Developing Benchmarks for the Life Science Incubation Industry

A Major Qualifying Project

Submitted to Massachusetts Biomedical Initiatives

And to the Faculty of

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Abstract

Currently there are no comparative data representing the performance of the life science incubator industry. By developing performance standards based on this study, Massachusetts Biomedical Initiatives and incubators nationwide can utilize these data to help monitor their incubator progress and evaluate their incubator performance. To obtain these data, a questionnaire was developed to recognize best practices and practical tools to monitor individual incubator performance and distributed to various incubators. The project also examined MBI's individual facilities performance to illustrate profitable performance areas. By continuing to obtain relative data, MBI can evaluate their incubator properly and develop practices to improve incubator performance.

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Executive Summary

As the life science incubator industry continues to expand research portraying performance standards becomes more essential to develop best practices. However, aggregate results of these criteria are not easily accessible. By gathering comparative data the life science industry will be able to benchmark necessary business tools to incorporate in life science incubators. By identifying business trends, the industry will be able to continue to grow efficiently.

Working with Massachusetts Biomedical Initiatives (MBI), our team developed performance standards to understand MBI's current position within the industry by developing a questionnaire to generate performance standards and identify best practices. Our team created a framework of questions relating to the industry performance using similar previous studies. Conducting additional research was also necessary to provide evidence backing the questions being asked. By obtaining this data MBI would have an understanding of their current position within the industry. After receiving the participant's responses, our team was able to develop the benchmarks for the industry and evaluate MBI accurately.

To being the evaluation of MBI our team needed to organize the current financial of their three facilities. By bringing current costs up to date, as well as making sure all present clients were accounted for our team was able to update the rent structure and MBI's current client's lease information. Previously, this information was not contained in the financial data. Organizing the current cost and rent structure allowed our team to compare MBI's financial structure with the developed benchmarks. Information regarding the percentage of leasable space was also needed for the comparative data of each of their three facilities to the industry.

Updating the information in regards to the layout of the three facilities allowed our team to compare MBI occupancy rate and percentage of rentable space to other incubators in the industry.

To construct a questionnaire that developed useful performance measurements our team followed a set of procedures involving research of prospective clients and previous studies. Our team also researched how to distribute the survey properly using the Tailored Design Method (TDM). The procedures are listed as following:

1. Research and develop appropriate questions.
2. Research and select potential participants.
3. Enter and format questionnaire in to Qualtrics.
4. Launch questionnaire and email cover letter with Qualtrics' link included.
5. Reminder emails sent one week after launch to those who had not responded.
6. Final reminder email sent three weeks later to those who had not responded.
7. Questionnaire deactivated for results analysis.

A separate methodology was used to organize MBI's financial data. The purpose of this set of procedures was intended to organize the data for industry comparison numbers, recognize exceeding costs and revenue potential, as well as account for recent updates of space allocation.

1. Obtain up-to-date spreadsheets from MBI.
2. Revised spreadsheets so that each facility had the same information being displayed.

3. Made sense of what each calculation on the spreadsheet meant.

4. Updated each facilities spreadsheet with the current tenants and new lease information.

5. Obtained accurate square footage data and updated any data that was incorrect.

6. Made a summary sheet and graphs for MBI's Board of Directors meeting.

After deactivating the survey our team analyzed the gathered results and determined benchmarks for the life science industry. The benchmarks pertain to the following five categories: facility, incubation program, financial data, incubation staff, and client data. The top benchmarks related to facilities were average facility size (24,000 $ft^{2)}$, average size of leasable space (17,500 ft^{2}) , and average occupancy rate (74 percent). The top benchmarks within incubation program were the incubator program goals which scored in the following order of importance:

1. Commercialization technologies
2. Fostering Entrepreneurial Climate
3. Growth of Business Sector
4. Growth of Business Sector
5. Creating Jobs in Community

This category also recognized average graduation rate (55 percent), average length of time clients spent in incubator (34 months), average percentage of clients still in business (57 percent), and average acceptance rate of clients (51 percent).

Within the financial category the priority benchmarks were average incubator revenue ($1.86 million), average incubator expenses ($473,000), and average allocation of expenses

(payroll= 41 percent; building and operating costs= 39 percent; program expenses= 19 percent). Relating to incubation staff the top benchmarks were average additional staff (1.5 employees), average time between strategic plan revision (3 years), percentage of incubators with an advisory board (87 percent; consisting of an average of 13 members). The last benchmarks relate to client data representing the average number of clients per facility (6), and the greatest client obstacles:

1. Lack of financing
2. Lack of entrepreneur expertise
3. Incomplete management team
4. Inadequate management team

After developing benchmarks for the life science incubator industry, our team performed an analysis of MBI's data and compared their current progress to develop standards. By identifying strengths and opportunities our team recommended certain practices to continue utilizing and opportune trends for MBI to incorporate in their incubation program. Identifying weaknesses and threats allowed our team to suggest changes or alter operations within the incubator. Also, our team incorporated the progression of MBI's strategic plan into the suggested recommendations. Integrating the strategic plan allowed for prominent strengths to be distinguished and recommendations to be prioritized properly.

The following were identified as strengths for MBI: high percentage of lab space compared to other incubators in the industry, significantly higher occupancy rate, free pre and post services offered to potential and graduated clients, respectively, and high graduation rate due to solidified acceptance criteria. The two strengths that stand out the most are the occupancy rate and graduation rate. The occupancy rate illustrates that MBI is able to draw in clients

consistently. The graduation rate reflects that the clients drawn in to the incubator are of high quality. The best opportunity for MBI is increasing their incubator space. Because of the high occupancy rate MBI will be able to expand their facility and essentially incubate more clients.

Although there were several strengths for MBI there were also several weaknesses. These weaknesses included size of the individual facilities, lack of graduation policy, and the need for more sponsorship's through collegiate relations. The small size of the incubators limits the number of clients they can accept and potential revenue from rent. Although the graduation rate is high, MBI could increase its percentage by defining a formal written graduation policy that details the criteria for graduation. Limited sponsorship through local colleges and universities hinders the recognition of prospective clients from academia. The low acceptance rate of clients for MBI is the first threat for business operation. This goes hand-in-hand with the second threat of prospective clients selecting an alternative incubator. By having to high standards MBI could potentially lose quality clients and limit their occupancy rate in the future.

Based on our results, our team was also able to conclude the life science incubation industry is still emerging, but growing rapidly. This is represented by the low graduation rate and the high percentage of incubators with one facility. The low graduation rate illustrates that the majority of incubators house clients that have recently been accepted. This is supported by the consistent percentage of clients still in business today. A high percentage of incubators with only one facility reflect that the life science incubator industry is still emerging, but the high occupancy rate across all incubators illustrates the rapid growth. In other words, incubators have not needed to expand, but are increasingly attracting clients.

According to our developed benchmarks, our team was able to conclude that MBI is a top-tier life science incubator. When reviewing our recommendations the strengths and opportunities greatly outweighed the weaknesses and threats. The significance of the strengths was much higher than the weaknesses when evaluating incubator performance. This means that MBI's strengths affect their operations much more than their weaknesses.

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Introduction

The life science incubator industry is rapidly expanding as research becomes more essential within certain fields. However, information related to industry performance is not easily available. Due to this, life science incubators nationwide are unable to identify best practices within the industry. Gathering comparative data will help benchmark necessary business tools to incorporate in life science incubators. By identifying business trends, the industry will be able to continue to grow efficiently.

Massachusetts Biomedical Initiatives (MBI) is a life science incubator located in Worcester, Massachusetts. Currently, MBI operates three facilities housing various types of life science research. This research includes: biotechnology, bio informatics, and medical devices. MBI offers a variety of pre and post services to perspective and graduated clients, respectively. These services include, but are not limited to, access to angel investors and networks, assistance with manufacturing practices, processes, and technology, and linkages to higher education resources (MBI, 2010). By providing these services, MBI is able to attract quality clients and remain a top-tier incubator. MBI is also able to form superior relationships with graduated clients by assisting them in future business operations.

In addition to pre and post services, MBI offers a wide range of shared research and safety equipment. These include autoclaves, darkrooms, and thermocyclers. Providing a large amount of equipment allows all types of research to be conducted within the incubator, and does not exclude any potential clients. MBI also has a complete advisory board to monitor incubator performance (MBI, 2010). By including specialists within the advisory board, MBI creates a competitive advantage over alternative incubators.

Working with MBI, our team developed performance standards to understand MBI's current position within the industry. In order to evaluate MBI properly, our team organized the current financial data. This involved updating current costs, as well as making sure all present clients were included in the rent structure. Also, our team updated each client's lease information. Originally, this information was not included within the financial data. In order to properly allocate rents, our team gathered this information for MBI and included it in the financial report.

Information pertaining to leasable space was also needed in regards to the three facilities. In order to understand how MBI compared to other incubators in regards to occupancy rate and percentage of rentable space, our team needed to update the information regarding the layout of the three facilities. Recently, MBI made changes to the arrangement of the facilities to increase lab and office space for the clients, but did not record these changes. Our team updated this information to have quality comparative data.

After organizing MBI's data, our team developed a questionnaire to generate performance standards and identify best practices. By using previous surveys, our team created a framework of questions relating to industry performance. Additional research was also performed to support the questions being asked. Research was also conducted to identify life science incubators nationwide. This information helped our team develop specific qualifications and select sixty-eight participants that met these criteria. Using the Tailored Design Method (Dillman, 2000) through a survey database (Qualtrics) our team distributed the survey for willing participants to complete. When the results were received, our team was able to develop preliminary benchmarks for the industry.

Using these benchmarks, MBI and participating respondents would be able to compare their incubator performance to that of the industry. Identifying best practices allowed MBI to recognize specific trends to incorporate in their business operations and strategy. While this information was useful to MBI's current progress, it is important that comparative data be continuously gathered. Using these results as a starting point, MBI and the life science industry could develop solid benchmarks that help life science incubators grow and thrive.

Background and Literature Review

Introduction

The goal of this project is to perform an analysis of the Life Science incubator industry by gathering aggregate data from incubators throughout the United States through a survey questionnaire. Working alongside MBI, our team performed an industry analysis as well as updated the cost and rent structure of MBI. A University of Michigan survey (cite) and the Total Design Method (Dillman, 2000) were used to help us create our survey.

Incubators provide space for clients who are not yet mature enough, or financially sound, to make it on their own. By joining an incubator it allows a start-up company to take advantage of a space for rent, financial benefits, and expertise/knowledge. Incubators offer different equipment and services for their clients to use at their leisure. If an incubator is specialized in a certain industry, the services and equipment offered will be geared for that specific industry.

MBI is a life science incubator that was founded in 1984 and is located in Worcester, Massachusetts. MBI offers laboratory space, common areas, as well as various services and equipment to their tenants. These services are offered at any one of their three facilities- Barber Avenue, Biotech Three, and Gateway Park. The Gateway Park facility is a partnership with Worcester Polytechnic Institute (WPI). In order to see how MBI compares to the rest of the industry, the survey results were used to examine MBI's strengths and weaknesses. Another performance indicator was MBI's three year strategic plan, last revised in 2007. Comparing MBI's goals and vision with the rest of the life science incubator industry was a great tool to examine the direction their business is heading.

Helping formulate our survey questions was a University of Michigan survey. The survey was sent out to incubator presidents, including Kevin O'Sullivan of MBI. Although it was a survey for all types of business incubators, it gave us a good understanding of what types of questions to ask and when to ask them. Also of help in constructing the survey was the Total Design Method (TDM) authored by Dr. Don Dillman (2000). Dr. Dillman explains how to properly conduct a survey. Although it was created in the 1970's, it has been updated and refined several times. The TDM explains the importance of sending out a cover letter, an appropriately constructed survey, reminder letters, and thank-you letters. When sending out the survey letters it is important to stress that those who participate will receive a copy of the summary data. This information can help them rate their performance within the industry. He also explains some of the things to avoid when asking questions of participants. Following his steps will increase the response rate and improve the results that are received.

The formulation of our survey and our results will allow MBI, and our survey participants, to see how they compare with the industry. By using the University of Michigan survey and the TDM, it allowed us to obtain important aggregate data.

Incubators

Incubators first were developed in 1959 in the small town of Bativia, New York. Early in the development process they were not very popular, but as we turned the calendar to 2010 it seems as though more and more start-up companies are considering this route. Incubators can be extremely beneficial and are being used in several different industries.

The reason for the development of incubators was drawn from several reasons. One reason came from venture capitalists who thought this opportunity would be a new way to apply their experience in new ways. By pooling these start-ups together they could minimize the risks.

Another motivation behind this movement was to improve the innovative and entrepreneurial way of thinking by universities. By 1980 there were only 12 incubators in the United States, but there was help on the way.

The U.S. Small Business Administration began to hold conferences to promote incubators by developing several initiatives. Next was the establishment of NBIA, which was, and still is, the primary source of data, know-how and other services for incubators. The early incubators focused on light manufacturing and new technologies and then over the years began to include biotechnology, clean energy, software and the arts. NBIA estimated in 1998 that 90 percent of all incubators in the U.S. were non-profit entities. But, with the dot.com boom, in 1999 and 2000 there was a shift in the industry. It was estimated that around 400 new for-profit incubators created. According to NBIA there are nearly 1,000 incubators in the United States today, about 90 percent of those being non-profit organizations. Here are some facts about the incubator industry in the United States today (ASME, 2010):

- 47 percent of incubators are mixed use
- 37 percent are designed for technology industries
- 7 percent are designed for manufacturing companies
- 3 percent are focused on community development/revitalization projects
- 44 percent of incubators acquire their clients from urban regions, 31percent from rural regions, and 16 percent from suburban regions

When these incubators are running they are usually sponsored by several types of organizations. Some of these sponsors serve as the host organization while others are simply a financial contributor. Here are some facts from NBIA about sponsors in the United States today:

- Approximately 25 percent of North American incubators are sponsored by academic institutions
- 16 percent are sponsored by government entities
- 15 percent are sponsored by economic development corporations (EDCs)
- 10 percent are sponsored by for-profit organizations
- Approximately 5 percent are hybrids with multiple sponsors
- 19 percent have no sponsor or host organizations

Recently, there has been a switch in momentum with incubators switching from for-profit to non-profit. Non-profit incubators require little or no equity while for-profit frequently demand up to 70 percent of shares as the price of entry. Including other countries such as China, UK, and Australia there are approximately 4,000 incubators worldwide.

Joining an incubator can be extremely beneficial for start-up companies. Why do companies join an incubator? One of the main reasons is due to lack of adequate financial resources. It can be very expensive to run a company right off the bat when you take everything into account – rent, salaries, purchasing equipment, insurance etc. By joining an incubator a lot of these costs can be minimized. With 48 percent of new businesses failing within the first five years due to lack of capital, it seems like a great idea to join an incubator. Not only will companies join because of financial reasons, but also for the access to knowledge. Many of these incubators are sponsored by large educational institutions and universities. With this connection also comes the access to their libraries and any academic expertise/consulting that can help their business flourish.

When joining an incubator companies are usually asking the question, what services can they provide for us? Most incubators will provide support in the following areas: facilities, equipment, professional services, knowledge access, and financing. As companies grow larger,

needing more space, it can be quite a hassle to pick everything up and move somewhere new and have to sign a new lease. Incubators are available to provide those companies the flexibility they may need. Most incubators offer spaces ranging from 250 square feet to 5,000 square feet. So, if a company were to grow too big for their current space they could simply move to a bigger area within the same facility. Also, when signing commercial leases they are often over an extended period of time. An incubator will offer leases as short as six months with extreme flexibility. Many incubators will offer their clients shared facilities. These are available for all of the tenants and include conference rooms, kitchens, and bathrooms. They will also offer their clients different equipment for their usage. Usually done on a shared lease, or pay-as-you-go basis, they may be computers, fax machine, telephone, chairs, tables etc. If an incubator is specialized in a certain industry, the equipment will be geared towards that industry (ASME, 2010).

Other things offered to clients are professional services and support. Some incubators may offer things such as a secretarial staff and an IT staff to assist with any computer and network maintenance. In some industries, such as the pharmaceutical or technology sectors, obtaining a patent is critical in the growth of their company. Several incubators will offer a Legal support team to assist in that process. They may also assist in licensing agreements and their contracts. As touched upon earlier, the knowledge that the incubator can provide to the tenants is exceptionally valuable. One of the final services, also mentioned before, is the financing incubators provide. Incubators will generally receive their financial support from one of the following sources: private funding, government subsidies, academic institutions, economic development corporations, and angel investors.

These companies may join for financial issues, different services/equipment offered, or the knowledge they have at their fingertips. But, as time passes it seems as though small companies are tending to gravitate towards starting out in an incubation program, especially with today's economy and the failure rate for start-ups during the first few years.

Our team also looked at the article "Building Futures or Stealing Secrets," authored by Susan Marlow and Maura Mcadam. The article focuses on business incubators as a whole and some of the disadvantages that emerged regarding incubator placement. According to Marlow and Mcadam, they feel there is a benefit in joining an incubator to realize the benefits of sharing challenges of business operations with other tenants. Tenants will also be able to take advantage of the credibility of firms that are now associated with their company. They also touched on the development of independent, secure internal systems as firms become more mature. Marlow and Mcadam recommended that this can be enhanced by having a quality incubator management team that is ready to provide support and advice to their tenants. However, they felt that the protection of privacy, intellectual property and competitive strategies were in jeopardy due to the firms proximity.

MBI

"Massachusetts Biomedical Initiatives (MBI) is a private, independent economic development organization dedicated to job creation and innovative healthcare throughout Massachusetts by promoting the growth of start-up biomedical companies." (MBI,2010)

MBI was founded as the Massachusetts Biotechnology Research Institute (MBRI) in 1984 with a mission "to accelerate the commercialization of academically based technology into commercial products and to assist in regional economic development through the creation of new companies leading, in turn, to creation of new employment opportunities." Due to a rapidly

evolving industry, MBRI changed its name to MBI in 1999. This was symbolic of their new approach to the market; they were going to focus on every aspect of the biomedical industry rather than focusing solely on biotechnology. (WPI MQP, 2008)

The ultimate goal of MBI is to assist in building the biomedical industry in Massachusetts by promoting the commercialization of our region's academic and science research to develop new biotechnology, medical device, and pharmaceutical companies.

Currently, MBI, located in Central Massachusetts, has three facilities located throughout Worcester, MA. These facilities can be found at Barber Avenue, Biotech Three, and Gateway Park. The Barber Avenue facility houses numerous laboratories of varying sizes, offices, a conference room, kitchen, and offers shared equipment and cold rooms to tenants. Biotech Three, located at One Innovation Drive, is a one million square foot research park and is recognized as one of the nation's leading biotechnology centers. Located directly across the street from the UMass Medical School, this incubator plays a key role in facilitating technology transfer from academic research to commercial application. MBI's site at Gateway Park is a partnership with WPI, and, in particular, the Bioengineering Institute. This incubator, which is positioned on the ground floor of the newly constructed building, will specifically identify and capture academic and science related research and transfer these discoveries into commercial based companies and jobs. Through these three facilities, MBI lowers barriers to success for emerging companies by providing cost-effective, high quality laboratory space and support services (MBI, 2010).

MBI offers several services to its tenants within their incubation program. Already mentioned are a multitude of shared equipment and facilities, but MBI alkso provides,

maintenance & cleaning, autoclaves, glass washer, and centrifuges, among other things. The laboratory space also provides the most up-to-date facilities for wet research in life sciences (MBI, 2010). Administrative services, including staff members who handle standard business operations, are also available. By not having to worry about this side of their business it allows the tenants to concentrate on their research and development (MQP). MBI will assist each employer with the development and implementation of a comprehensive health and safety program. In order to better help with the implementation, MBI will help their tenants in obtaining permits and licenses to ensure that the laboratories are being properly maintained. The Health and Safety staff at MBI will take a look at each tenant individually, determine which health program fits their company the best, and then help them with the permits, application process and training for the program. However, one service that cannot be measured is MBI's experience. MBI's long standing success within the industry allows them to be mentors and consultants for the start-up companies in their facilities. This will help the clients achieve the goals they have set for themselves. If tenant companies go public or are sold, MBI seeks a negotiable one percent equity agreement. The MBI Board of Trustees set up this endowment with the purpose of using this equity to help develop their laboratory space and shared equipment. Through continued development it will encourage the growth and success of future life science start-ups. As a cost reduction measure for its utilities and facilities, MBI tenants share things such as copy machines, restrooms and common rooms. But, based on the equipment found in the lab and what the current market is, MBI sets a competitive price for its tenants. Currently, the startup companies at MBI will sign a one year lease and will be able to renew their lease at MBI's discretion. If a client is producing MBI will bring them back for another year, but if they are not, it allows them to reduce their risk of having an unproductive tenant. MBI's hope

is that companies will grow large enough to get their own facility and begin to thrive on their own.

The Biocomputing Center at MBI is an engineering and educational initiative between MBI, industry, and regional academic institutions. Some of the commercial and academic partners involved include: IBM Corporation, Microsoft Corporation, NextBio, University of Massachusetts Medical School, Tufts University School of Medicine, and Worcester Polytechnic Institute. The Center acts as a catalyst for collaborative research leading to new computational tools and techniques for the life sciences. The non-profit Biocomputing center is filled with staff and advisors with expertise in advanced simulation, data mining, database design, machine learning and software development (MBI, 2010).

To date, MBI and its former venture capital are, Commonwealth BioVentures Inc. (CBI), have invested over $8 million of public funding and over $50 million of private money in new technology driven companies. The result has been three major incubator centers and the creation of over 50 companies. Those companies receiving support from MBI and CBI have over $50 million a year in payroll and have raised $600 million of additional financing. These companies have helped fuel the economic growth of the region and are employing over 2,000 people, 1,500 of them located in central Massachusetts.

Over the last 20 years MBI has been a leader in the life science incubation industry. Their success has been recognized not only throughout the state of Massachusetts, but also by others throughout the country. MBI's facilities and services have given their tenants the tools needed to graduate and be successful.

MBI's Strategic Plan MBI's strategic plan was last updated in 2007. The strategic plan outlines MBI's mission and what their core values are. The plan also offers a detailed strategy for accomplishing the mission. The mission statement reads as follows:

> *Massachusetts Biomedical Initiatives (MBI) is a private, non-profit economic development organization dedicated to job creation throughout Massachusetts by promoting the birth and growth of start-up biomedical companies that are committed to developing innovative ways to improve health care. MBI offers support to creative entrepreneurs in developing sound scientific and business plans. Through its MBIdeas Incubator facilities located in Worcester, MBI lowers barriers to success for emerging companies by providing cost-effective and high quality laboratory space and support services. MBI is committed to collaborating with the academic and business communities, and local and state governments, to promote Massachusetts as an international leader in the biomedical industry.*

MBI's core values are:

- Honesty, respect, and dedication to creating an environment for life science commercialization opportunities through collaboration
- Commitment to helping client companies comply with all applicable laws, with emphasis on health and safety
- Commitment to personal and business growth, and creation of *new* jobs
- Commitment to collaborative development of biomedical and related industries in Massachusetts

In order for MBI to accomplish its mission, it hopes to actively facilitate success and ensure financial viability. In regards to our project, MBI hopes to identify appropriate measures of success and regularly track progress. MBI intends to actively facilitate success by:

1. Identifying and attracting entrepreneurial scientists and emerging companies.

2. Functioning as mentor and partner.

3. Functioning as facilitator by providing incubator facilities as a catalyst to lower barriers to success for emerging companies.

4. Providing personal and institutional connections to existing and emerging resources.

5. Facilitating expansion and/or relocation when appropriate.

To ensure financial viability, MBI plans to:

1. Research progress in other areas of the country to ensure that MBI remains at the forefront of providing successful biomedical incubator facilities.
2. Identify and secure sufficient income independent of government grants.
3. Pursue government grants (e.g., National Center for Research Resources, EDA Grants, State Economic Development) to ensure ability to provide resources at below market rates.
4. Work with local elected delegation, newly elected governor, and state legislature to support MBI's mission of creating jobs; continue visits to Beacon Hill; maintain visibility at biomedical conventions; and invite legislators to MBI facilities on a regular basis, emphasizing MBI's track record of creating jobs.
5. Ensure that failure of client companies does not jeopardize MBI's financial interests.
6. Minimize expenses (e.g., operational efficiency, best use of staff, and control of space).

MBI also hopes to appropriately measure success and regularly track progress by developing measurable metrics based on the following:

1. Potential clients for incubator facilities, number of candidates, “yield rate”, etc.

2. Space allocation, number of employees, and revenues for clients located in incubator facilities

3. Evaluations of why client companies succeed and why they fail, to be better able to advise future companies.

4. Number of companies, employees, and revenues of the biomedical industry in both central Massachusetts and Massachusetts as a whole. Specifically, map the biomedical corridor of expansion stretching from Boston/Cambridge westward with an aim to link resources and broaden economic opportunities across the local region and the state.

5. Operational costs and income to ensure balanced budget.

6. Additional parameters as new developments dictate.

Continuing to follow this strategic plan since it was developed in 2007 has allowed MBI to become one of the top life science business incubation programs in the country. Our project hopes to aid MBI in ensuring financial viability by evaluating its rent structure for each facility and making appropriate recommendations, and by developing measurable metrics for success that will allow MBI’s management team to gauge its operations and performance using comparable data representative of the life science incubation industry.

TDM

How a survey is designed and distributed can affect the response rate and accuracy of results both positively and negatively. During these processes three types of errors need to be considered: sampling error, coverage error, and measurement error. Sampling error is the result of not surveying all elements of the population. Coverage error is the result of prohibiting all members of the survey population to have a nonzero chance of being included in the sample for survey participation. Measurement error is the result of poorly worded questions or inaccurate questions that create skewed answers or answers that the researchers have difficulty interpreting. (Dillman, 2000)

By using the TDM, researchers are able to reduce measurement error and increase response rate. The TDM is a development of survey procedures that increases trust among respondents. Trust is increased by creating perceptions that costs are reduced and high rewards are available for participating in the survey. In doing this, survey error is reduced. Chances of an accurate response are higher when respondents believe the anticipated rewards are greater than the expected costs. (Dillman, 2000)

A majority of a questionnaire, as well as the implementation process, can be adjusted to develop trust for the respondent. To establish trust researchers can provide a token of appreciation in the response, emphasize sponsorship of legitimate authority, and make the overall task seem very important. Increasing the anticipation of rewards involves asking for advice, providing tangible results, providing social validation, and emphasizing scarcity of response opportunities. Finally, reducing social costs includes avoiding subordinating language, avoiding inconvenience, making the question short and easy, and minimizing the requests of personal information. (Dillman, 2000)

There are also several techniques for writing survey questions. The goal of writing a survey is to develop a set of questions that each individual respondent will interpret the same way. This will allow all respondents to answer accurately and be willing to answer. There are several criteria to follow when writing individual questions. The survey must require an answer from each respondent that is asked. Also, the questions must consider whether responding demands considerable research or thought, or if the respondents have an accurate, ready-made answer for each question. Finally, researchers must consider if the respondent is willing to reveal the requested information, and if the respondent will feel motivated to answer each question (Dillman, 2000).

To implement the survey properly and achieve high response rates there are five elements to consider. First, the questionnaire must be respondent friendly. Second, four contacts to the respondents must be made, including a fifth additional contact to respondents who have not completed the survey near the deactivation date. These contacts are: pre-notice letter, cover letter including questionnaire, thank you expressing appreciation and including reminder, replacement questionnaire indicating the response has not yet been received, and a final contact such as a telephone call to improve response rate. The third element is a return or contact address for questions or concerns. The fourth element is personalization of correspondence and the final element is prepared incentives for to express appreciation. (Dillman, 2000)

Overall, the TDM is a set of procedures to conduct self-administered surveys to produce high response rates and obtain useful and reliable information. Through this process, researchers will be able to understand why respondents did or did not complete the survey. By understanding this, researchers may be able to increase trust amongst respondents and alter anticipation that rewards from the survey will outweigh the cost. (Dillman, 2000)

Prior Studies

To understand the types of questions to be asked and to provide evidence for the original framework of the questionnaire, our team researched prior surveys and studies conducted about incubators and the life science industry. The information provided in these studies was very similar to the NBIA and Michigan University studies and also introduced new information to our project team.

The first study was the "Knowledge Deployment and Knowledge Network: Critical Factors in Building Advantage of Business Incubator Knowledge Service" by Zhigao Chen, Ling Ma, and Ziangyun Chang. The article studies the critical factors in knowledge service advantage of business incubators and concludes that knowledge network and knowledge deployment are two critical factors in developing business incubators. Knowledge networking and deployment includes educating entrepreneurs on business skills and allows for increased productivity for companies. Systematic knowledge integration in incubator clusters develops competitive advantage that increases innovation and improves the economical scenario within the industry (Chen, Ma, Chang, 2006).

This article also determines that cooperation among various enterprises creates value and fosters credible business networking. In order to have a quality incubation enterprise with quality knowledge learning and innovation the incubator must have a combination of different organizations. Universities and research must be involved to introduce new technologies and research methods. Finance companies and consultant firms provide financial knowledge and managerial knowledge. The assistance of accounting offices provides proper accounting knowledge. Most importantly a well thought out incubator management assists the

collaboration of all teams and allows for start-up enterprises and entrepreneurs to become successful graduated companies (Chen, Ma, Chang, 2006).

The second study used was "Incubator Best Practice: A Framework" by Anna Bergek and Charlote Norman. The article argues that identifying incubator best practice requires a holistic approach, rather than emphasizing incubator outcomes as done in the past. Evaluating incubators through a holistic approach involves evaluating the goals of the incubator and the performance of various incubators is determined based on how well their program fits into their incubator model. The study concludes that identifying best practice incubator models requires incubators to describe and distinguish between different incubator models and evaluate their performance and outcome based on relation to their original models. (Begek and Norman,2008)

The main argument behind this study is defining incubator best practice as "a process that is better at delivering a particular result than any other process." (Begek and Norman, 2008) To recognize these better processes, incubators must not only recognize the outcome of an activity, but relate this outcome to the expected results. By identifying practices that produce outcomes that are consistent with expected goals, incubators will solidify a framework for best practices. Defining suitable outcome indicators will identify best practice models and distinguish between models that produce different outcomes for equal goals. (Begek and Norman, 2008)

The third article providing evidence for the questionnaire was the "Analytical Study Targeting Optimal Site and Characteristics for a Regional Wet Laboratory Incubator" by ANGLE Technology group. This study evaluated four separate incubators based on demographics, as well as incubator goals. The article concludes that incubators must thoroughly evaluate and consider the size of their facilities based on required lab space and prospective clients. Research of prospective clients is essential for maximizing business opportunities. If an

incubator is attractive to various clients they must be ready to house quality clients at all times. The article also looks into the types of equipment offered to clients. Shared equipment must be leased and provided based on the types of studies conducted in the region. Equipping an incubator with the proper business tools will improve occupancy rate for an incubator. (ANGLE, 2007)

The final study used to support the questionnaire was "Internal Capabilities, External Networks, and Performance: a Study on Technology-Based Ventures" by Choonwoo Lee, Kyungmook Lee, and Johannes M. Pennings. The article looks into the internal capabilities and external networks based on the financial and technological investments during the start-up period. This study concludes that the financial and technological investments provided during the beginning periods of operation greatly affect the incubator performance throughout. Quality investments improve the performance of business operations as well as ties to capitol investors. (C. Lee, K. Lee, M. Pennings, 2001)

The article also develops an argument supporting the necessity of sponsorships and relationships with external sources. Incubators should encourage external partners to commit their resources to the start-up process. By strategically committing external partners to start-up companies performance incubators can greatly increase their chance of success. This also allows clients to form relationships for post-graduation with capitol investors and sponsorship companies. (C. Lee, K. Lee, M. Pennings, 2001)

Benchmarks and Best Practices

Every business hopes to be the best and be a model for others to follow. Developing best practices for life science incubation programs requires a significant amount of information and data from a large number of these incubators, which can be then complied to determine what the

best practices are. But what are best practices? How are these performance measures and practices determined? The following will shed light on these questions.

Best practices are considered to be the best ways of working to reach a business objective. Determining these best practices involves keeping up-to-date with the ways that successful businesses operate and measuring the ways of working against those used by industry leaders. (www.businesslink.gov). That is why it is important to gather information from a large sample that represents an industry. Best practices are also defined as a process that is better at delivering a particular result than any other process. (Bergek and Norman, 2007) Evaluating best practices allows incubation managers to look for ways to enhance their programs' effectiveness and efficiency. (NBIA) With comparative data, incubation managers and presidents can make decisions to improve their programs and operations. These best practices can be developed by benchmarking performance, which allows a business to compare theirs to other businesses in order to highlight areas for improvement. (www.businesslink.gov) Performance usually refers to the goal attainment of an activity or scheme. (Bergek and Norrman, 2007)There are a number performance measures pertaining to facility data, financial data, and client data that incubation programs can measure to determine their best practices. The identification of best practices for incubators requires describing and distinguishing differences in incubators performance in relation to their individual goals. (Bergek and Norrman, 2007) It is essential to ensure that incubator performance aligns with the incubation program goals.

Performance measures and best practices can be determined by enabling an in depth analysis of an incubator. Gathering such data can be accomplished through methods such as our team's questionnaire. A number of categories relative to an incubator performance include selection information such as criteria for selecting clients and where clients are drawn from;

infrastructure information such as the facility data, localities, space allocation efficiency and administrative services; business support such as coaching/training activities to develop clients; mediation of clients in regards to how their businesses relate to their markets; and graduation information such graduation policies, graduation rates and graduate success. (Bergek and Norrman, 2007) NBIA's periodic reports about the business incubation industry also provide vital information for incubation programs regarding comparative data that is categorized similarly. The measures NBIA reports are a considered to be the most notable best practices since NBIA is the one of the most credible business incubation organizations in the world. Developing best practices by analyzing an incubation programs performance measures in each category and then comparing those findings to the incubator's goals or strategic plan and other industry benchmarks is the most effective method for accomplishing this.

Business incubation performance is also measured on their clients' growth and financial performance when the leave the incubation program. Clients leaving an incubator may be due to graduation or failure to meet incubation program graduation policy criteria. A successful incubation program will have a significant number of clients who are surviving and profitably and those who are surviving, growing, and on the path to profitability. (Dilts and Hackett, 2004) Less successful incubators will have a number of clients who may be surviving but not growing and not profitable or were terminated while still in the incubation program and suffered minimal or large losses when they exited the incubator. (Dilts and Hackett, 2004) Our questionnaire inquires about the factors that determine incubator performance in regards to client success such as incubation program graduation policies, graduation rates, and graduate client success after graduation.

Also in regards to client success reflecting upon incubator success, Dilts and Hackett discuss the importance of selection criteria when choosing which prospective clients are accepted into the incubation program. A successful incubation program's acceptance criteria should be based upon managerial characteristics, market characteristics, product characteristics, and financial characteristics. (Dilts and Hackett, 2004) Managerial characteristics refer to the employment experience and technical expertise of the applicant's management team. Market characteristics refer to the properties of the market the applicant is entering and the market potential. Product characteristics refer to the properties of the product the prospective client's hopes to commercialize. The financial characteristics refer to the profit potential of the applicant and their required investment. These acceptance criteria Dilts and Hackett elaborate on support those our questionnaire question asking our participants to score in regards to importance when accepting prospective clients. Incubation programs with high standards for accepting clients create value when selecting quality clients that have greater potential for success and rejecting prospective clients with lesser credentials and less potential for becoming successful.

Our team used the article "Assessing and Managing the University Technology Business Incubator: An Integrative Framework" by, Sarfraz A. Mian to research the criteria used to asses business incubators. This article develops a framework for evaluating and managing technology based incubators affiliated with universities. The study proposes a structure for assessment drawn from knowledge of business incubation, university involvement in business development support, and commonly accepted ways of building an integrative framework. (Mian, 1997)

The article determines that the model must consist of three performance dimensions: program sustainability and growth, tenant firm's survival and growth, and contribution to the sponsoring university's mission. More specifically, this article concludes that by integrating

expected performance outcomes, the degree of consistency in management polices with program objectives, and scope of the available services and their perceived value added within the framework will improve the effectiveness of the incubator and the success of their clients. By adopting this framework, incubators asses and direct tenant projects properly. (Mian, 1997)

Using the article, "Linking Incubator Services to the Performance of Incubator Firms: A Review," authored by Hongwei Wang, Dechang Lin, Hong Yin, Qiang Lu, and Haiqing Cheng, our team researched how a business incubator is properly run. The article discusses the importance of incubators providing innovative services to clients who will improve both the incubators performance as well as the tenant. By having quality services, it will increase the firms' survival rate and their growth rate. The authors break down the services into infrastructure support, access to financial resources, and access to networks. When analyzing business performance, the authors defined New Venture Performance as a function of four variables. They used an equation NVP = f (E,IS,S,R), to explain their arguments. E represents venture team, IS represents industry strength, S represents strategy, and R represents venture resource. Because most research on the industry has been broad, they hope to fill the gap by linking incubation services and incubation performance, and then concluding with several propositions.

Because MBI is directly linked to WPI, our team felt it was necessary to examine relationships between incubators and universities. The article "A Strategy for Developing New Research/Technology-Based Firms" by, Sarfaz A. Mian describes the importance of the relationship for promoting the development of new research based –firms. This article thoroughly examines the role played by universities in providing a nurturing environment for the

survival and growth of incubated firms. In doing this, several management policies and value-added aspects are determined for universities to support new research firms. (Mian, 1996)

It is concluded that the strong relationships between universities and business incubators are a viable strategy for providing a quality research environment and effectively assists in the development of research firms. Sponsorships from universities help to develop strong objectives, firm management practices, and determine necessary services to add value within the incubator. In doing this, incubators are able to develop a set of criteria when considering new research firms as well as performance checkpoints for incubated clients. The article also concludes that this university linkage plays a large part in supporting the critical elements to nurture business incubators. Overall, the development of sponsored relationships between university and businesses incubators allows for strong financial sustainability and quality research environments for new and existing firms. (Mian, 1996)

Conclusion

Understanding the background information related to the project objectives allowed our team to construct a methodology that would effectively produce quality aggregate performance standards and develop useful benchmarks for the life science industry. Researching life science incubators and specifically the type of research conducted in the facility helped form questions to identify current trends. Obtaining this information helped develop a questionnaire that was relative to all life science incubators.

It was also important to research NBIA to locate previous studies about the performance of life science industry. More specifically, it allowed our team to identify any standards that had been determined previously. Through this research, eight categories were able to be determined

related to incubator performance. By identifying the previous standards, our team was able to form questions within the survey that would relate to these criteria.

A major portion of the research was dedicated to identifying best practices. Understanding the type of business operations that increased incubator performance was essential to creating useful benchmarks. Best practices included current trends within the industry, equipment provided within the facilities and managerial and employment staff for the incubator. Determining the practices that created top tier incubators would illustrate to less successful incubators the necessary business tools to incorporate in their facilities.

When the types of questions asked were determined, it was vital to gather prior studies conducted relating to incubator performance. This allowed our team to know the previous information gathered, but more importantly support the questions being asked within the questionnaire. This research solidified the questions developed because our team was confident that the information being asked was relevant to incubator performance. Not only was the information relevant, but the responses would generate useful results for the industry.

After understanding solidifying the information supporting the questionnaire, our team researched how to successfully implement a survey. Looking into the Tailored Design Method allowed our team to reduce measurement error pertaining to surveys. More importantly, it provided information on how to increase response rate. Through this information, our team developed a method that created incentive for the participants.

Methodology

Introduction

The first project objective is to collect key data on life science incubators and use those aggregate results to examine the performance of MBI. To collect reliable data, our team designed a questionnaire pertaining to eight determined categories: facility, incubation program, incubation services, incubation staff and management, clients, revenue and expenses, client revenue, and background information. (Chen, Ma, Cheng, 2007; Begek and Norman, 2008; Molnar and Kitts, 2008) The second project objective is to analyze the cost structure of MBI and evaluate the profitability of each individual facility.

To construct a quality questionnaire there were certain key factors that our team had to consider. The first was decreasing sampling error, coverage error, and measurement error to obtain accurate and reliable data. (Dillman, 2000). Our team also wanted to increase the response rate and have a high number of respondents. This would allow our aggregate data to reflect a large percentage of the industry. To do this, our team used the Tailored Design Method. The Tailored Design Method is a survey approach that creates trust among respondents as well as perceptions of increased rewards and reduced costs for participating in the survey. (Dillman, 2000) Our team offered no incentive other than the development of key industry standards, with a copy to participants.

There was also careful consideration taken to determine the incubators that would receive the questionnaire. In order to avoid bias, our team ignored reputation and developed qualifications to receive the questionnaire. For the aggregate results to reflect that of the industry the incubator must have clients that exclusively devote their operations to life science. Also, the incubator must have facilities with lab space solely for life science operations. If an incubator

did not meet these criteria it was ruled out of the respondent list. Using these qualifications our team was able to research and select sixty-eight incubators nationwide.

The final step of developing the questionnaire was selecting the proper survey questions. It was important that the questions would lead to results that created quality performance measurements for the industry. The questions had to be applicable to all life science incubators, regardless of rentable space, number of facilities, or number of clients. To begin, our team constructed a framework of questions using a previous questionnaire; "National Business Incubation Study." This survey was constructed in December, 2009 by the University of Michigan's Institute for Research on Labor, Employment and the Economy (IRLEE); the National Business Incubation Association (NBIA); and Cybergroup, Inc., and was intended to identify best practices and develop practical tools to help incubation practitioners monitor individual incubator progress, and evaluate and measure incubator performance. (Molnar, 2009) After developing the framework, our team researched previous life science incubator surveys to ensure that all areas were covered in our questionnaire. From this research, our team was able to eliminate certain questions and add or modify other, but more importantly obtain reliable evidence supporting the questions contained in the survey.

After the proper research was conducted, our team was confident that the questionnaire would develop useful life science performance measurements. These measurements were then used to examine the performance of MBI. Our team then identified several strong performance areas, as well as noted certain industry trends MBI could follow to improve incubator performance.

The second portion of the project analyzed the cost and rent structure of MBI, and evaluated the profitability of each individual facility. By accounting for all costs, MBI was able

to compare their current performance to the results of the questionnaire. Comparing performance would help MBI develop tools to improve their incubator performance, as well as evaluate current practices. Also, our team evaluated the facilities individually, rather than as one whole incubator. This illustrated the most profitable areas for each facility, and allowed MBI to reorganize their rent structure to increase profit.

In order to determine the most profitable facility, and compare the cost and rent structure to the industry's performance accurately, our team had to ensure that all costs were considered. This was completed by editing the financial information. Our team researched current costs and made sure they were up to date within the spreadsheets. To complete this properly, our team researched individual costs, recognized overhead charges within facilities, and updated rent fees for MBI. A template was also developed in Microsoft Excel to help MBI update and easily locate individual and total costs. After ensuring that all costs were considered, our team was able to identify areas within each facility that generate high profit, as well as recognize areas for improvement and possibly increase profit.

When the project objectives were complete, it was important to properly link the separate results together. Doing this would represent the final deliverable for MBI. By developing performance standards for the industry our team was able to compare MBI's current practices to that of the industry. This led to recommendations for improving incubator performance, developing useful tools and techniques, as well as identifying the best practices of MBI. Recognizing the performance measures allows MBI, and other life science incubators, to stay consistent with the performance of the industry and maintain profitability for their incubator.

Questionnaire Methodology

Constructing the Questionnaire

Increasing the response rate was an important factor when constructing the questionnaire. It was crucial to obtain a response rate that would allow the aggregate results to represent the performance of the industry. Our team used the Tailored Design Method. The Tailored Design Method allowed for our team to decrease sampling error, coverage error, and measurement error to obtain accurate and reliable data. (Dillman, 2000) Also, our team wanted the respondents to feel the responses were confidential and important to the industry. The TDM included a set of procedures that creates trust among respondents as well as perceptions of increased rewards and reduced costs for participating in the survey. (Dillman, 2000)

Writing the questions properly allowed for each type of error to be minimized. The goal of writing our survey questions was to develop them in such a way that every respondent interpreted it the same, was able to respond accurately, and was willing to answer. (Dillman, 2000) To do this, our team designed the questions so each individual question was applicable to all the incubators being surveyed. In other words, all the material was relevant to the practices of each incubator. Also, our team designed the questions so that the recipients would have a ready-made, accurate answer. One important consideration was the willingness to reveal the requested information. Our team included questions that would create standards for the industry, but not reveal too much information about individual incubator performance. It was important to respect the privacy of the business when constructing the questionnaire. In order to remain consistent with each question, our team followed key principles and applied them to each question: use words, do not be vague, keep it short, be specific, do not talk down to respondents, avoid bias,

avoid objectionable questions, do not be too specific, and avoid hypothetical questions. (Dillman, 2000)

Constructing the questionnaire was also essential to reducing the sampling, coverage, and measurement error. Our team wanted the questionnaire to be easy to complete, understand, and follow. To do this, our team followed several principles while developing the questionnaire. Each question was written in a way that minimized the need to reread portions in order to comprehend the response task. Also, necessary instructions were placed where the information was needed, rather than the beginning of the questionnaire. This allowed the respondents to flow through the survey easily, and receive guidance easily when needed. The beginning of each succeeding question also had to be easily identified by the respondent. (Dillman, 2000) By placing each question on separate web pages it allowed for the respondent to focus on one response at a time.

Implementing the survey properly was the most important part to increase the response rate for the questionnaire. There were a total of four contacts by email, and an additional phone call if needed. The first letter sent to the contacts was a pre-notice letter (APPENDIX B). This email was distributed to all contacts indicating that they will be receiving a survey shortly, and informed the contacts on the purpose of the survey. The second email included a cover letter and the link to the survey (APPENDIX C). The cover letter stressed the importance of the questionnaire to the success of the industry and the performance of individual incubators. The third email sent to the respondents was a thank you letter expressing appreciation for participation in the survey. The fourth letter was a replacement questionnaire (APPENDIX D). This letter was sent to all contacts that had not filled out the questionnaire yet. It emphasized the importance of the response and indicated the response had not yet been received. After all the

proper emails were distributed, a phone call was placed to the contacts that had not yet completed their responses. The phone call allowed our team to understand why the contacts were not completing the questionnaire and potentially increase the response rate by stressing the importance of developing benchmarks for the life science incubation industry. (Dillman, 2000)

Several principles were followed to construct the pre-notice and cover letter properly. The purpose of the pre-notice is to provide a timely notice that the contact will receive a request to help with our study. In order to do this, the letter needed to be brief as well as personalized. It addressed issues that all life science incubators can relate to and was positively worded to emphasize improvement. The pre-notice is intended to build anticipation and stress importance of the survey rather than provide details for participation in the survey. The cover letter stressed all the necessary information in regards to participating in the survey. It included an introductory paragraph about the survey and the issue it relates to. Also, the letter explains why the recipient was selected and explains indirectly that there was no bias when selecting incubators. Most importantly, the cover letter stressed confidentiality. Our team stressed that individual results would not be released and could not be indentified when examining the final results. The last portion of the cover letter was intended to increase participation. It emphasized voluntary participation, but also stated that results would be distributed based on request for individual incubators to track their performance. (Dillman, 2000)

By using the Tailored Design Method our team was able to reduce all types of error associated with the distribution of a questionnaire. Also, following the set of procedures helped improve the response rate. This was necessary in order for the results to reflect the performance of the industry. Our team was also able to implement the survey properly. Adding incentive, emphasizing confidentiality, and stressing the importance of the survey created trust amongst

respondents to participate in the questionnaire. Completing all the necessary steps helped our team obtain useful and reliable data.

Contact Selection and Qualification

Initially, our team received a contact list from NBIA containing contact information for all the life science incubators listed in their membership. This initial contact list from NBIA consisted of the incubators' name, website, location, contact name, and the contact's email. There were 78 listed in the initial spreadsheet. After sitting down with Mr. Kevin O'Sullivan of MBI and reviewing this list, our team had a select group of successful incubators that Mr. O'Sullivan referred as successful incubators and recommended be surveyed. This recommended list was very short and in order to properly survey the industry, and avoid bias, our team researched life science incubators nationwide. By expanding the list through research our team was able to generate a group of contacts that represented the entire life science incubation industry.

To expand the initial list of selected recipients, our team analyzed the entire incubator contact list from NBIA. Originally, our team viewed each individual incubator website and researched the type of businesses within their incubator. Our team looked through information regarding their incubation programs, facilities, and clients. The first analysis was more focused on the clients of each incubator. By viewing the clients and their profiles, our team would have an understanding of what type of companies called the incubator home and whether or not they were indeed a life science incubator. Based on these criteria, a decision was made as to whether or not the incubator was a life science incubator. There are various types of life sciences that companies focus on such as biotechnology, pharmaceuticals, virology, genetics, bioinformatics, medical devices, diagnostics, therapeutics, and biomedical research. The initial qualifications required a large majority of "life sciences" clients to be enrolled in the individual incubator

program and have designated facilities or floors for life sciences clients. The first analysis yielded only 18 incubators that met the requirement, 15 had a majority of life science clients but did not specify facilities or floors designated for life sciences clients, and the remaining 45 were either of no use to the questionnaire because they had no, or very few, life sciences clients, or they were a considered a mixed incubator. A mixed incubator houses clients from different industries. (NBIA, 2010) After the first analysis, our team concluded that the incubators that did not qualify needed a reevaluation and more research needed to be done to discover quality life science incubators outside of the NBIA membership list.

The second analysis was much more in depth and yielded much better results. The qualifications were similar to the first analysis, except the standards were lowered from a "large majority" to a "majority" of clients and sought out incubators with "wet" lab space in their facilities with various life sciences research equipment. After reevaluating the 60 that were initially disqualified, our team found that roughly 20 of these incubators did meet the new requirements criteria. Our team now had 38 qualified recipients from the NBIA list for our questionnaire.

Although this was a reasonable number of potential participants, more incubators needed to be identified to obtain results that would represent industry progress. Knowing that not all incubators are members of NBIA, our team looked elsewhere and continued to add quality incubators to the recipient list. This was the second step of the second analysis. Entering the terms "life sciences incubator", "bioscience incubator", "biotechnology incubator", "medical device incubator", "biotech business development" and other terms synonymous with our target, such as innovation and ventures, into and academic search engines that are part of the WPI Gordon Library electronic research, resulted in many new, qualified incubators for our team to

survey. The new incubators were also analyzed using the same criteria as the NBIA list. After the second analysis was completed, our team had a total of 68 qualified incubators to survey (Appendix A). Being able to identify various life science practices allowed our team to discover numerous of life science incubators nationwide and finalize our contact list.

Once the list was finalized, our team needed to verify and update any contact information. Our intent was to only have contacts who were incubator presidents, CEOs, or directors. This would allow the survey to be directed straight to the person who would be able to best answer the questions and provide the necessary information. More than half of the names and emails were provided within the NBIA list nearly 95 percent of that original information was accurate. The remaining incubators contact information was easily found and updated. Those contacts that were not supplied or added during the second analysis needed to be researched and added to the overall list. This was done by going back to the individual incubator's website and searching the staff and management information or finding other contact information. Finding the appropriate names and emails was easily attainable. Of the 68 incubators on the final list, all but seven had a direct email to the person we sought. Of the seven, an email alias from their websites was used and the survey was distributed to the incubators' general contact.

Developing Survey Questions

To collect relevant key data it was essential to develop a questionnaire that allowed our team to construct performance measures. The questions contained in the survey had to be relevant to all life science incubators, and gather information that reflected the industry (Appendix F). To begin, our team researched several life science incubator surveys. One survey in particular, conducted by the University of Michigan, aimed to identify best practices and develop practical tools to help incubation practitioners monitor individual incubator progress, and evaluate and

measure incubator performance. (Molnar, 2009) This survey was used as an initial framework for our team because the purpose of the survey was very similar to our project objective. By understanding the type of questions asked to help identify best practices our team developed a questionnaire tailored specifically to life science incubator performance.

The "National Business Incubation Study" conducted by the University of Michigan in December, 2009 served as a useful guideline because of the criteria contained within. From the previous study our team was able to develop eight categories related to incubator performance: facility, incubation program, incubation services, incubation staff and management, clients, revenue and expenses, client revenue, and background information.

The questions contained within each category allowed for areas of strength and weakness to be identified within the industry. Questions within the facility section asked about the size of the facilities and number of facilities within the incubator, as well as the amount of leasable space within each facility. This allowed our team to group incubators based on size and number of facilities, and more importantly compare MBI to other like incubators. Questions within the incubation program section were typically about the strategic plan of the incubator and program goals. This section also aimed to identify different graduation policies for clients, average graduation time, as well as necessary criteria for clients to be accepted into the incubator. The incubation services section asked about the various services offered to the clients before, during, and after the client rented space within the incubator. These questions also gathered information about management's involvement with the services and equipment offered to the clients.

The next set of questions pertained to incubation staff and management. These questions gathered information on the number of employees working for the incubator. They also aimed to identify the size of the management team, and recognize an advisory board an individual

incubator may have. Revenue and expense questions examined the types of funding, profit, and expenses for the various incubators. The questions obtained the average revenue, as well as the sources of revenue for the industry. The remaining questions gathered information on the clients as well as general background information. These questions targeted different obstacles for clients, as well as general information about the clients and incubator.

After defining the eight categories, our team researched similar studies to support the questions in our survey. By gathering evidence that supported our questionnaire, our team could confidently distribute the survey and develop performance measures based on the results. A study published in 2002, "Maximizing the Success of Emerging Biotech Companies – The Incubator," looked into the composition of various advisory boards and the influence they had on the success of the incubators. The study concluded that the advisory board needs to be heavily involved in the review of potential clients, the selection of new tenants, and review of clients' progress and ability to meet development standards. (Larabee, 2002) From this research, our team was able to solidify the questions pertaining to incubator programs and graduation standards within the industry.

A second study conducted in 2007 by the ANGLE Technology Group gathered data related to potential incubation sites as well as funding support and operational decision-making regarding the location, size, and management of the incubator .(ANGLE Technology Group, 2007) The information obtained from the study helped develop criteria that would allow our team to evaluate incubators effectively within the industry. More specifically, the research provided evidence for the questions aimed at the allocation of funding, as well as insight to various expenses and revenues.

Our team also researched what defined best practices for an incubator. In 2008, a study conducted by the Department of Management and Engineering at Linkoping University in Linkoping, Sweden, evaluated the performance of incubators in relation to their incubator models rather than incubator outcome. In other words, the study aimed to identify models and strategic goals that increased the success of incubators and their clients. (Bergek, 2008) The information gathered from this study provided evidence for the questions relating to incubator program goals. Our team recognized that having a quality incubator model helped the performance of incubators, and was then able to evaluate the progress of the industry based on the number of incubators with effective models and the type of goals within these models.

The last area our team researched was how to properly analyze and relate the survey results to the industry. A study conducted in 2006 by the University of Science and Technology in Shanghai, China, addresses the issue that most incubators have a lack of knowledge of current business practices. The study analyzes the effect of knowledge deployment and illustrates the advantages of proper knowledge service. From the research conducted, our team was able to portray our results properly to network the performance measures of the life science incubator industry, as well as develop questions that generated useful results. (Chen, Ma, and Chang, 2006) Essentially, this created usable data for individual incubators to recognize best practices and monitor current incubator performance.

The questionnaire was able to be distributed effectively because of the research of previous studies supporting the survey. By constructing a framework and determining categories related to tracking performance, our team created a questionnaire that was able to identify best practices and understand the current industry's progress. Research on previous surveys and studies provided evidence supporting the original questions and gave insight to alternative

methods for measuring incubator performance. The final questionnaire would confidently produce useful results that could be compared to MBI and create performance standards for the industry.

Prospecting Survey Software and Services

Our questionnaire required a number of capabilities for our team and the end participant that would make the questionnaire easy to implement and execute as well as be participant friendly. Our team sought out a survey software or service that would incorporate all features. Specific features consisted of being able to easily enter all questions, provide a wide range of question capabilities and formats, collect and analyze data internally, capable of being saved and continued, distribute easily, and send reminders and thank you notifications upon completion. Having these criteria as the basis of our survey software search, our team researched general, web-based survey service websites such as Surveymonkey.com and Zoomerang.com. After researching these two popular survey services, our team was not satisfied and searched for another option that met our criteria.

After researching both Surveymonkey.com and Zoomerang.com, Professor Banks encouraged our team to contact Dan LeClair from the Association of Advanced Collegiate Schools of Business (AACSB). Professor Banks has participated in several surveys distributed by the AACSB. Mr. LeClair is the current Vice President and Chief Knowledge Officer for the AACSB. Mr. LeClair was initially contacted via email and a phone interview was arranged within a few days. As the phone interview commenced with Mr. LeClair, he asked our team what the purpose of the questionnaire the respondents it targeted. Mr. LeClair then asked what our team was looking for in a survey software or service. The capabilities and functions from above were mentioned and it was noted that Surveymonkey.com and Zoomerang.com did not meet the

software requirements. Mr. LeClair stated that the AACSB had used Surveymonkey.com in the past but became unsatisfied with its performance and looked elsewhere. Our team was then informed of the software the AACSB currently uses. Mr. LeClair stated that the AACSB had been utilizing Qualtrics survey software for a few years and was very satisfied with its functionality and the service support provided by Qualtrics. He also recommended Qualtrics would be perfect for what our team was trying to accomplish and that it would benefit the project to research their software and view their website in order to develop a better understanding of what they have to offer and their capabilities. From the information received during the interview our team decided to look into the Qualtrics software.

Immediately following the telephone interview with Dan LeClair from the AACSB, our team began researching the Qualtrics website. Qualtrics was exactly the type of software needed to successfully launch the survey. It would be able to easily design and enter all questions, provide a wide range of question capabilities and formats, collect and analyze data internally, capable of being saved and continued, distribute easily, and send reminders and thank you notifications upon completion. Qualtrics also provided a number of other capabilities that would make our experience much more efficient than other survey software or services.

After concluding that Qualtrics was the survey software to be used for the survey, our team contacted Professor Banks detailing our interview with Dan LeClair and his recommendations as well as our thoughts on why Qualtrics would be best for our project. Professor Banks then contacted a sales representative from Qualtrics and purchased a Qualtrics license for the WPI Business Department. Along with the purchase came an interactive, online training session with a Qualtrics representative who would explain how to better understand Qualtrics and its survey capabilities. Our team sat in on the online training session via

teleconference and Gotomeeting .com. The Qualtrics representative was very informative and was open to answering any question anyone in attendance had to offer. The representative also provided real examples of how to use the basic features for designing the survey and generating reports for results. Qualtrics also has an impressive video tutorial library on its website for answering practically any question the user might render.

Designing the Survey in Qualtrics

Upon finalizing the hard copy draft of the questionnaire and selecting Qualtrics as the survey software, it was time to actually enter the questionnaire into the Qualtrics design template. This open template allowed the entering questions by copying and pasting them from the Microsoft Word document that the original draft was finalized in and format them in any way needed. This saved a considerable amount of time, but formatting the individual questions with Qualtrics' capabilities was somewhat tedious and repetitive. Overall, the Qualtrics' program was easy to learn and simple to use and accomplished everything to develop the final results.

Qualtrics offers its users a variety of question types and formats for each type when creating a survey. There are 15 types of questions with formats ranging from one to 21 types. Our team only used a few types of question types such as text entry, constant sum, multiple choice, and matrix tables. Text entry questions are rather straightforward where a question is presented and there is a text area for the respondent to enter their response in the form of text. This text area has several options such as single lined, multiple lines, and essay text box, a form, or password. Text entry questions also offer a validation type option, which simply means forcing a response for the specific question in order for the respondent to move to the next question. Other options for text entry questions include no validation, maximum length or content validation. The "no validation" option does not force the respondent to answer the

question. The “maximum length” option sets a maximum length that the response can be such as no more than 25 words. The “content validation” option forces the respondent to only enter a response a certain way such as entering only a number, date, phone number, state, zip code, or text. Constant sum questions display a question and provide response fields that only accept numbers. Once the number of response fields is selected, the user can select the type of response fields (choices, bars or sliders), position of the fields (horizontal or vertical), a total box that sums the responses, validation, or symbols (none, before or after the field) such as “$”,“%”, etc. Multiple choice questions display a question and a number of choices for the respondent to select. Once the number of choices is selected, the user can select the answer type (single answer or multiple answer), the position of the choices (horizontal or vertical), and validation options such as force response. The matrix table questions display a statement describing how the respondents should appropriately complete the matrix. It also displays the statements down the left side and the scale points across the top right with radio buttons below each scale point for each statement thus forming a matrix. Once the number of statements and scale points are selected, the user can select the answer type (single, multiple or dropdown list) and validation options such as forced response. Entering and designing the questions into these question types and formats was very simple and easy to understand.

The response for Question 1 “How many incubation facilities do you manage?” would affect many of the questions following it. First, our team forced content validation. In our case, only a number could be accepted as a valid response; no letters, symbols, or anything else would be accepted by the questionnaire. This response would only accept numbers 1-5. That is because our team knew that the participants would have at least one incubator and no more than 5 incubators based off the research on our selected list of potential participants. Once a valid

response is entered for Question 1, the following questions that inquired about various facilities, client, or financial data would react to that response. This "reaction" is called display logic. Display logic eliminates questions that do not pertain to a certain respondent based on his or her answers (www.qualtrics.com). In a sense, this made the questionnaire "smart" and allowed for a much better questionnaire flow thus saving the respondent time. There are eleven questions that required skip logic based upon the response provided in Question 1. For instance, if "2" is entered for Question 1, those eleven questions would only display two response fields for the two incubator facilities. Since our answer range was 1-5 for Question 1, our team had to implement display logic 4 times for each question that depended on Question 1's response.

Display logic was also used in a number of other questions that did not depend on the answer to question 1. For instance, matrix table questions that listed "other" as a choice would display another question if "other" were selected as the response. If "other" was not selected as the response, the questionnaire would skip to the next question. The same was true for constant sum questions that offered "other" as an option. In this case, if the respondent entered an integer other than zero into "other" field the display logic would then display another question asking the respondent to elaborate on what "other" meant. Other examples of display logic use were in various multiple choice questions that only asked "yes" or "no." If "yes" were selected as the response, another question would be displayed, and if "no" were selected, the questionnaire would move to the next appropriate question.

Sharing the Questionnaire with Other Qualtrics Users

Since each of our team members was assigned separate Qualtrics accounts, only one questionnaire needed to be created because of the "Collaboration" capability. This capability allowed our team to easily share the questionnaire with each other without having to only use

one account, activate or publish it. Under the "My Surveys" tab in our individual Qualtrics' homepages to the right of the questionnaire "Name" and "Responses" sections located in the center of the webpage is the "Tasks" section on the right. This section includes links that allow the user to conduct a variety of survey tasks such as editing, viewing results, sending, previewing, collaborating, copying, and deleting. Selecting the "Collaborate" link enables a pop-up in Qualtrics to appear that includes a text box that allows the user to enter a person's name that has a Qualtrics account and add that person as a survey user. Once a person is added as a user for a survey, the original user can determine the amount of accessibility the other users can have. Accessibility options include editing, viewing results, activating/deactivating the survey, copying, and distributing the survey. Each team member was added as a user and given full accessibility of the questionnaire. Professor Banks was also added as a user but was limited to editing, viewing results, and copying the questionnaire. The "Collaborate" task was completed soon after the questionnaire was created in Qualtrics. This capability also allowed our team members to design and edit different sections of the questionnaire simultaneously from separate accounts since it is saves and updates it in real time.

Reviewing and Testing the Questionnaire in Qualtrics

In order to understand if our questionnaire flowed and functioned in the manner our team wanted it to, the questionnaire was reviewed and tested before activation. Qualtrics allowed our team to accomplish this rather simply. After all the questions were entered into Qualtrics and enhanced with logic and other Qualtrics formatting, our team selected the "Review" task in the "Tasks" section under the "My Survey" tab in Qualtrics. Upon selecting this task, a window popped-up displaying the first question of our questionnaire as our participants would view it. Our team then answered each question appropriately and went back and forth with certain questions that

contained logic and changed the answers in order to determine if the logic was working properly. If there happened to be any issues with logic or the flow of the questionnaire, those questions were fixed to ensure the questionnaire flowed well and functioned properly. The questionnaire was tested several times by each team member and Professor Banks before it was finalized and activated.

Distributing the Questionnaire Pre-notice

Prior to finalizing the survey design in Qualtrics, our team sent the questionnaire pre-notice to all our potential participants. Since our team was not allowed to send a mass email message to our entire potential participant contacts list, by agreement with NBIA, individual emails were sent to all contacts. The contact list was divided equally amongst the team and on March 2, 2010, our team sent personalized pre-notices with the subject "Developing Benchmarks for Life Science Incubators Project" via email to our contacts.

Activating and Distributing the Questionnaire

In order for our team to distribute the questionnaire to our potential participants, the questionnaire needed to be "Activated" in Qualtrics. Launching the questionnaire in Qualtrics simply meant selecting the "Distribute Survey" tab on our questionnaire's homepage in Qualtrics, then selecting the "Activate your survey to collect responses" link located in the center of the page. Upon activating the questionnaire, a unique link for our questionnaire was generated by Qualtrics. This unique link could also be copied and pasted into an email.

Immediately after activating the questionnaire, our team then began to distribute the questionnaire via individual, personalized emails. This was done in a similar fashion to the questionnaire pre-notice emails, except this time, the questionnaire link was inserted in the cover letter and into the email body and included our unique questionnaire link at the end of the cover

letter. Each personalized email included “Developing Benchmarks for Life Science Incubators Questionnaire” as the email subject. Each email was distributed by the team on March 4, 2010.

Formulating and Distributing Reminder Emails

Executing the questionnaire in accordance with TDM required our team to send reminder emails to those who did not respond to the survey after a determined amount of time after the questionnaire was originally distributed. After logging into Qualtrics and determining who had completed the questionnaire, those participants were removed from the reminder email list. Each team member was responsible for the same contacts from the original questionnaire distribution emails. These emails, again, were personalized and contained the same email as the original questionnaire distribution email except with the subject reading “Reminder: Developing Benchmarks for Life Science Incubators Questionnaire.” The first reminder emails were sent 12 days after the questionnaire was distributed.

After waiting a week from when the first reminder emails were distributed, our team then formulated a new email that would be our final reminder sent to our potential participants to complete our questionnaire. Again, our team referenced the Qualtrics account in order to determine who had completed the questionnaire since the first reminder emails were sent. Those who completed the questionnaire were removed from the reminder list of contacts. Our team then formulated a new email that stressed the importance of participating in our questionnaire, explained how much time it would take to complete questionnaire, provided an option to fax the completed questionnaire to the WPI Management Department office, and set a date for when the questionnaire link would be deactivated. The final reminder emails also contained the questionnaire link and were personalized individually in the same manner as previous emails.

The final reminder included the subject reading “Final Reminder: Developing Benchmarks for Life Science Incubators Questionnaire” and were distributed on March 23, 2010.

Follow-up Calls

Prior to closing the questionnaire, our team called each individual contact that had yet to complete our questionnaire. A generic transcript (Appendix E) was then formulated for each call that stressed the importance of our project, asked for participation, and asked for reasons why targeted participants were not completing the questionnaire. Similarly to sending our questionnaire emails, the remaining contacts list was divided equally amongst our team. Since our original contact list only contained individual emails as a way of communication, our team had to research the remaining incubators’ websites in order to find a telephone number for the individuals our team intended to contact, or a general number that connected to a receptionist or administrative assistant that could connect the call to the person completing the survey.

Cost and Rent Structure Analysis Methodology

Working alongside MBI, part of our project was to evaluate their cost/rent structure. Due to MBI having there Board of Directors meeting on March 31st, we had to complete this by then in order for Mr. O’Sullivan to present our findings to them. This included an analysis of all three facilities that belonged on MBI.

After sitting down with Mr. O’Sullivan in our first meeting, our team determined the goals of this project and what he was obtain from our findings. Mr. O’Sullivan informed our team that he was interested in updating MBI’s financial information. The analysis determined how much MBI could potentially charge its tenants compared the amount it is currently charging them.

In order to better understand this information Mr. O'Sullivan gave us access to MBI's financial spreadsheets. The spreadsheet had been put together by a former accountant who is no longer with MBI. Our team would be working alongside with Mr. O'Sullivan and Judy Cocaine, the Manager of Administration. Because this was the first time being presented this information, our team thought it would be beneficial to sit down and understand how the spreadsheet was set up and what the data was trying to show.

MBI wanted us to make sure that each spreadsheet was exactly the same, and displayed the same information. In order to make sure that we were moving at the proper rate to get this project completed, we were in constant communication with Mr. O'Sullivan and Ms. Cocaine. This would be done in one of three ways: our weekly meetings with Kevin, emails throughout the week, or going to MBI during the week to discuss any progress either side has made. Both sides would work on this project throughout the week and when any significant progress was made, the other side was informed of it. Having an idea of what Judy was working on was useful to us because it allowed us to focus our attention on something else or perhaps lend Ms. Cocaine a hand. So, if the progress was made early enough in the week, before our weekly Thursday meetings, we would discuss meeting with Ms. Cocaine on a Monday or Tuesday and discuss the work our group had completed. Throughout the months of January, February, and March we went in a several times to visit Ms. Cocaine on a Tuesday to discuss any work that our group or herself had completed.

By examining and updating MBI's financial information, they were able to present our findings to the Board of Directors on March 31st. Updating the list of tenants along with making sure all three facilities were formatted the same was crucial to our analysis and suggestions. By

working with Mr. O'Sullivan and Ms. Cocaine the new data provided MBI the accurate information they were looking for.

Results

The results chapter of this report pertains to both the questionnaire and the cost and rent analysis findings. Upon deactivating the questionnaire and compiling all the response data, our team exported the data generated in Qualtrics to a Microsoft Excel file for further analysis. This data was calculated into means, medians, ranges, and visuals such as charts and graphs. Fifteen life science incubators of our 68 potential participants from the life science incubation industry responded to our questionnaire. This is a 22 percent response rate. As the respondents progressed through the questionnaire, the number of responses dwindled and eight questionnaires were completed, an 11 percent completion rate. This low response rate and low completion rate from our participants made it possible for outliers to skew the averages and medians calculated that were used to develop the benchmarks (Appendix G). This could also be affected by non-response bias. Had the other 53 life science incubators at least responded to our questionnaire, various metrics would have been more representative of the entire life science incubation industry. After completing our follow-up phone calls, several incubator representatives stated that they did not have enough time to complete the questionnaire because they were too busy. As the following results show, incubators are thinly staffed and certain individuals' time is occupied by business related tasks that prevent them from having the time to complete a somewhat lengthy questionnaire. Other possible reasons for non-response bias may have been ignorance or filtering of emails containing the questionnaire from our team.

Updating and finalizing the cost and rent analysis of Massachusetts Biomedical Initiatives was critical when forming our comparison of MBI and the Life Science Incubator Industry. By revising their spreadsheets, we were able to analyze MBI's performance with other

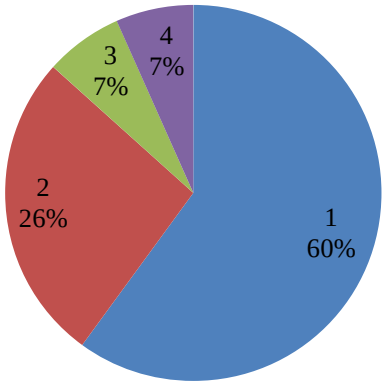
incubators. MBI is able to see where they are in good standing and where they may need to make some adjustments. A one page sheet comparative data sheet was also formed to help MBI show prospective clients their current standing within the life science incubator industry.

Questionnaire Results

Facility and Space Allocation

Number of incubation facilities managed per program (n=15) Life science incubation programs around the United States vary in the number of facilities they operate. Sixty percent of responding incubators reported they manage only one incubation facility, 26 percent reported managing two facilities, another seven percent reported managing three facilities and the remaining seven percent managed four facilities.

Figure 1: Facilities Managed



Facility gross square footage (n=15) The average gross square footage for an incubator facility was 24,068 square feet. The median was 22,000 square feet. The smallest facility was 1,923 square feet and the largest facility reported was 92,000 square feet

Facility leasable space (n=15) The average total leasable space for an incubator facility was 17,656 square feet. The median was 12, 915 square feet per facility. The smallest total leasable space for an incubator facility was 1,923 square feet and the largest total leasable space was 52,000 square feet.

Facility occupancy rates (n=15) For responding incubators, facility occupancy rates averaged 74 percent. The median occupancy rate was 84 percent per facility. Occupancy rates ranged from 10 percent to 100 percent.

Percentage of total leasable space (n=15) The average percentage of total leasable space for an incubator facility was approximately 70 percent. The median percentage of total leasable space is 65 percent. The range for the percentage of leasable space was 40 percent to 100 percent.

Facility Space Allocation Common space consists of hallways, bathrooms, shared equipment rooms, conference rooms, and kitchens. The average percentage of common space (n=12) allocated in a facility is 22 percent. The median percentage of common space was 16 percent. The range for the percentage of common space was 12 percent to 50 percent.

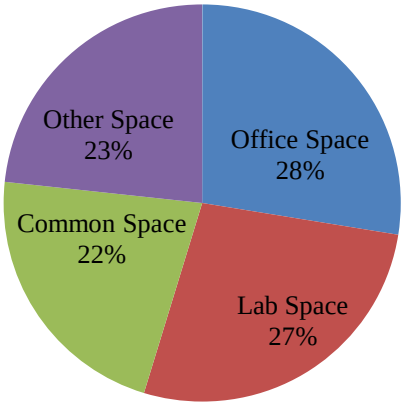
Office space pertains to space that is solely allocated for an office. The average percentage of office space (n=12) allocated for a facility was 28 percent. The median percentage of office space was 15 percent. The range for the percentage of office space was nine percent to 100 percent.

Lab space is simply space in an incubator that is allocated for labs and more specifically in life science incubators, wet labs. Wet labs are labs dedicated to testing and analyzing chemicals, drugs, or biological matter using sophisticated equipment. The average percentage of

lab space (n=12) allocated in an incubator facility was 27 percent. The median percentage of lab space was 34 percent. The range for the percentage of lab space was 10 percent to 80 percent.

Our questionnaire did not ask for "other" space, but since the common, space, and lab space did not total 100 percent, our team categorized the difference as "other" space. "Other" space can be classified as incubator space not used by the clients. "Other" space consisted of 23 percent of allocated facility space.

Figure 2: Facility Space Allocation



Incubation Program

Incubation program goals The participants were asked to score a list of incubation program goals from one to five where one was considered lowest importance and five was considered highest importance. Those answering either four or five for a respective program goal were considered highest importance and those answering one or two for a respective program goal were considered lowest importance. Program goals with the highest importance according to respondents were building or accelerating growth of a business/industrial sector (4.5), and

creating jobs in the community/region (4.5), commercializing technologies (4.4) and fostering the entrepreneurial climate in the community/region (4.4).

Incubation program goals that were somewhat important included diversifying the local/regional economy (3.9), identifying potential spin-in or spin-off business opportunities (3.6), retaining businesses in/attracting firms to the community/region (3.6), generating complementary benefits for the sponsoring organization (3.4) and generating net income for the incubator or sponsoring organization/ founders/investors (3.1).

On the other hand, goals such as encouraging minority entrepreneurship (2.6), “other” goals (2.33), revitalizing a distressed neighborhood (2.3) and moving people from welfare to work (1.9).were considered less important goals. “Other” goals provided by a participant included the development of the workforce that compliments the growing business.

Table 1: Incubation Program Goals

Incubation Program Goal	Mean Score
Building or accelerating growth of a business/industrial sector	4.5
Creating jobs in the community/region	4.5
Commercializing technologies	4.4
Fostering the entrepreneurial climate in the community/region	4.4
Diversifying the local/regional economy	3.9
Identifying potential spin-in or spin-out business opportunities	3.6
Retaining businesses in/attracting firms to the community/region	3.6
Generating complementary benefits for the sponsoring organization	3.4
Generating net income for the incubator or sponsoring organization/founders/investors	3.1
Encouraging minority entrepreneurship	2.6
Other	2.33
Revitalizing a distressed neighborhood	2.3
Moving people from welfare to work	1.9

Incubation program benefits and business support services offered to prospective clients and graduates There are a wide variety of business support services and benefits that incubation programs can offer to their clients before they are enrolled in the program and after they have graduated from the program. Life science incubation programs focus their business support services and benefits on the necessities for operating a business and becoming established.

Responding life science incubation programs listed access to angel investor or networks, access to venture capital investors, help with business basics, help with presentation skills, high

speed-internet access, linkages to high education resources, networking activities among incubation program clients, business management process assistance, customer assessment service, inventory management, linkages to strategic partners, management team identification, marketing assistance, specialized equipment or facilities, and technology commercialization assistance to be the most common business support services and benefits offered to clients These business support services and benefits were offered by more than 75 percent of respondents.

Fifty percent to 74 percent of life science incubators offer assistance with manufacturing practices, processes, and technology, general legal services, help accessing commercial bank loans, helping with accounting or financial management, helping with regulatory compliance, human resources support or training, assistance with product design and development practices, processes, and technology, comprehensive business training programs, intellectual property management, loaned executive to act in management capacity, and shared administrative or office services to their prospective clients and graduates.

Less than 50 percent of respondents offered assistance with e-commerce, helping accessing specialized noncommercial loan funds/loan guarantee programs, help with business etiquette, shadow advisory boards or mentors, economic literacy training, federal procurement assistance, in house investment funds, logistics/distribution support or training, and international trade assistance to their prospective clients and graduates.

Table 2: Types of Benefit and Business Support Services Offered to Prospective Clients and Graduates

Benefit/Business Support Service Offered	Percent of Incubation Programs Offering Benefit/Business Support Service to Prospective Clients and Graduates
Access to angel investors or networks	100%
Access to venture capital investors	100%
Help with business basics	88%
Help with presentation skills	88%
High-speed Internet access	88%
Linkages to higher education resources	88%
Networking activities among incubation program clients	88%
Business management process, customer assessment service, inventory management	75%
Linkages to strategic partners	75%
Management team identification	75%
Marketing assistance	75%
Specialized equipment or facilities	75%
Technology commercialization assistance	75%
Assistance with manufacturing practices, processes, and technology	63%
General legal services	63%
Help accessing commercial bank loans	63%
Help with accounting or financial management	63%
Help with regulatory compliance	63%
Human resources support or training	63%
Assistance with product design and development practices, processes, and technology	50%
Comprehensive business training programs	50%
Intellectual property management	50%
Loaned executive to act in management capacity	50%
Shared administrative or office services	50%
Assistance with e-commerce	38%
Help accessing specialized noncommercial loan funds/loan guarantee programs	38%
Help with business etiquette	38%
Shadow advisory boards or mentors	38%
Economic literacy training	25%
Federal procurement assistance	25%
In-house investment funds	25%
Logistics/distribution support or training	13%
International trade assistance	0%

Shared equipment provided to incubation program clients Shared equipment is the equipment offered to all tenants within the facility for their joint use. The equipment provided is generally related to the types needed for a certain industry. For our questionnaire, the equipment represented was considered necessary for the life science industry. The majority of our respondents offered -80 freezers, analytical balances, autoclaves, DI pure water system, glass washer and an ice machine. However, not many of the respondents offered vacuum ovens, glassware, flammable refrigerator, evaporator, and a dark room.

Table 3: Shared Equipment Offered by Incubation Program

Type of Shared Equipment	Percentage of Incubators Offering Type of Shared Equipment
-80 Freezer (n=8)	62.5%
Analytical balances (n=8)	62.5%
Autoclave (n=8)	62.5%
Centrifuge (n=8)	62.5%
DI pure water system (n=8)	62.5%
Glass washer (n=8)	62.5%
Ice machine (n=8)	62.5%
Hotplate/Stirrer (n=8)	50%
pH meter (n=8)	50%
Hot oven (n=7)	43%
Dry ice chest (n=8)	37.5%
Liquid nitrogen dewar (n=8)	37.5%
Ultracentrifuge (n=8)	37.5%
Thermocycler (n=7)	28.5%
Dark room (n=8)	25%
Flammable refrigerator (n=8)	25%
Glassware(n=8)	25%
Evaporator (n=7)	14%
Vacuum oven (n=7)	14%

Safety equipment/supplies offered to clients in wet labs Wet laboratories are laboratories where chemicals, drugs or other material or biological matter are tested and analyzed requiring water, direct ventilation, and specialized pipe utilities. Such web labs require safety equipment/supplies. Three-quarters of our respondents offered a chemical fume hood with acid and base cabinets and an eyewash/safety shower. Sixty-two percent offered flammable storage cabinets, spill control supplies, and a type IIA biological safety cabinet. To the lone respondent who offered other safety/equipment supplies, that incubation program also provided: GC, GC/MS, HPLC, LC/MS, DSC/TGA, Tablet Press, KF, Freeze dryer, and a clean room.

Table 4: Safety Equipment/Supplied Offered to Clients in Wet Labs

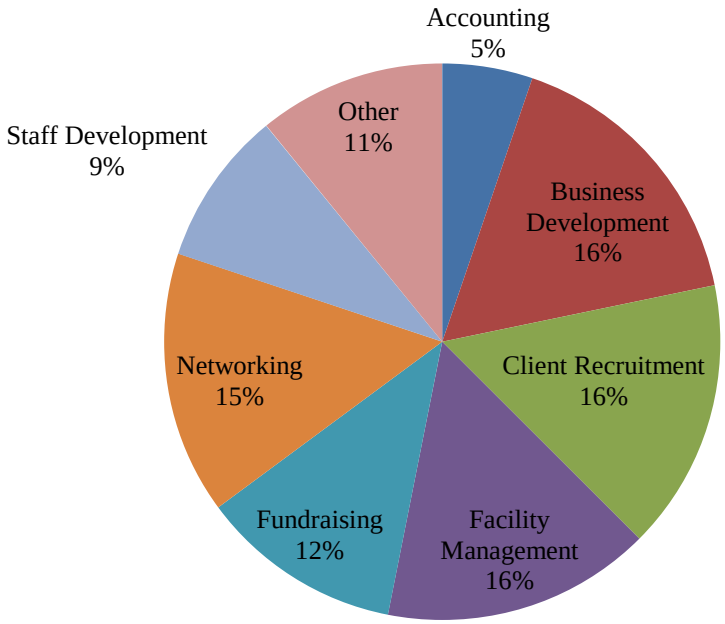
Safety Equipment/Supplies	Percentage of Incubators Offering Safety Equipment to Clients in Wet Labs
Chemical fume hood with acid and base cabinets (n=8)	75%
Eyewash/safety shower (n=8)	75%
Spill control supplies (n=8)	62.5%
Flammable storage cabinet (n=8)	62.5%
Type IIA biological safety cabinet (n=8)	62.5%
Other (n=7)	14%

Incubation Program Management and Staff

Incubation program president's time allocation Being the president of an incubation program, time is often spent handling multiple tasks. Many of these incubators do not have many additional employees. On average our respondents only had 1.5 additional employees besides themselves to assist with a variety of tasks. So, the incubation presidents have to be a jack of all trades, and this is evident in the responses to this question. Of the eight different

categories – Accounting, Business development, client recruitment, facility management, fundraising, networking, staff development and other – all of the percentages fell between nine percent and 16 percent. The only one that did not was accounting, at five percent. Those who responded to having other activities stated they may have to work with their clients, give tours of the facility, laboratory and workforce development, mentor clients, or new program development.

Figure 3: Incubator President's Time Management



Incubator program additional professional staff members (n=8) As stated in the prior question, the average number of additional staff members employed is 1.5. The median number of additional employees was two. The number of additional professional staff members ranged from one to four additional members.

Hours per employee the additional employees work on average per week (n=8) The additional employees on average work 23.13 hours a week. Many of the additional employees do not work a full forty hour work week because their services are not necessary all the time and it helps manage the payroll. The median number of hours worked per week by the additional employees was 35 hours. The number of hours the additional employees worked ranged from 25 to 45 hours per week. This range does not support the average number of hours because some respondents entered "zero" as their response, thus skewing the average.

How often incubator staffs collects information on key business outcomes (n=8) All of the respondents collect key information on key business outcomes either annually or more than once a year. Sixty-two percent of the respondents collected information more than once a year while the other 37 percent collected it annually.

What year was the incubator's strategic plan last revised? (n=8) Strategic planning is an organization's process of defining its strategy, or direction, and making decisions on allocating its resources to pursue this strategy, including its capital and people. It is important to have an updated strategic plan in order to keep the organization running in the right direction and maximizing its potential. Three of the eight respondents last revised in 2010, two of the eight revised in 2009, and the remaining three revised in 2007.

Incubation program advisory board (n=8) An advisory board is a select group of individuals with no legal responsibilities to the firm that offer advice and guidance to the management team of a business. Eighty-seven percent of life science incubation programs have an advisory board offering advice to their management team.

Number of individuals on an advisory board (n=7) On average, incubation programs having an advisory board have 13 individuals on their advisory board. The median number of individuals on an advisory board is 13 individuals. The range of individuals on an advisory board ranged from four to 26 members.

Business professionals on an advisory board Having a diverse group of business professionals on an advisory board offers an incubation management team a number of diverse perspectives that can greatly improve various operations in the incubation program. Having specialized business professionals is very important in the life science incubation industry. All responding incubators had an accountant, biotech drug discovery and development experts, marketing/public relations experts, recruitment/retention/compensation experts, and regulatory affairs experts on their advisory board. Other important individuals on most advisory boards included legal/intellectual property experts (83 percent), venture capital/investment banking experts, and biotech devices technical experts (80 percent) on their advisory boards. Other less important individuals included clinical trial experts (67 percent) and real estate/operations experts (67 percent) on their advisory boards.

Table 5: Types of Business Professionals on Incubation Program Advisory Boards

Business Professional on Advisory Board	Percent Having Business Professional on Advisory Board
Accountant (n=3)	100%
Biotech Drug Discovery & Development Experts (n=6)	100%
Marketing/ Public Relations (n=3)	100%
Recruitment/Retention/Compensation (n=2)	100%
Regulatory Affairs (n=3)	100%
Legal/ Intellectual Property Experts (n=6)	83%
Venture Capital/ Investment Banking (n=6)	83%
Biotech Devices Technical Experts (n=5)	80%
Clinical Trial Experts (n=3)	67%
Real Estate/ Operations (n=3)	67%

Incubation Program Client Acceptance Criteria Selecting clients to participate in an incubation program requires a number of criteria to be considered before a lease is signed. Most incubators have different criteria for accepting clients into their programs. Participating life science incubators were asked to score the importance of the acceptance criteria above from one to five, where one was the lowest importance and five was the highest importance. Responses of four and five were considered as high importance and responses of one or two were considered to be the lowest importance. According to our responding incubators, intellectual property (4.25), market opportunity (4), business model (4) and company development stage (4) scored the highest importance when accepting clients. Other important acceptance criteria included the prospective client's industry application (3.75), financial status (3.63 percent), job creation

potential (3.63), management experience (3.38 percent) and incubator program participation (3.13). The least important acceptance criterion was the prospective client's relationship with a local university/research institute (2.88).

Reporting incubators (n=8) stated that approximately 51 percent of prospective clients were accepted into their incubation program. The lowest acceptance rate was 10 percent, while the highest was 100 percent.

Table 6: Incubation Program Acceptance Criteria

Incubator Program Acceptance Criteria	Mean Score
Intellectual Property	4.25
Market Opportunity	4
Business Model	4
Company Development Stage	4
Industry Application	3.75
Financial Status	3.63
Job Creation	3.63
Management Experience	3.38
Incubator Program Participation	3.13
Local University/Research Institute Relationship	2.88

Incubation Program Clients

Number of client companies per facility (n=8) The average number of clients in a life science incubation facility is six. The median number of clients per facility was 5.5 clients. The number of client companies in a facility ranged from one to 13 per facility.

Affiliate client companies (n=8) Affiliate client companies are clients that lease space in an incubator but do not receive any of the incubation program's services. Sixty-two percent claimed

that they do not have affiliate client companies in their incubation program. Thirty-eight percent said that they did indeed have affiliate client companies. Of those stating that they did have affiliate client companies in their incubation program (n=3), affiliate clients made up approximately 44 percent of their client company base. To counter the general definition of an affiliate client company, those reporting having affiliate client companies (n=3) reported that those affiliate client companies do receive the same services as regular client companies.

Obstacles for incubation programs' client companies (n=8) All businesses, especially new businesses, often face several challenges and obstacles as they develop and grow. The participants were asked to score the obstacles for their clients' experience in the incubation program from one to five where one was considered the smallest obstacle and five being the biggest obstacle. According to respondents, the biggest obstacle for incubation program clients is the lack of financing for the company (4.5). Other significant obstacles for clients are the entrepreneur lacks background or expertise in entrepreneurship (3.38), an incomplete management team (3.38), an inadequate management team (3.38), entrepreneur's unwillingness to accept advice (3.38) and limited access to relevant networks or expertise (3.18). Less significant obstacles included limited market potential (2.88), lack of technology literacy (2.5 percent) and lack of customer acceptance (2.38). The smallest obstacle for clients was the distance from or access to markets (1.88).

Table 7: Types of Obstacles for Incubation Program Clients' Experience

Obstacles for Client Experience	Mean Score
Lack of financing for company	4.5
Entrepreneur lacks background or expertise in entrepreneurship	3.38
Incomplete management team	3.38
Inadequate management team	3.38
Entrepreneur unwilling to accept advice	3.38
Limited access to relevant networks or expertise	3.13
Limited market potential	2.88
Lack of technology literacy	2.5
Lack of customer acceptance	2.38
Distance from or access to markets	1.88

Incubation program client graduation policy Most incubation programs have a client graduation policy with a number of requirements for clients to meet in order to graduate the incubation program. Of the responding life science incubators (n=8), 50 percent have a graduation policy. Of those, 50 percent having a graduation policy (n=4), 50 percent use a formal, written graduation policy (n=2) requiring all clients who meet certain benchmarks to graduate from the incubation program. And of those having a formal, written policy with graduation benchmarks, 100 percent require those who fail to meet those benchmarks to leave the incubation program.

Participants were also asked if there were any circumstances that would permit a client to remain in the incubation program after meeting the graduation policy. Seventy-five percent of responding incubators (n=4) stated that they permit a prolonged stay in the incubation program. Reasons for a prolonged stay in the incubation program included waiting for an opportune time

to make a big announcement about graduation, policies are not made for every industry, and negotiating for new space at the incubator.

On average, responding incubators (n=8) reported that it takes roughly 34 months for a client to graduate from the incubation program. The median number of months for a client to graduate from an incubation program is 36 months. The average fastest time for a client to graduate (n=8) the incubation program was roughly 14 months. The longest time for a client to graduate (n=8) the incubation program was roughly 48 months.

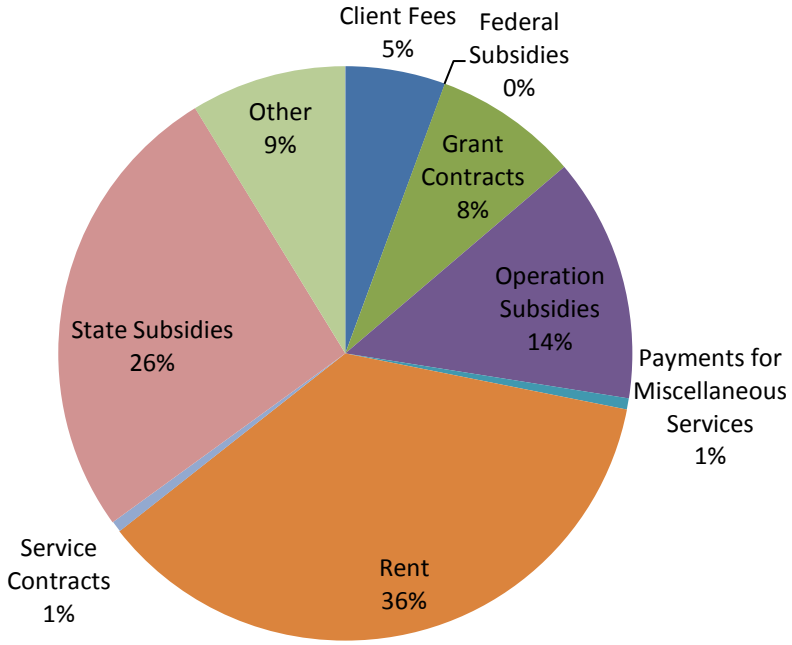
Participants were also asked their client graduation rate from their incubation program. The industry average graduation rate (n=8) was approximately 55 percent. The median graduation rate was 73.5 percent. The lowest reported graduation rate was 15 percent and the highest graduation rate was 100 percent. Also, participants were also asked what percentage of their graduate clients are still in business today. Approximately 57 percent of clients who have graduated are still in business today (n=8).

Incubation Program Finances

Incubation program revenue Incubation programs generate their revenue from a number of different sources. Life science incubation industry respondents (n=8), on average, generate a large majority of their revenue from rent (36 percent) and state subsidies (26 percent). Another significant source of revenue is operation subsidies (14 percent). Less significant sources of revenue include “other” (nine percent), grant contracts (eight percent) and client fees (five percent). “Other” sources of revenue reported were private partnerships. The smallest and least significant sources of revenue include service contracts (one percent), payments for miscellaneous services (one percent) and federal subsidies (zero percent).

The participants were also asked how much revenue their incubators actually generated in the most recent fiscal year. Responding incubation programs (n=10), generated an average of $1.04 million per facility. The median generated revenue was $275,000 per facility. The lowest revenue reported was $25,000 and the highest reported was $14 million.

Figure 4: Incubator Revenue Source



Incubation program tax status The tax status of an incubator generally determines if it is eligible to receive government benefits such as subsidies. Eighty-seven percent of responding incubators (n=8) reported that their incubation program is non-profit.

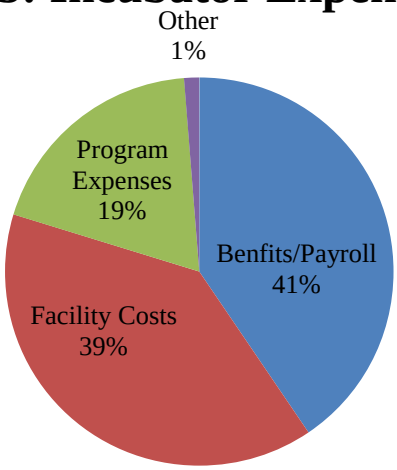
Incubation program subsidy benefit A subsidy is a source of financial assistance paid to a business that is generally not for profit and benefits a certain area/region or industry in regards to economic development or improvement. Subsidies are generally provided to business from

various forms of government such as local government, state government or the federal government or private institutions. According to respondents (n=8), 62 percent of life science incubators benefit from a subsidy of some sort. Of those benefitting from a subsidy (n=5), the source of the subsidy was reported to be from the city government, state government or university. Those with a subsidy were then asked if their subsidy had ever expired. Sixty-seven percent of those with subsidies (n=3) had never had a subsidy expire.

Incubation program equity policy (n=9) Equity is equal to total assets less total liabilities. Twenty-two percent of our respondents stated that they claim a stake in their client's equity. Of the two respondents who responded yes, they claimed 50 percent of their client's equity. On the other hand, 78 percent of the respondents did not claim any of their tenant's equity.

Incubation program expenses Operating an incubation program, like any other business, requires a substantial budget in order to cover a variety of expenses. Responding life science incubators (n=8) reported having an average of $473,000 in expenses per facility. The median expenses per facility are $300,000. The lowest amount of expenses reported was $84,000 and the highest was $1.3 million. After reporting their expenses, respondents were asked to report the sources of their expenses and the percentage each expense was responsible for in regards to their total expenses per facility. 88 of reporting incubators' (n=8) expenses were generated through benefits/payroll (41 percent) and facility costs (39 percent). Nineteen percent of the expenses were delegated to the incubation program. One percent was dedicated to "other" expenses such as advertising, travel, and indirect expenses.

Figure 5: Incubator Expense Data

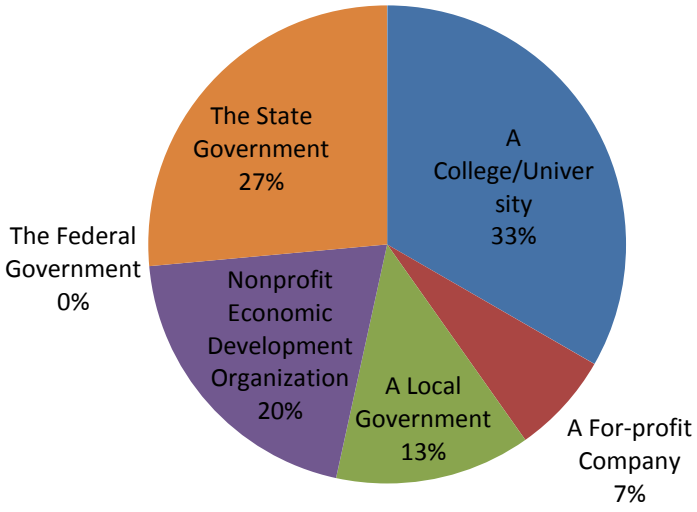


Incubation Program Background Information

NBIA Membership Seventy-five percent of responding incubators (n=8) stated that their incubator was a member of the National Business Incubation Association (NBIA).

Incubator sponsorship The highest percentage of incubation sponsorship came from the College/University sector at 33 percent. This is partially due to the opportunity it gives Universities the opportunity to commercialize technologies in labs, provide students with hands-on experience, and promotes business development in their community. Following College/ Universities was the State Government and Nonprofit Economic Development Organizations, 27 and 20 percent, respectively. The Local Government and For-profit companies wrapped up the remaining 20 percent. The Federal Government received zero percent sponsorship.

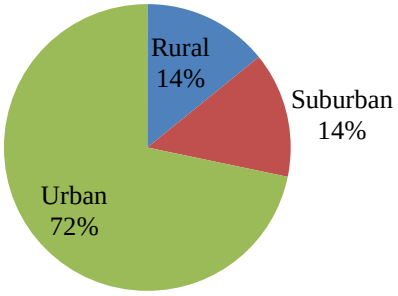
Figure 6: Incubator Sponsorship



Incubator focus: Biotechnology, Bioinformatics, Medical Device, or All Within the Life Science Incubation Industry there are four main sectors that programs will focus on – Biotechnology, Bioinformatics, Medical Device, or All of the above. The main purpose of this survey was to gather aggregate data for this industry specifically, as there is not much information out available. Sixty-two percent of our respondents stated that their focus falls under Biotechnology, while the remaining 38 percent stated that there focus fell under "All of the above."

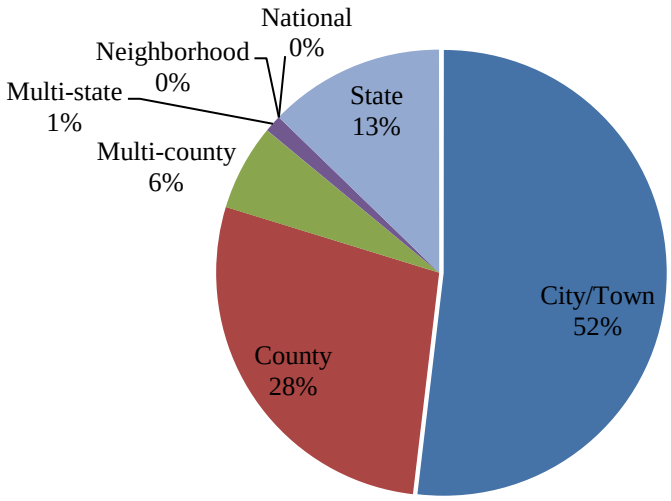
Incubator location As expected, a high number of respondents claimed that their incubation location would be categorized in the urban sector. The urban sector amassed for over 70 percent of our responses. Being in a large city will often have more resources and be closer to the "business world," compared to the rural areas. The remaining 28 percent was split evenly by suburban and rural areas.

Figure 7: Incubator Location



Areas clients are drawn from Many would assume that the location of clients that are drawn to a specific incubation program would be closer rather than further away from the facility. This is evident in the response we received, with 52 percent stating their clientele are drawn from the same city/town. The next largest percentage came from "County," drawing in 28 percent of clientele. The same county would be the next closest in proximity to the specific facility. The remaining clientele was drawn from the State, Multi-county, and Multi-State, 13 percent, six percent, and one percent, respectively. Neighborhood and National both received percentages of zero.

Figure 8: Areas Clients Drawn From



Year incubator began accepting clients Understanding the year different incubator programs began accepting clients was a good way to determine the track record our respondents have. Some have been around for quite some years while others just opened their doors only a few years ago. Thirty-eight percent of our respondents began accepting clients for the first time in between 2004 and 2010. Another 38 percent opened their doors between 1995 and 1998. The remaining 24 percent accepted clients in 1986 and 1990.

Cost and Rent Analysis Results

Updating and finalizing the cost and rent analysis of Massachusetts Biomedical Initiatives was critical when forming our comparison of MBI and the Life Science Incubator Industry. By revising their spreadsheets, we were able to analyze MBI's performance with other incubators. MBI is able to see where they are in good standing and where they may need to make some adjustments. A one page sheet was also formed to help MBI show potential clients some quick numbers.

The cost analysis broke down the rent cost, CAM charges, additional overhead charges, utilities, insurance, health & safety, facilities management, maintenance, cleaning, and parking. This included the total cost, and the total cost per square feet for each facility. Biotech Three had the most expensive rent cost at $202,919.40 followed by Gateway's cost of $90,216.00 and Barber Avenues cost of $85,402.44. The large rent cost at Bio Three accounts for 54 percent of their total cost. On the other hand, Barber Avenue's rent makes up 46 percent of their total cost while Gateways rent accounts only for 34 percent of their total cost. Barber Avenue was the only site who had a utilities cost, while Biotech Three was the only facility with additional overhead charges. The only two costs that were consistent for all three facilities included their health & safety cost, and the facilities management. MBI has the same cost for their Health &Safety cost, as well as their facilities management. The maintenance expenses were fairly similar for Gateway and Barber Avenue, but there was a large discrepancy between these two and Bio Three. The maintenance cost at Bio Three was about half the price compared to Gateway and Barber Avenue. Gateway Park is also home to other companies whom also work inside the building. So, MBI is charged for parking at Gateway, and is the only facility where this cost is accrued.

The latest spreadsheet now holds a summary sheet of the chargeable space and is broken down by location. It displays the total number of labs, and offices as well as their square footage for each facility. Gateway offers 15 labs totaling 3,805 square feet and 8 offices & cubes which total 620 square feet. 22 of the possible 23 spaces are occupied. Barber Avenue has 13 labs and 10 cubicles. The labs account for 4,185 of the total square feet, while the offices & cubes make up 940 square feet. Out of the potential 23 spaces, 21 are being rented. The third facility, Bio Three, offers a much higher number of labs, 22. Between the 22 labs and 15 offices & cubes, 36

of them are being occupied. The labs, and offices & cubes account for 4,185 square feet and 1,789 square feet, respectively.

In addition to the summary sheet for the chargeable space, a tenant prospect data base chart was also added. This incorporated the amount of prospect inquiries, signed leases, and the capture rate. This information dated back to 2007. In 2007, there were 25 prospects that showed interest in MBI and two of them signed leases. The amount of prospect inquiries almost doubled the following year when there were 45 inquiries. Six signed leases for a 13 percent capture rate. In 2009, the number of prospects interested in MBI as an incubator jumped up to 51. Out of the 51 companies who showed interest in MBI, eight of them became tenants.

The total cost per square foot varied at the three separate facilities. Barber Avenue had the lowest cost at $30.37 to keep it operating. Gateway and Biotech Three were slightly more expensive to run; it costs MBI $35.39 and $41.28 per square foot to operate these, respectively. Based on the information from the previous spreadsheet, Barber Avenue's cost has increased almost four dollars from $26.50. On the other hand, Biotech Three costs had dropped almost four dollars from $45.74. Gateway did not have a cost analysis chart completed for their sheet.

By updating the list of tenants and their corresponding labs, it allowed MBI to have their new occupancy rate be performed. Due to a lack of available information on the previous analysis, Barber was the only site that could be compared to a previous figure. Their occupancy rate fell from 95 percent to 91 percent. Gateway Park and Biotech Three were both higher at 97 percent and 97 percent, respectively. Fortunately for MBI, all of those were well above the industry average of 74 percent.

The updated spreadsheet also showed MBI how their common and shared area was being allocated. On the old version there was nothing that detailed this information. Barber Avenue had the highest percentage of space allocated towards common and shared area. This includes Electrical closets, Dark rooms, Men's/Women's room, kitchen, and corridors. Both Gateway and Biotech Three had much less of their space assigned to common and shared area. This space was limited to corridors, and glass wash rooms.

A one-page comparative data analysis was also used to distinguish where MBI stacked up tothe rest of the Life Science Incubation Industry. The one-page analysis was a side-by-side comparison for MBI. It displayed nine different topics that were felt to distinguish the current standing of a life science incubator. The nine topics included: number of incubators, revenue data, client data, budget data, average facility size, graduate companies, employees per incubator facility, occupancy rate and incubator common area. The analysis will be presented at the Board of Directors meeting in the fall of 2010.

Updating MBI's cost and rent structure allowed for an analysis of the three different facilities and where they each stood financially. By adding new charts and tables MBI is able to examine important information much easier. All of the data that are displayed on one spreadsheet now are present on the other two.

Recommendations

After developing benchmarks for the life science incubator industry, our team performed a SWOT analysis of MBI and compared their current performance to the progress of the industry. By identifying strengths, weaknesses, opportunities, and threats, our team was able to make several recommendations to improve incubator performance in the future. Also, our team incorporated the progression of MBI's strategic plan into the suggested recommendations. Integrating the strategic plan allowed for prominent strengths to be distinguished and recommendations to be prioritized properly.

Once the life science incubator industry benchmarks were developed MBI's data was compared to the aggregate result. Areas where MBI was well above the industry average were considered strengths. On the other hand, areas where MBI fell behind the industry average were recorded as weaknesses. Opportunities and threats were determined based on the current incubation program, the strategic plan and program goals, and relating prior research to MBI's data.

Strengths When the benchmarks were created, it was evident that Massachusetts MBI is a top tier incubator. Strengths were present across multiple categories. The first strength identified was the high percentage of lab space compared to other incubators in the industry. The average percentage of lab space for overall incubators was twenty-seven percent, compared to MBI at forty-nine percent. This shows that MBI's incubators are more tailored towards client research and the development of life science. The second strength is the occupancy rate. MBI is able to fill eighty-nine percent of their leasable space compared to the industry average of seventy-four percent. By filling more incubator space MBI is able to generate more rent, which is fifty

percent of their revenue source. Also, the high occupancy rate reflects a high client demand for space.

The third strength is the free pre- and post services offered to potential and graduated clients, respectively. MBI offered all services free to both types of clients while the industry fails to do so. This creates an attraction to draw in more clients to MBI and strengthens the relationship with graduated clients. MBI is able to assist graduate clients with business to help companies stay in business. These services went hand-in-hand with the shared and safety equipment offered. While most incubators only offered a select type of equipment MBI offers all necessary equipment pertaining to life science research and safety.

The fourth, fifth, and sixth strength all relate to client acceptance and success. The industry accepts fifty-one percent of clients on average, while MBI only accepts sixteen percent. This strength is represented directly by the graduation rate. On average, the industry graduates fifty-five percent of their clients compared to MBI's graduation rate of seventy-six percent. The low acceptance rate illustrates that MBI thoroughly evaluates potential clients to ensure that quality companies are accepted into the incubator. Also, the quality of MBI's clients is represented by the percentage of clients still in business. The industry average is fifty-six percent while seventy-six percent of MBI's clients are still in business.

The last strength identified was the advisory board. MBI's advisory board consists of twenty-six individuals, where as the industry average consists of thirteen members. By having more members, MBI is able to allocate specialists to various areas of business and diversify their strategic plan. This shows that MBI recognizes all areas of business and understands the proper methods to operate effectively, efficiently, and profitably.

Weaknesses Although, MBI is a top tier incubator, there are still several weaknesses. The first weakness identified is the size of their incubators. Compared to the industry average MBI is almost three times smaller. Incubators nationwide average facility size of 24,068 square feet, while MBI's average facility size is 8,268 square feet. Smaller facility size results in a loss of prospective clients to competitors and missed opportunity of future business.

The second weakness is the lack of graduation policy. Although the industry for incubators with graduation policies is fifty percent, our team's research emphasizes the importance of incorporating a graduation policy. MBI currently has a high graduation rate, but by including a graduation policy clients will be able to recognize graduation requirements. A policy will develop a solidified rubric allowing clients to understand where they are within the graduation process.

The final weakness identified is the need for more sponsorship's through collegiate relations. Sponsorships do not only include grants and discounted rents, but the ability to attract prospective clients. Through WPI, MBI may be able to create relationships with accredited life science companies. Failure to further develop these sponsorships will result in loss of potential clients.

Opportunities By following certain trends or including alternative practices, MBI could improve their incubator performance. The primary opportunity is increasing incubator space. This is illustrated when comparing MBI's facility size to that of the industry. The average incubator space for the industry is 24,068 square feet, compared to MBI's average facility size of 8,268 square feet. Because of the high occupancy MBI is able to maintain, our team feels that by increasing the size of the three facilities MBI will be able to move more clients through their

incubator and increase the number of successful incubators graduated into the life science industry

The second and last opportunity recognized involves the current low market potential for client. MBI's response to the questionnaire informed our team that the market opportunity for clients is a large obstacle currently. If MBI is able to place more emphasis on perspective client….evaluating perspective clients placing more emphasis on market opportunity lower obstacle and

Threats Our team also recognized several threats for MBI. The first threat is the high costs of the Biotech facility. The facility is much more expensive to operate than Gateway and Barber, and generates lower revenue because of these costs. Failure to reduce costs or find alternative means of revenue may reduce MBI's ability and opportunity to invest in new business practices, as well as purchase or lease equipment that could improve incubator performance. Proper funding for research and development will allow for opportune growth and solidify MBI as a top tier incubator.

Another threat is the low acceptance rate of clients for MBI. On average, the industry acceptance rate is fifty-one percent, compared to MBI's acceptance rate of only sixteen percent. MBI accepts quality clients, but as new life science companies emerge potential business clients could be lost to alternative incubators. By rejecting a high percentage of clients, MBI limits their ability to fill all leasable space and misses out on business opportunities.

The last threat is related to the acceptance rate. As the life science industry continues to grow new, "false, unqualified incubators will begin to arise. "False" refers to incubators that offer leasable space but do not provide the proper equipment and services to effectively conduct life science research. MBI has been able to promote their incubator properly, but could benefit

by emphasizing the lack of equipment and services in arising incubators. Failure to make this distinction may result in a loss of clients and lowered occupancy rate due to a false appearance that a cheaper alternative will support potential clients

Additional Recommendations In addition to the SWOT analysis, our team developed recommendations pertaining to the financial information. Currently, MBI uses Microsoft Excel to record their financial information. Our team looked into several alternatives that MBI could easily update and monitor the cost and rent information using the Dashboard option within excel. Dashboard manages the information easier and generates charts and graphs that illustrate high areas of cost or income.

The final recommendation is to incorporate required quarterly updates by a fulltime accountant. The financial information was not originally up-to-date and did not have information about recently accepted or graduated clients. By updating the financial information regularly, MBI will be able to compare their performance to the industry easily and maintain a quality rent and cost structure.

By developing benchmarks for the life science industry, our team was able to recognize the strengths, weaknesses, opportunities, and threats for Massachusetts Biomedical Initiatives. Prioritizing business practices based on identified strengths and altering methods to minimize and avoid weakness will coagulate MBI as a top tier incubator. Knowing various opportunities and threats will allow MBI to gain a competitive advantage within the industry and over competing incubators.

Conclusions

Limitations A large portion of the results depended on the response rate, which was 22 percent. This percentage reflects the number of participants (15) who answered a portion of the questions, but only eight completed the full survey. Our team concluded that this was due to a number of limitations.

The first limitation was the design of the survey. Our team placed the majority of the questions on separate web pages. This created a psychological effect on the user that the survey was much longer than it actually was because the respondents could only answer one question at a time rather than answering several questions on one page. This resulted in much higher waiting time between questions and made the survey much more inconsistent. Our team concluded that this limitation was due to the fact that the number of respondents diminished as the survey neared completion.

Another limitation was due to the fact that there were other surveys distributed through the industry during the same time period as ours. This created competition between our questionnaire and other similar studies. Multiple prospective participants emphasized that they received similar surveys and found completing a second survey to be redundant. Because the life science incubation industry is so new, multiple researchers are trying to develop aggregate results to improve their performance.

The third limitation was extreme outliers which skewed our team's developed benchmarks, specifically those pertaining to financial and facility data. The outliers were due in part to the low response rate. Had more incubators completed the survey, the developed benchmarks would have been more representative of the life science incubation as a whole, thus reducing the impact

of outliers. The next several limitations were related directly to our team. The fourth limitation was our interpreted credibility. Although the pre-notice and cover letter emphasized association with Worcester Polytechnic Institute, including an affiliation with MBI would have possibly strengthened our credibility. Even further, having sponsorship from a renowned organization, such as NBIA or the U.S. Government, would validate our questionnaire to a greater extent.

The fifth limitation was the inability to obtain complete contact information. Because our team had to research incubators with limited resources, a small number of contacts had incorrect or indirect information. Prospective participants with incorrect information were fully unable to be contacted and could not receive the survey. Incubators with indirect information were able to be reached, but a credible respondent could not be reached.

The final limitation was related to the use of the TDM in regards to the e-mail distribution. Although the TDM is an accredited survey distribution method and revised in 2000 to include electronic surveys, e-mail was not an adopted means of communication as it is today. Thus, the TDM did not account for high amounts of spam and e-mail filters and as a result the survey may have been overlooked or never received. Also, recurring and reminder e-mails can become of annoyance to recipients.

State of the Industry Based on our results, our team was also able to conclude the life science incubation industry is still emerging, but growing rapidly. This is represented by the low graduation rate and the high percentage of incubators with one facility. The low graduation rate illustrates that the majority of incubators house clients that have recently been accepted. This is supported by the consistent percentage of clients still in business today. A high percentage of incubators with only one facility reflect that the life science incubator industry is still emerging,

but the high occupancy rate across all incubators illustrates the rapid growth. In other words, incubators have not needed to expand, but are increasingly attracting clients.

The lack of consistent acceptance criteria across the industry also represents that the industry is still emerging. Life science incubators have been unable to determine solidified measurements to decide if clients will benefit their facility. As the industry continues to grow, acceptance criteria will become more evident allowing incubators to accept quality clients and increase their graduation rate.

MBI According to our developed benchmarks, our team was able to conclude that MBI is a top-tier life science incubator. When reviewing our recommendations the strengths and opportunities greatly outweighed the weaknesses and threats. The significance of the strengths was much higher than the weaknesses when evaluating incubator performance. This means that MBI's strengths affect their operations much more than their weaknesses.

When looking back at the state of the industry, our team concludes that MBI could be used as an example for best practices. It is evident that compared to the progress of the industry MBI is clearly ahead. MBI has been able to maintain a high occupancy rate while expanding from one facility to three. Also, the noticeably higher graduation rate reflects the quality of acceptance criteria when determining clients they accept. In addition to quality clients, MBI provides supportive services and necessary equipment for clients within their facilities. This enables clients to maximize potential research capabilities and easily continue business after graduation.

Future Suggestions Overall the project involved limitations when obtaining the data our team was looking for. Our team experienced low participation which resulted in a low response rate. In general the response rate was reflective of our whole project and resulted in performance

measurements that represented only a portion of the whole industry. Although the response rate was low it is evident that the industry is growing and that MBI is ahead of the curve.

By improving our project, MBI will be able to continue to track their performance within the industry and remain a top-tier incubator. Here we offer a few suggestions to help MBI and future projects collect key data. Shortening the survey would make it easier on respondents and allow the survey software to be more user- friendly. In addition, the questions contained within the survey would be more concise and relevant to developing benchmarks. Utilizing MBI's integrity would involve their association with NBIA and their reputation as an industry leader to improve the students' credibility. This would also allow for relationships to be formed with various incubators and increase the sense of importance for the project.

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Appendix A: Questionnaire Contact List

Life Science Incubator	City	State
AB Tech	Candler	NC
Accelerator	Seattle	WA
Accuitive Medical Ventures	Duluth	GA
Akron Global Business Accelerator	Akron	OH
Arizona Center for Innovation	Tucson	AZ
Austin Technology Incubator-Bioscience	Austin	TX
Bay Innovation Group	Jamaica Plain	MA
BioSquare at Boston University Medical Ctr	Boston	MA
BIOSTART	Cincinnati	OH
Boston University Business Incubator	Boston	MA
Business Technology Development Center Inc	Huntsville	AL
Cambridge Innovation Center	Cambridge	MA
Central Michigan University Research Corporation	Mount Pleasant	MI
Chicago Technology Park	Chicago	IL
Cumberland Emerging Technologies	Nashville	TN
Delaware Technology Park Inc	Newark	DE
Downstate Biotechnology Incubator	Brooklyn	NY
Emergence Venture Partners, LLC	Berkely	CA
Fitzsimons BioBusiness Incubator	Aurora	CO
Georgia BioBusiness Center	Athens	GA
GSU CollabTech		GA
Hammond INnovation Center	Hammond	IN
Innovation Depot	Birmingham	AL
Institute for Industrial & Applied Life Sciences	St Joseph	MO
Kansas University Medical Ctr Research Inst	Kansas City	KS
Life Sciences Business Dev Ctr	Augusta	GA
LIMR Biotech Incubator	Winnewood	PA
Massachusetts Biomedical Initiatives	Worcester	MA
Memphis Bioworks Foundation	Memphis	TN
Missouri Innovation Center Inc	Columbia	MO
Momentum Bioscience, LLC	Culver City	CA
NanoRite Innovation Center	Eau Claire	WI
New Orleans BioInnovation Center Inc	New Orleans	LA
North Texas Enterprise Center for Medical Tech	Frisco	TX
Oakdale Research Park	Coralville	IA
Pennsylvania Biotechnology Center of Bucks County	Doylestown	PA
Pittsburgh Life Sciences Incubator	Pittsburgh	PA
Purdue Technology Centers of West Lafayette	West Lafayette	IN
QB3 Garage	San Francisco	CA
BioGenerator	St. Louis	MO
Rochester BioVenture Center	Rochester	NY

Rocky Mountain Innovation Initiative	Fort Collins	CO
San Diego Science Center	San Diego	CA
San Jose BioCenter	SanJose	CA
SATAI Network	San Antonio	TX
Seedling Enterprises, INC.	Newton	MA
Sid Martin Biotechnology Incubation Program	Gainsville	FL
South Carolina Biotechnology Incubation Program	Greenwood	SC
Southwest Michigan Innovation Center	Kalamazoo	MI
Split Rock Partners		
TechColumbus	Columbus	OH
The Vertical Group	Summit	NJ
U of Buffalo Biomedical Incubator	Buffalo	NY
UAMS Arkansas BioVentures	Little Rock	AR
University City Science Center	Philadelphia	PA
University Enterprise Laboratories	Minneapolis	MN
University of Iowa Research Park BioVentures Center	Coralville	IA
UT-Baptist Research Park	Memphis	TN
Virginia Biosciences Development Center	Richmond	VA
VT KnowledgeWorks	Blacksburg	VA
TechFortWorth Incubator	Fort Worth	TX
Emerging Technology Centers	Baltimore	MD
QBIC	Quebec	QB
UCF Business Incubator	Orlando	FL
Center for Emerging Technologies	St. Lois	MO
Nidus Center for Scientific Enterprise	St. Louis	MO
University Technology Park at IIT	Chicago	IL
Indiana University Emerging technologies Center	Indianapolis	IN

Appendix B: Pre-Notice

March, 2010

Dear _____:

Executives in most industries make extensive use of comparative data for their industry to help them refine their operations and make strategic decisions. Unfortunately, such data do not exist for incubators that have life science operations. Yet executives of several incubators have indicated that they want that information. We have constructed a questionnaire to address this problem.

Your incubator is one of a select group of incubators throughout the U.S. that have life science operations that we have approached to help with this effort. Within three days you will receive another email message from us with a link to an easy-to-use online questionnaire. We shall analyze the data from completed questionnaires, and aggregate the results to create industry standards. As encouragement to participate, we shall make those aggregate data available to each incubator executive who completes the questionnaire. Note that data for individual incubators will not be made public and will only be used for research purposes. However, so that the results truly represent the industry, it is important for each questionnaire to be completed.

For your reference, we are senior undergraduate students in the business school at Worcester Polytechnic Institute (WPI), located in Worcester, Massachusetts. The project represents a significant part of our senior thesis, called the MQP. We are working under the direction of a nationally known scholar of entrepreneurship, Professor McRae C. Banks, who is also the head of the business school. Should you have any questions about our questionnaire or

our project, you may email us at mbimqp10@wpi.edu; the message will come to each of us, including Professor Banks. Alternatively you may call Professor Banks at 508.831.5965.

Thank you in advance for your time and consideration. Your willingness to participate will be of immense help to the life science incubator industry.

Sincerely,

Christopher Boudreau
David Kulis
Joseph Pitkin

Appendix C: Cover Letter

March, 2010

Dear _____:

Executives in most industries make extensive use of comparative data for their industry to help them refine their operations and make strategic decisions. Unfortunately, such data do not exist for incubators that have life science operations. Yet executives of several incubators have indicated that they want that information. We have constructed a questionnaire to address this problem.

Your incubator is one of a select group of incubators throughout the U.S. that have life science operations that we have approached to help with this effort. The completed questionnaires will permit us to create industry standards. As encouragement to participate, we shall make those aggregate data available to each incubator executive who completes the questionnaire. Note that data for individual incubators will not be made public and will only be used for research purposes. However, so that the results truly represent the industry, it is important for each questionnaire to be completed.

If you have any questions or concerns about the questionnaire or the project, please contact our team at mbimqp10@wpi.edu. Thank you for your time and consideration in completing the survey.

The link to the survey is provided below:

http://wpi.qualtrics.com/SE?SID=SV_6Vea4DOqAenQSfG&SVID=Prod

Sincerely,

Joseph Pitkin
Christopher Boudreau
David Kulis

Appendix D: Final Reminder Emails

March 2010

Dear _____,

Executives in most industries make extensive use of comparative data for their industry to help them refine their operations and make strategic decisions. Unfortunately, such data do not exist for incubators that have life science operations. Yet executives of several incubators have indicated that they want that information. Our team has constructed a questionnaire aiming to obtain this data.

Our team has previously sent you an email containing the link to the questionnaire. In order for the results to fully represent the industry, as well as benefit your incubator, it is important that the questionnaire is completed. Completing the questionnaire takes fifteen to twenty minutes, and can be saved and continued if the information required is not readily available.

It has come to our attention that the questionnaire can be printed. If it is easier to answer the questions this way, our team is willing to enter the data into the questionnaire if you fax the results to (508)-831-5720.

Your response is highly important to understanding the importance of the industry. In order to receive these results, please complete the questionnaire. The results will benefit the performance of life science incubators nationwide. The questionnaire will be deactivated Wednesday, March 31, 2010 at 9pm.

If you have any questions or concerns about the questionnaire or the project, please contact our team at mbimqp10@wpi.edu. Thank you for your time and consideration in completing the survey.

The link to the questionnaire is provided below:

http://wpi.qualtrics.com/SE?SID=SV_6Vea4DOqAenQSfG&SVID=Prod

Sincerely,

Christopher Boudreau

David Kulis

Joseph Pitkin

Appendix E: Follow-up Call Script

Hello,

I am _____, a student from Worcester Polytechnic Institute. I would like to speak with _____. Is _____ available?

(If not available)...Could you please tell me when _____ will be available? (Return call at that time)
#1. (If available)...I have recently contacted you via email about participating in a questionnaire that will greatly benefit the Life Science Incubation industry by developing benchmarks for best practices and providing important comparative data for all life science incubator managers. This questionnaire will gather aggregate data and individual responses will remain confidential. This questionnaire takes approximately 20 minutes to complete. Did you receive this email?

#2.(If no for #1)...Ok, well based on the information you have heard, will you be willing to complete our questionnaire?
#2.(If yes for #1)...In order for the results to represent the industry as a whole, your response is very important. Are you willing to complete our questionnaire?

#3.(If yes for #2)...Great! Do you still have the email containing the link for our questionnaire? If not, I can forward you the link for the questionnaire.
#4.(If no for #2)...For our reporting information that will be used in our results, can you please explain why you are not willing to complete the questionnaire? (Record response). Thank you for your time. Have a great day!

#5(If yes for #3) Also, we are hoping to close the questionnaire this Friday. That is because the questionnaire has been active for over 3 weeks now and as students, we have a limited amount of time remaining to complete our project. Will you be able to complete the questionnaire by this Friday?

#6(If yes for #5) Great! Thank you for your time and we look forward to receiving your response soon. Have a great day! (End call)
#6(If no for #5) Can you please explain why?

Appendix F: Questionnaire

1. How many incubation facilities do you manage?

2. What is your incubator facility's gross square footage?

3. What is the total amount of leasable space, in square feet, at your incubator facility?

4. What was your occupancy rate during the most recent fiscal year for incubator facility?

5. What is the percentage of total leasable space for your incubator facility?

6. What percentage of the incubator facility's space is allocated to common space?

7. What percentage of the incubator facility's space is allocated to lab space?

8. What percentage of the incubator facility's space is allocated to office space?

9. Rate the importance of the following goals for your incubation program. (1 being LEAST important, 5 being MOST important)

    Building or accelerating growth of a business/industrial sector
    Commercializing technologies
    Creating jobs in the community/region
    Diversifying the local/regional economy
    Encouraging minority entrepreneurship
    Fostering the entrepreneurial climate in the community/region
    Generating complementary benefits for the sponsoring organization
    Generating net income for the incubator or sponsoring organization/founders/investors
    Identifying potential spin-in or spin-out business opportunities
    Moving people from welfare to work
    Retaining businesses in/attracting firms to the community/region
    Revitalizing a distressed neighborhood
    Other

10. Does your incubation program have an equity policy or claim a stake in your clients' equity? Please indicate the percentage claimed.

11. Which of the following services does your incubator offer to prospective clients (Pre) and to clients who have graduated or been asked to leave (Post)?

    Access to angel investors or networks

Access to venture capital investors
Assistance with e-commerce
Assistance with manufacturing practices, processes, and technology
Assistance with product design and development practices, processes, and technology
Business management process, customer assessment service, inventory management
Comprehensive business training programs
Economic literacy training
Federal procurement assistance
General legal services
Help accessing commercial bank loans
Help accessing specialized noncommercial loan funds/loan guarantee programs
Help with accounting or financial management
Help with business basics
Help with business etiquette
Help with presentation skills
Help with regulatory compliance
High-speed Internet access
Human resources support or training
In-house investment funds
Intellectual property management
International trade assistance
Linkages to higher education resources
Linkages to strategic partners
Loaned executive to act in management capacity
Logistics/distribution support or training
Management team identification
Marketing assistance
Networking activities among incubation program clients
Shadow advisory boards or mentors
Shared administrative or office services
Specialized equipment or facilities
Technology commercialization assistance

Of the services listed above, what percentage is provided by an outside source?

12. Which of the following shared equipment does your incubation program provide to clients? (The following types of equipment are in general terms; there is no specific model or brand)

80 Freezer
Analytical balances

Autoclave
Centrifuge
Dark room
DI pure water system
Dry ice chest
Evaporator
Flammable refrigerator
Glass washer
Hot oven
Hotplate/Stirrer
Ice machine
Glassware
Liquid nitrogen dewar
pH meter
Thermocycler
Ultracentrifuge
Vacuum oven

13. Which of the following safety equipment/supplies are offered to clients in wet labs?

Chemical fume hood with acid and base cabinets
Eyewash/safety shower
Flammable storage cabinet
Spill control supplies
Type IIA biological safety cabinet
Other

14. What percentage of the incubation program president's time is spent on delivering the following incubator related services? (Must total 100 percent.)

Accounting
Business Development
Client Recruitment
Facility Management
Fundraising
Networking
Staff Development
Other

15. What other incubator related services occupy the incubation program president's time?

16. How many additional professional staff members are employed by the incubator program?

17. How many hours per employee do the additional employees work on average per week?

18. The incubator staff collects information on key business outcomes (e.g., employment, gross revenues, etc.) on most or all incubator clients:

    Annually
    More than once a year
    Never

19. The incubator staff collects information on key business outcomes (e.g. employment, gross revenues, etc.) on most or all incubator graduates:

    Annually
    More than once a year
    Never

20. What year was the incubator's strategic plan last revised?

21. Does your incubation program have an advisory board?

22. How many individuals serve on the advisory board?

23. Which of the following business professionals serve on your incubator's advisory board?

    Accountant
    Biotech Devices Technical Experts
    Biotech Drug Discovery & Development Experts
    Clinical Trial Experts
    Legal/ Intellectual Property Experts
    Marketing/ Public Relations
    Recruitment/Retention/Compensation
    Real Estate/ Operations
    Regulatory Affairs
    Venture Capital/ Investment Banking

24. Rate the importance of the following criteria for accepting a client into your incubation program. (1 being LEAST important,5 being MOST important)

Business Model
Company Development Stage
Financial Status
Incubator Program Participation
Industry Application
Intellectual Property
Job Creation
Local University/Research Institute Relationship
Management Experience
Market Opportunity

25. What percentage of applicants is accepted into the program?

26. What is the total number of client companies in your incubator & facility?

27. What is the total number of client companies in each facility?

28. Affiliate clients are clients that lease space in an incubator but do not receive any of the program's services. Does your incubation program have any affiliate clients?

29. What percentage of your clientele do the affiliate clients make up in your facility?

30. Do the affiliate clients receive the same services as the other clients?

31. What are the primary obstacles your clients experience?(1being the SMALLEST obstacle, 5 being the BIGGEST obstacle)

Distance from or access to markets
Entrepreneur lacks background or expertise in entrepreneurship
Entrepreneur unwilling to accept advice
Incomplete management team
Inadequate management team
Lack of customer acceptance
Lack of financing for company
Lack of technology literacy
Limited access to relevant networks or expertise
Limited market potential

32. Does your incubation program have a graduation policy?

33. Does your incubator use a formal, written graduation policy requiring all clients who meet certain benchmarks to graduate from the incubation program?

34. Does your incubator require those that fail to meet these benchmarks to leave the incubation program?

35. What is the average number of months before a client graduates from your incubation program?

36. What is the fastest time, in months, that a client has graduated from your incubator?

37. What is the longest time, in months, it has taken a client to graduate from your incubator?

38. Are there any circumstances that permit a client to remain in your incubation program after meeting your graduation policy?

39. Why were they permitted to remain in your incubation program after meeting your graduation policy?

40. How many clients have been permitted to remain in your incubation program after meeting your graduation policy?

41. What percentage of your clients graduate from your incubation program?

42. Of those clients who graduate, what percentage of those is still in business today?

43. How much revenue did your incubation program generate in the most recent fiscal year?

44. What is the source of your incubation program's generated revenue, by percentage?

    Client Fees
    Federal Subsidies
    Grant Contracts
    Operation Subsidies
    Payments for Miscellaneous Services
    Rent
    Service Contracts
    State Subsidies
    Other

45. What are the "other" sources of your incubation program's revenue?

46. What are the total expenses for your incubation program at your facility?

47. What are the total expenses for your incubation program for each facility, by percentage? (Must total 100 percent.)

    Benfits/Payroll
    Facility Costs
    Program Expenses
    Other

48. What are the "other" expenses?

49. Does your incubation program benefit from a subsidy?

50. What is the source of your subsidy?

51. Have you had a subsidy that has expired?

52. Is your incubator a member of NBIA?

53. What is your tax status for your incubator?

54. Is your incubator sponsored/owned by (select all that apply):

    A College/University
    A For-profit Company
    A Local Government
    Nonprofit Economic Development Organization
    The Federal Government
    The State Government
    Other

55. Does your incubator focus on:

    Biotechnology
    Bioinformatics
    Medical Device
    All of the above

56. Would you categorize your incubator as Rural, Suburban, or Urban?

57. Please estimate the percentage of your clients, both affiliate and resident, drawn from each area. (Must total 100 percent.)

    City/Town
    County
    Multi-county

Multi-state
National
Neighborhood
State

58. What year did your incubator begin accepting clients?

59. May we contact you with follow-up questions?
Yes
No

Appendix G: Benchmarks Developed

Facility and Space Allocation

Total Facility Size: 24,000 ft

Total Leasable Space: 17,500 ft

Percentage of Facility: 73%

Facility Occupancy Rate: 74%

Facility Space Allocation

Office Space: 28%

Lab Space: 27%

Common Space: 22%

Other: 23%

Incubation Program

Top Incubator Goals:

Building or accelerating growth of a business/industrial sector

Creating jobs in the community/region

Commercializing technologies

Fostering the entrepreneurial climate in the community/region

Percentage with Equity Policy: 78%

Percentage with Graduation Policy: 50%

Graduation Rate: 55%

Clients Length of Time in Program: 34 months

Clients Still in Business Today: 57%

Top Prospective Client Acceptance Criteria

- Intellectual Property
- Market Opportunity
- Business Model
- Company Development Stage
- Industry Application

Client Acceptance Rate: 51%

NBIA Membership: 75%

Incubation Program Staff

Additional Staff: 1.5 employees

Strategic Plan Revision: Every 3 years

Percentage with Advisory Boards: 87%

Advisory Boards Members: 13 individuals

Incubation Program Clients

Clients per Facility: 6

Top Client Obstacles

- Lack of financing for company
- Entrepreneur lacks background or expertise in entrepreneurship
- Incomplete management team
- Inadequate management team
- Entrepreneur unwilling to accept advice

Incubation Program Financials

Revenue per Facility: $1.86 million

Revenue Source

Rent: 36%

Subsidies: 40%

Other: 24%

Expenses per Facility: $473, 000

Expenses Allocation

Payroll:	41%
Building and Operating Costs:	39%
Program Expenses:	19%

Tax Status

Non-Profit: 87%

For-Profit: 13%

Appendix H: MBI Comparative Data

WPI MQP Analysis of Life Science Incubator Industry

Comparative Data - MBI 2010

NUMBER OF INCUBATORS

Life Sciences	MBI
60% Manage 1 Facility	3
26% Manage 2 Facilities	
7% Manage 3 Facilities	
7% Manage 4 Facilities	

CLIENT DATA

Average Number of Clients per Facility

Life Sciences	MBI
6.3 Per Facility	7.0 Per Facility

Average Client Length of Stay before Graduating

Life Sciences	MBI
34.1 Months	33 Months

AVERAGE FACILITY SIZE (SQUARE FEET)

Life Sciences	MBI
24,068	8,268

54%	20,000 Sq ft or less (Includes MBI)
21%	20-40,000 Sq ft
25%	Over 40,000 Sq ft

GRADUATE COMPANIES

Percentage of Clients that have Graduated

Life Sciences	MBI
55%	76%

Percentage of graduates still in business

Life Sciences	MBI
56%	76%

OCCUPANCY RATE

Life Sciences	MBI
74%	89%

REVENUE DATA

Source: Rents

Life Sciences	MBI
36%	50%

Source: State Subsidy

Life Sciences	MBI
26%	15%

Source: Other

Life Sciences	MBI
38%	35%

BUDGET DATA

Total Annual Expenses

Life Sciences	MBI
$290,267.29	$433,333.33

% Payroll of Budget

Life Sciences	MBI
41%	15%

Building Operation Costs

Life Sciences	MBI
39%	70%

Program Expenses

Life Sciences	MBI
19%	15%

EMPLOYEES PER INCUBATOR FACILITY

Life Sciences	MBI
1.5	1.3

INCUBATOR FACILITY COMMON AREA

Life Sciences	MBI
22%	20.3%

Appendix I: MBI Strategic Plan

Massachusetts Biomedical Initiatives

Strategic Plan Update

January 2, 2007

◆◆◆

Committee Members

Abraham W. Haddad, D.M.D., Chair; Robert Anderson, John E. Bassett, Ph.D., Dennis D. Berkey, Ph.D.,

Thomas Finneran, Karen H. Green, David R. Grenon, Dennis L. Guberski, Peter Levine, M.D., Baltej S. Maini M.D.,

Christian W. McCarthy, Charles F. Monahan, Jr., Philip R. Morgan, Kevin O'Sullivan, Yael Schwartz, Ph.D., Richard Stanton

Facilitator: John W. Chandler

Recorder: David Thurlow, Ph.D.

I. MISSION STATEMENT AND CORE VALUES

A. Mission Statement: Massachusetts Biomedical Initiatives (MBI) is a private, non-profit economic development organization dedicated to job creation throughout Massachusetts by promoting the birth and growth of start-up biomedical companies that are committed to developing innovative ways to improve health care. MBI offers support to creative entrepreneurs in developing sound scientific and business plans. Through its MBIdeas Incubator facilities located in Worcester, MBI lowers barriers to success for emerging companies by providing cost-effective and high quality laboratory space and support services. MBI is committed to collaborating with the academic and business communities, and local and state governments, to promote Massachusetts as an international leader in the biomedical industry.

B. Core Values:

- Honesty, respect, and dedication to creating an environment for life science commercialization opportunities through collaboration
- Commitment to helping client companies comply with all applicable laws, with emphasis on health and safety
- Commitment to personal and business growth, and creation of *new* jobs
- Commitment to collaborative development of biomedical and related industries in Massachusetts

C. Value Proposition for Prospective Tenants

Massachusetts Biomedical Initiatives (MBI) promotes the birth and growth of start-up biomedical companies that are committed to developing innovative ways to improve health care. Situated in the expanding Massachusetts corridor of biomedical technology, MBI supports creative entrepreneurs with sound scientific and business plans by:

- Providing high quality laboratory space and support services at below-market rates
- Facilitating access to a skilled work force, state-of-the-art equipment, and capital resources
- Fostering partnerships with an extensive local community of prominent academic and business organizations
- Promoting growth to world class status - collaborating and competing with leaders in the international biomedical industry

II. HISTORICAL PERSPECTIVE

A. Biomedical (Biotechnology, Medical Devices, and Bioinformatics) Industries in Central Massachusetts

1. Early 1980s: Worcester Area Chamber of Commerce (WACC) identifies biotechnology as having potential for establishing economic growth based on the area's existing strengths: 1) academic institutions such as UMass Medical School, Tufts Veterinary School, WPI, Worcester Foundation for Experimental Biology, and other colleges and universities; and 2) physical resources, including land, water; and proximity to intellectual resources in greater Boston.

2. Mid to late 1980s: WBDC arranges for **collaboration** among all community organizations to facilitate local growth of biotechnology.

   - Passage of clear and explicit local ordinances modeled after NIH guidelines
   - Development of new life-science based programs at local colleges to help provide qualified labor pool
   - Promotion of science and math in both primary and secondary schools, including extensive teacher training
   - Creation of agencies to promote development of biotechnology and other appropriate industries: Worcester Business Development Corporation (WBDC), Massachusetts Biotechnology Research Institute (MBRI), Massachusetts Biotechnology Research Park (MBRP) and Centers of Excellence Corporation
   - Cooperation with media to provide reliable information and establish credibility

3. 1990s: Growth of biomedical industries to more than 50 companies, including BASF, those located in the MBRP, and others.

4. 2003: Expansion to 89 companies, more than 4000 employees, and more than $500 million in revenue.

B. Founding, funding, and evolution of MBI

- 1984: MBRI established
- 1987: MBRI creates Commonwealth Bioventures Inc. (CBI) as a for-profit venture capital component
- 1984 to 1997: MBRI helps launch more than 20 companies, raising over $20 million in funding
- 1997: MBI created to replace MBRI and focus on life science company incubation
- 1997 to 2000: MBI develops two new incubator (facility) sites at former St. Vincent Hospital and 100 Barber Ave
- 2000 to 2006: MBI provides counsel to local scientific entrepreneurs; hosts 39 companies; 200 employees; $27M impact
- 2003 to 2006: MBI "graduates" 22 biomedical companies with a combined success rate of 75%

III. STRATEGY FOR ACCOMPLISHING THE MISSION

A. Actively Facilitate Success

1. Identify and attract entrepreneurial scientists and emerging companies

- Explicitly define the value MBI provides to clients (mentoring, partnering, cost-effective facilities, access to resources, etc.)
- Disseminate information about MBI through personal contacts, publications, and an expanded web site to recruit biomedical entrepreneurs and emerging or established companies
- Target regional institutions in the Boston-Devens-Worcester corridor to identify scientists doing research and development with potential relevance to MBI
- Target existing companies that can be recruited to Massachusetts (domestic and European)
- Partner with emerging state-supported efforts to develop sales/marketing teams targeting other regions of the country
- Advertise MBI's role as a complement to existing strengths in other parts of MA (not a competitor) by emphasizing the expanding corridor of biomedical companies in MA. Continue to build on past reputation of Boston and linking future growth to other parts of MA, recognizing in particular recent accomplishments in basic science at UMass Medical Center in Worcester and in clinical trials at Baystate Medical Center in Springfield as well as research and science applications at UMass Amherst

2. Function as mentor and partner

- Emphasize opportunities for developing new tools and providing services to existing pharmaceutical and biomedical companies, as well as help in bringing new products to market
- Require clients to develop sound business and scientific plans so as to ensure a proper balance of expertise in both science and business needs, and support these efforts by providing access to local business organizations and invited speakers such as attorneys, bankers, and biomedical company executives
- Emphasize importance of intellectual property rights, increased flexibility in patent deals, and transparency of finances
- Offer workshops on identifying sources of funding and writing grants
  - venture capital resources
  - government grants (e.g., small business programs)
- Work with potential clients to meet eligibility requirements for entering MBI incubator facilities or other venues for launching business in Massachusetts
- Help in the identification and recruitment of technical staff
- Construct, maintain, and disseminate a list of relevant core competencies at institutions throughout the region

III. STRATEGY FOR ACCOMPLISHING THE MISSION (continued)

3. Function as facilitator by providing incubator facilities as a catalyst to lower barriers to success for emerging companies.

- Provide physical resources at below market rates
  - laboratory and office space
  - shared equipment (laboratory and office)
  - operations and infrastructure (e.g., security, maintenance)
- Maintain supportive and efficiently operated facilities to provide high quality experience for clients
- Provide necessary permits that ensure compliance with health and safety regulations
- Provide referrals to appropriate regulatory agencies for development of new products and guidelines for, or alternatives to, federally approved clinical trials

4. Provide personal and institutional connections to existing and emerging resources.

- Educational (equipment, machine shops, student interns, faculty consultants, project collaborations, seminar venues, etc.)
- Industrial and commercial: foster communication (especially with large pharmaceutical firms); e.g., to address emerging companies' concerns that they may their ideas may be "stolen" and large companies' requirements that initial stages of development and testing are done properly
- Emerging initiatives (e.g., stem cell/regenerative tissue center associated with UMass Medical Center or other large federally supported biomedical projects in MA such as new BSL-4 labs)
- Healthcare organizations, including hospitals throughout central and western MA
- Other scientific entrepreneurs
- Governmental (especially state senators and representatives)
- Attorneys, bankers, and other business executives
- Angel and Venture Capital Investors

5. Facilitate expansion and/or relocation when appropriate.

III. STRATEGY FOR ACCOMPLISHING THE MISSION (continued)

B. Ensure financial viability of MBI

7. Research progress in other areas of the country to ensure that MBI remains at the forefront of providing successful biomedical incubator facilities.

8. Identify and secure sufficient income independent of government grants.
   - rental
   - equity in client companies
   - other

9. Pursue government grants (e.g., National Center for Research Resources, EDA Grants, State Economic Development) to ensure ability to provide resources at below market rates.

10. Work with local elected delegation, newly elected governor, and state legislature to support MBI's mission of creating jobs; continue visits to Beacon Hill; maintain visibility at biomedical conventions; and invite legislators to MBI facilities on a regular basis, emphasizing MBI's track record of creating jobs.

11. Ensure that failure of client companies does not jeopardize MBI's financial interests.

12. Minimize expenses (e.g., operational efficiency, best use of staff, and control of space).

13. Resolve issues at Winthrop St. facility, attract new clients to Gateway Park, and explore other options as they may arise, including Biotech Park.

14. Once Winthrop street issues are resolved, evaluate need for a facilities manager that can free Kevin O'Sullivan to focus on his primary responsibilities as marketer, partner and mentor. As part of this process, complete a review of Kevin's job description to ensure that his personal efforts are clearly focused on attracting and mentoring clients, and on engaging partners in support of MBI's mission.

IV. IDENTIFY APPROPRIATE MEASURES OF SUCCESS AND REGULARLY TRACK PROGRESS

Develop "measurable metrics" and benchmarks that are attainable over a set period of time. Monitor progress on a regular basis and submit to the Board of Directors both an annual management report and a periodic short update. The short "balanced scorecard" update should serve as a ready reference, providing metrics on areas that reflect the progress and health of MBI and the implementation of the strategic plan. Suggested areas to track include job creation, number of new companies, outreach efforts, taxable infrastructure, filling of new facilities, and budget-related figures. Other metrics to track and provide updates on can include:

1. Potential clients for incubator facilities, number of candidates, "yield rate", etc.

2. Space allocation, number of employees, and revenues for clients located in incubator facilities.

3. Evaluations of why client companies succeed and why they fail, to be better able to advise future companies.

4. Number of companies, employees, and revenues of the biomedical industry in both central Massachusetts and Massachusetts as a whole.

Specifically, map the biomedical corridor of expansion stretching from Boston/Cambridge westward with an aim to link resources and broaden economic opportunities across the local region and the state.

5. Operational costs and income to ensure balanced budget.

6. Additional parameters as new developments dictate.