -1 minor factor -2 minusc. factor -3 no factor 				
4 Decline due to Loss of Rivalry or Other Change in Firm Cond.	<ul style="list-style-type: none"> 3 sole factor 2 main factor 1 major factor 0 contrib. factor -1 minor factor -2 minusc. factor -3 no factor 				
5 Government: Decline due to Interference	<ul style="list-style-type: none"> 3 sole factor 2 main factor 1 major factor 0 contrib. factor -1 minor factor -2 minusc. factor -3 no factor 				
6 Decline due to Other Reasons (Chance, Technical Discontinuity)	<ul style="list-style-type: none"> 3 sole factor 2 main factor 1 major factor 0 contrib. factor -1 minor factor -2 minusc. factor -3 no factor 				