
Minority Suppliers for
Baltimore's Biotech Industry

FINAL REPORT

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G R O U P

EXECUTIVE SUMMARY

Biotechnology, defined as the “application of biological knowledge and techniques pertaining to molecular, cellular, and genetic processes to develop products and services,” is becoming one of the nation’s leading industries. Over the past decade, the biotech industry has experienced dramatic growth, with revenues increasing from \$8.0 billion in 1992 to \$29.6 billion in 2002. As of December 31, 2002, the biotech industry employed 194,600 people, more than the employment of the entire toy & sporting goods industry. (BIO, 2004)

Empower Baltimore Management Corporation (EBMC) commissioned Optimal Solutions Group (OSG) to conduct a study on the biotech industry, its suppliers, and the prospective opportunities that they could bring to minority entrepreneurs and low-skilled workers in the Baltimore area. OSG researchers conducted a literature review of issues pertinent to minority business utilization in the biotech field, as well as the propensity of minority businesses to hire minority workers. In addition, OSG identified, described, and located minority suppliers in the biotech field, determining the likely impact the burgeoning industry will have on Baltimore’s low-skilled workforce. Additionally, OSG researchers provided descriptions of various types of career ladders that low-skilled workers could utilize to advance beyond entry-level positions.

Biotech Suppliers with Weak Local Presence

<u>NAICS Code</u>	<u>Industry</u>
5111	News, Periodical, Book & Database Publishers
3254	Pharmaceutical & Medicine Manufacturers
4881-4884	Support Activities for Air, Rail, Road, and Water Transportation
441-444, 446-448, 451-452	General Retail, Except Food & Beverage & Miscellaneous
5415	Computer Systems Design & Related Services
5417	Scientific Research & Development Services

The propensity of minority employers to hire minority workers is a pertinent issue, especially in Baltimore City. Black job applicants are more likely to be hired in firms where the hiring agent is African American opposed to establishments where the hiring agent is white. The hiring agent’s race may affect the racial composition of the workforce in the following ways (Stoll, Raphael, Holzer, 2004):

- Hiring agents may rely on social networks to recruit new hires; the racial composition of these networks is likely correlated to the race of the hiring agent;
- The race of the hiring agent may have an affect on the race of new hires if the hiring agent exhibits a preference for his/her own race;
- Minority hiring agents send the signal to other minorities that there is a potential for advancement within the firm, despite racial background; and,
- Firms with minority hiring agents are perceived as being less discriminatory, thus attracting a greater number of minority applicants, as opposed to a firm with a white hiring agent.

In the context of the biotech industry and its suppliers, career ladders offer a tremendous amount of potential to low-skilled workers who are looking to advance in the field. Single-firm career ladders offer a way for low-skilled workers to gain experience and develop higher-order skills in order to excel to supervisory or managerial positions. Single-industry career ladders provide workers with industry-specific experience that would benefit not only their current employer, but also other employers in the field looking to fill upper-level positions. Cross-industry career ladders offer the potential for employees of biotech suppliers to transition into the biotech field itself.

I. INTRODUCTION

Biotechnology, defined as the “application of biological knowledge and techniques pertaining to molecular, cellular, and genetic processes to develop products and services,” is becoming one of the nation’s leading industries. Over the past decade, the biotech industry has experienced dramatic growth, with revenues increasing from \$8.0 billion in 1992 to \$29.6 billion in 2002. As of December 31, 2002, the biotech industry employed 194,600 people, more than the employment of the entire toy & sporting goods industry. (BIO, 2004)

Forty-one states across the nation have established programs and initiatives to stimulate the development of the industry (Cortright & Mayer, 2002). According to *Signs of Life: The Growth of Biotechnology Centers in the U.S.*, the Washington/Baltimore metropolitan area is one the nation’s leading areas in the biotech field. As a result, it is becoming increasingly important to understand the potential opportunities that could arise from the booming industry.

Empower Baltimore Management Corporation (EBMC) commissioned Optimal Solutions Group (OSG) to conduct a study on the biotech industry, its suppliers, and the prospective opportunities that they could bring to minority entrepreneurs and low-skilled workers in the Baltimore area. OSG researchers conducted a literature review of issues pertinent to minority business utilization in the biotech field, as well as the propensity of minority businesses to hire minority workers. In addition, OSG identified, described, and located minority suppliers in the biotech field, determining the likely impact the burgeoning industry will have on Baltimore’s low-skilled workforce.

II. LITERATURE REVIEW

In order to assess the impact of the growth of the biotech industry in the Baltimore area, it is important to understand the effect the industry has had in other areas of the country. Biotech clusters in the San Francisco, Boston, and San Diego metropolitan areas are among the most established in the nation.

A. Select Biotech Clusters

San Francisco

According to the Biotechnology Industry Organization (BIO), the biotech industry originated in San Francisco in 1976 as a result of federal government demands for the discovery of a cure for cancer. Bay Area institutions such as Harvard University, University of California (UC) San Francisco, and UC Berkeley facilitated research in the emerging field (BIO).

San Francisco has remained the leader of the biotech industry for nearly three decades. In addition to the three institutions previously mentioned, the Bay Area is home to other major universities such as Stanford, University of California at Davis, University of California at Santa Cruz. Currently, the local industry consists of over 580 biotechnology companies that employ over 85,000 employees (BIO). It is not unusual for employees in the field to switch between university and private sector jobs, explaining the proliferation of area biotech firms. According to BIO, the local industry experiences a growth of approximately 30 firms per annum.

Boston

Massachusetts’ biotech companies were founded in the early 1990s, with a majority of firms being located in the Boston and Cambridge areas (MBC, 2004). According to a Milken Institute report, Boston is the second largest biotech cluster in the nation (Devol, et. al, 2004). Presently, the state is home to

more than 280 biotech companies, over three times the amount it had just one-decade prior. State industry figures also show a 10-percent growth in employment per annum over the past five years. (Finer, 2004) According to the Washington Post, "biotechnology accounts for 18 percent of the state's venture-capital investment, 27 percent of its [research and development] spending, [six percent] of its public companies, and approximately 10 percent capitalization" (Finer, 2004).

San Diego

San Diego has the third largest biotechnology cluster in the nation, following San Francisco and Boston respectively. The founding of Hybritech, one of the country's pioneers in the field, in 1978 was the first step in the emergence of the local biotech industry. Over the past 25 years, more than 50 firms can be considered the progeny of the area's first biotech company. As of 2003, San Diego was home to 502 biomedical companies, with biotech firms employing over 32,000 people. The industry accounts for five percent of all nonagricultural employment and 5.3 percent of gross metropolitan product in the region. (Devol et. al.)

B. Common Success Factors

According to The Brookings Institution, regions that lead the nation in the biotech industry all share two common factors: a strong research capacity and the ability to translate the research into commercial activity. In addition to San Francisco, Boston, and San Diego, Seattle and Raleigh-Durham accounted for 56 percent of new biotech companies formed during the 1990s. Moreover, 75 percent of new venture capital in biopharmaceuticals in the past six years, and 74 percent of the value of research contracts from pharmaceutical firms, are attributable to the five regions (Cortright and Mayer, 2002).

Research shows that region needs more than prominent research institutions to support the growth of the biotech industry. Accessibility and availability of high-skilled, well-educated workers, particularly scientists and technicians, NIH-funded research initiatives, the presence of established biotech companies, and the ability to generate new firms are all important to the success of the industry (Cortright and Mayer, 2002).

C. Minority Business Utilization in the Biotech Field

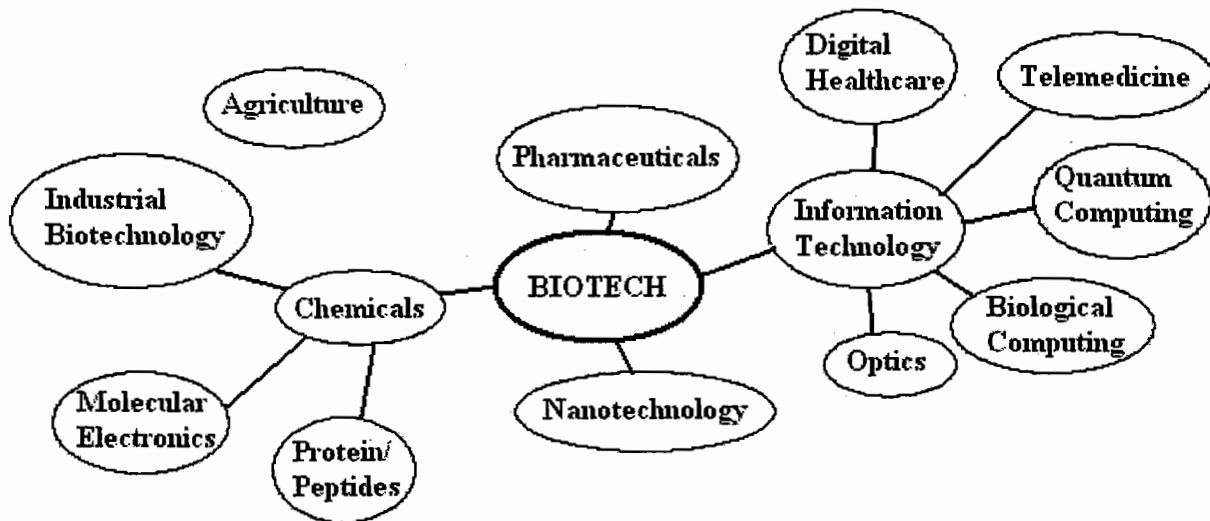
OSG researchers were unable to find a sufficient amount of literature regarding minority business enterprise (MBE) utilization in the biotech industry's supply chain. However, an adequate amount of information concerning the opportunities available to minorities within the biotech industry itself was available. Research revealed that the presence of minorities in the biotech field, in terms of scientists and staff, is lacking. Although it is unlikely that the disparity is due to conscious discrimination, minority under-representation remains a major issue. Some biotech firms refer to "an unfilled pipeline" as a major hindrance, citing the scarcity of minorities who have degrees in biotech-related fields such as cellular biology, microbiology, and molecular biology (Finn, 1997).

The *youth* of the industry has also been cited as a contributing factor to the underutilization of minorities. A majority of biotech firms are small companies that often do not have human resource departments and minority hiring policies. Though these small firms tend to hire people based on their academic qualifications and have neither diversity nor affirmative action programs. These types of programs tend to be established once firms reach the 80 to 100-employee range. In general, minority issues remain low on the priority scale for many biotech companies. Research indicates that people tend to hire workers like themselves; with the dearth of minorities and women in the sciences, MBEs and minority and women employees in the biotech industry will continue to be in short supply (Finn, 1997).

III. DESCRIPTION OF BALTIMORE'S BIOTECH ENVIRONMENT

The biotech industry does not have a separate classification in the North American Industry Classification System (NAICS) or the Standard Industrial Classification System (SIC). Most biotech firms are classified in one of two NAICS categories: research and development in the physical, engineering, and life sciences (NAICS 54171) and pharmaceutical and medicine manufacturing (NAICS 3254). Figure 1 illustrates the breadth of the industry.

Figure 1. The Evolving 21st Century Biotech Industry



Source: DOL & NES, 2004

A. Baltimore's Biotech Industry

The proximity of the East Baltimore Biotech Park and the UMB Research Park to such facilities as the Johns Hopkins Medical School, Johns Hopkins Hospital, and University of Maryland Medical System, make it likely that the local biotech sector will be concentrated in the following industries (The France Institute, 2003, Optimal Solutions Group):

- Pharmaceutical & Medicine Manufacturing (NAICS 3254)
- Medical Equipment and Supplies Manufacturing (NAICS 3391)
- Ophthalmic Goods Manufacturing (NAICS 339115)
- Research and Development in Physical, Engineering, and Life Sciences (NAICS 54171); Testing Laboratories (NAICS 54138)

B. Biotech Entrepreneurship in Maryland

According to a Maryland TEDCO report, a majority (85 percent) of Maryland's 142 Bio-/Medical-/Health-Informatics firms were founded in the state. Local entrepreneurs in the industry, which is a combination of biology, medical, health, and information technology, cite the plethora of research institutions in the state, as well as presence of key professional associations in the local vicinity, as major contributing factors to their decision to establish firms in the state. An analysis of the state's 142 firms revealed that the founders of the companies came from diverse backgrounds, with founders' previous experience coming from private industry, academia, research institutions, and the federal government. A common factor among many of the founders (1/3), however, was their attendance in area universities and colleges.

IV. SUPPLIERS OF THE BIOTECH INDUSTRY

The positive impact of the growth of the biotech industry will be far reaching, affecting not only the industry itself, but also its suppliers. Tables 1 and 2 below detail the major suppliers to the biotech industry, by NAICS code¹. Table 1 lists the industry codes of suppliers that have an existing sizeable presence in the Baltimore area. These industries are likely to see an increase in business as a result of the biotech parks. Table 2 lists industry codes of suppliers that do not currently have a strong local presence, and thus have the most potential to generate new employment opportunities.

Table 1. Suppliers for Baltimore's Biotech Industry: Sizable Local Presence

<u>NAICS Code</u>	<u>Industry</u>
2333	Building Maintenance & Repair
3222	Paperboard Containers & Boxes
5418	Advertising
5419	Other Professional, Scientific, and Technical Services,
5614	Business Support Services
5617	Services to Buildings and Dwellings
5324	Commercial and Industrial Machinery and Equipment Rental and Leasing
5613	Employment Services
5616	Investigation and Security Services
8111	Automotive Mechanical and Electrical Repair and Maintenance
8112, 8113	Miscellaneous Repair Services (Non-Automotive)
5411	Legal Services
6243	Vocational Rehabilitation Services
8413	Architectural, Engineering, and Related Services
8412	Accounting, Tax Preparation, Bookkeeping, and Payroll Services
5611, 5416	Office Administration Services; Management, Scientific, and Technical Consulting Services

Source: The France Institute, 2003, Optimal Solutions Group

Table 2. Suppliers for Baltimore's Biotech Industry: Weak Local Presence

<u>NAICS Code</u>	<u>Industry</u>
5111	News, Periodical, Book & Database Publishers
3254	Pharmaceutical & Medicine Manufacturers
4881-4884	Support Activities for Air, Rail, Road, and Water Transportation
441-444, 446-448, 451-452	General Retail, Except Food & Beverage & Miscellaneous
5415	Computer Systems Design & Related Services
5417	Scientific Research & Development Services

Source: The France Institute, 2003, Optimal Solutions Group

In order to best determine the impact of the biotech sector on employment opportunities to new workers, OSG's analysis involved the industries that have a limited presence in the Baltimore area, as described in Table 2 above.

¹ OSG used tables from a University of Baltimore's Jacob France Institute report as the basis for developing Tables 1 and 2. The France Institute's tables were detailed by SIC. OSG researchers converted these industries into NAICS.

A. Local Biotech Suppliers

The following tables and figures detail the local presence of the biotech industry's suppliers. The retail industry is comprised of a significantly greater amount of employees and establishments than the other suppliers to the biotech industry. Minority businesses in this industry, however, are greatly underrepresented.

Table 3. Maryland Biotech Suppliers

<u>Industry</u>	<u># of Employees, 2003</u>	<u># of Firms, 2003</u>
General Retail, Except Food & Beverage & Miscellaneous	206,324	11,794
Computer Systems Design & Related Services	50,180	4,831
Scientific Research & Development Services	28,019	883
News, Periodical, Book & Database Publishers	10,737	499
Support Activities for Air, Rail, Road, and Water Transportation	7,736	432
Pharmaceutical & Medicine Manufacturers	5,262	60

Table 4. Biotech Suppliers: Minority Owned v. Non-Minority Owned

<u>Industry</u>	<u># MBEs Registered at MDOT</u>	<u>Total Firms in Maryland²</u>	<u>% MBE</u>
Computer Systems Design & Related Services (NAICS 5415)	687	4,831	14.2
Support Activities for Air, Rail, Road, and Water Transportation (NAICS 4881-4884)	52	432	12.0
Scientific Research & Development Services (NAICS 5417)	94	883	10.6
News, Periodical, Book & Database Publishers (NAICS 5111)	38	499	7.6
Pharmaceutical & Medicine Manufacturers (NAICS 3254)	1	60	1.7
General Retail, Except Food & Beverage & Miscellaneous (NAICS 441-444, 446-448, 451-452)	85	11,794	0.7

According to Figure 2, a majority of minority businesses registered at MDOT are located in Baltimore City, Howard, Montgomery, Baltimore, and Prince George's Counties. Numerous Computer Systems Design (NAICS 5415) firms registered in the state are also based in the Washington D.C./Northern Virginia area.

Figure 3 illustrates MDOT-registered minority businesses across the nation. Biotech suppliers include firms based in Arizona, California, Colorado, Delaware, Florida, Georgia, Illinois, Indiana, Louisiana, Maine, Massachusetts, Michigan, Minnesota, Montana, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Texas, Virginia, and Wisconsin. The majority of out-of-state suppliers are in the Computer Systems Design and Scientific Research and Development industries.

² Data is from the Bureau of Labor Statistics, Quarterly Census of Employment & Wages, 2003

Figure 2. MDOT Registered Biotech Suppliers: Maryland

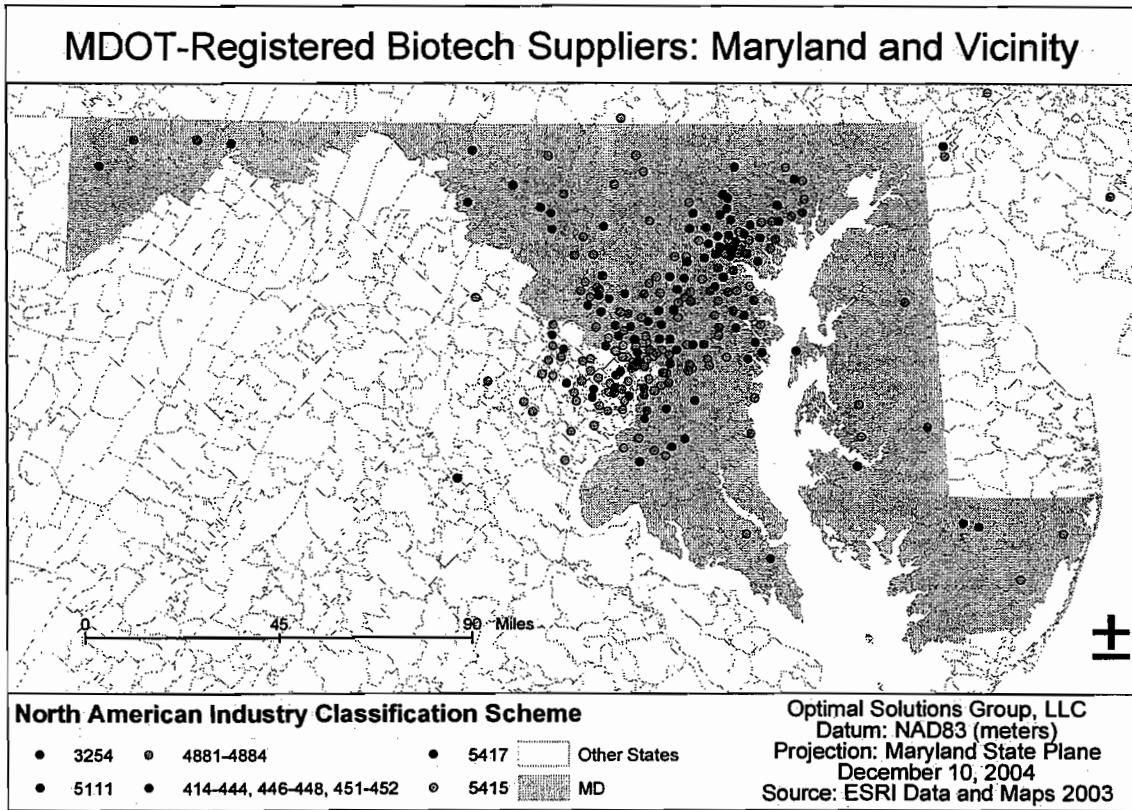
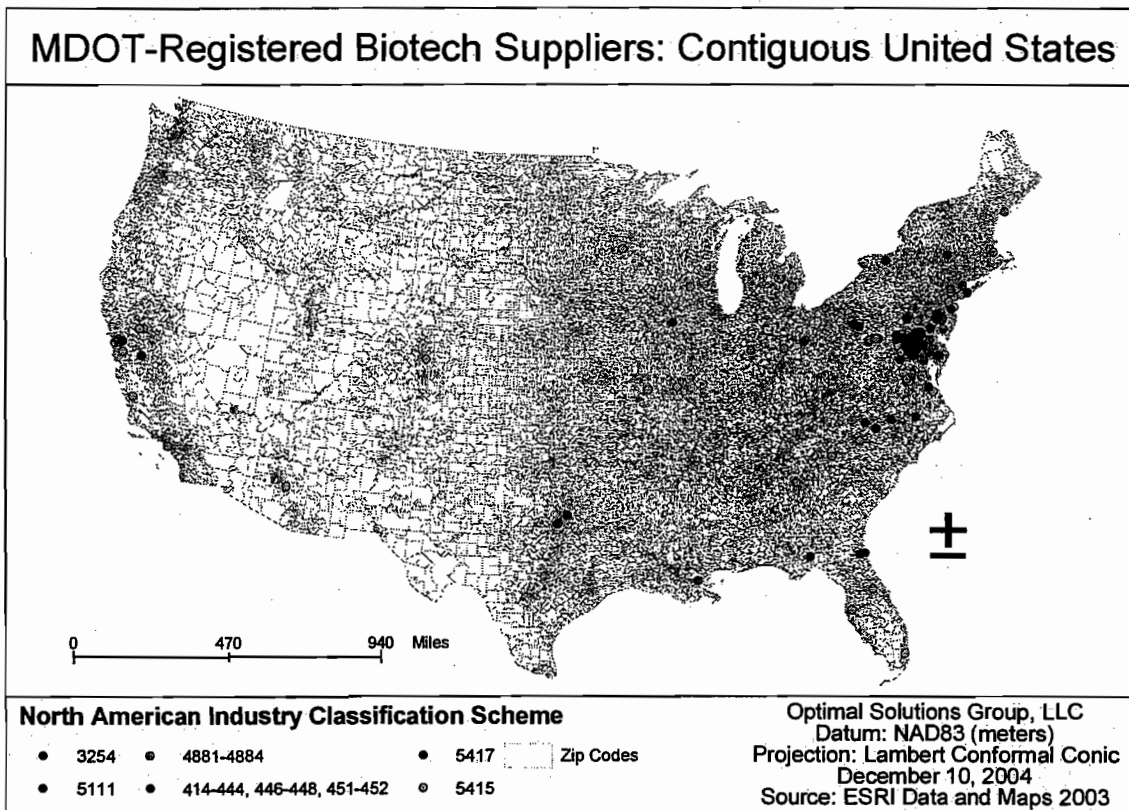


Figure 3. MDOT Registered Biotech Suppliers: National



V. MBE PROPENSITY TO HIRE OTHER MINORITIES

In an effort to identify hiring trends that have the potential to benefit minorities, OSG conducted a literature review on the propensity of minority businesses to hire minority employees. According to *Black Job Applicants and the Hiring Officer's Race*, black applicants are more likely to be hired in firms where the hiring agent is African American opposed to establishments where the hiring agent is white. The hiring agent's race may affect the racial composition of the workforce in the following ways (Stoll, Raphael, Holzer, 2004):

- Hiring agents may rely on social networks to recruit new hires; the racial composition of these networks is likely correlated to the race of the hiring agent;
- The race of the hiring agent may have an affect on the race of new hires if the hiring agent exhibits a preference for his/her own race;
- Minority hiring agents send the signal to other minorities that there is a potential for advancement within the firm, despite racial background; and,
- Firms with minority hiring agents are perceived as being less discriminatory, thus attracting a greater number of minority applicants, as opposed to a firm with a white hiring agent.

Moreover, a survey conducted in Los Angeles County regarding the hiring practices of minority owned firms revealed that minorities have a tendency to hire workers within their own ethnic group. Key findings include (Romney, 1999):

- Nearly seventy five percent of Hispanic business owners described their workforce as being Hispanic; Forty one percent of black business owners hired within their own ethnic group; Nearly one third of Asian firms reported having a predominately Asian workforce;
- No more than three percent of any minority group described their workforce as mostly white;
- African American-owned businesses were the only firms likely to employ a predominately black workforce; only one percent of Hispanic firms, three percent of Asian firms, and four percent of white firms employed African Americans in any considerable amounts;
- Hispanics were the only ethnic group employed in large numbers by white owned firms; this is indicative of the demographic profile of the area, where Hispanics comprise 41 percent of Los Angeles County's workforce, an even higher proportion than whites; and,
- Employee recommendations are a key factor in the hiring process, especially for small companies that do not have human resource departments.

B. Implications for Baltimore

The industries identified in Section IV of this report, Computer Systems Design and Related Services, Scientific Research and Development Services, and Support Activities for Transportation, offer the most promise for minority entrepreneurs. According to the Bureau of Labor Statistics, the Computer Systems Design and Related Services industry is among one of the top ten fastest growing industries in the nation, with over 600,000 jobs expected to be added to the economy between 2002 and 2012. The Scientific Research and Development Services and Transportation Support industries are also expected to grow, though more moderately, with an expected addition of 35,900 and 31,500 jobs between 2002 and 2012.

The growth of these industries presents a considerable amount of opportunities for local entrepreneurs. In addition to their expected expansion, the three industries also rank among the top three with the most sizable minority presence, placing minority entrepreneurs in an excellent position.³ Consequently, because minority business owners have a higher propensity to hire a workforce with a similar ethnic background, the minority population of the Baltimore area stands to benefit.

³ Refer to Table 4 in Section IV of this report.

Additionally, nationwide employment in the Pharmaceutical and Medicine Manufacturing industry is expected to grow by 23.2 percent (68,000 workers) between 2002 and 2012. The national trend, in addition to the proximity of Johns Hopkins Medical School, Johns Hopkins Hospital, and University of Maryland Medical System, also present a plethora of opportunities for local minority entrepreneurs.

VI. IMPACT OF BIOTECH INDUSTRY ON LOW-SKILLED WORKERS

It is likely that the biotech industry itself will offer few employment opportunities to low-skilled workers; however, the suppliers to the industry offer such workers greater chances for success.

A. Low-Skilled Workers

OSG researchers cross-referenced the list of industries with minimal local presence, with the Department of Labor's occupational skill sets, to produce a list of skills that workers in those industries would need to be qualified for employment opportunities that would be generated by the expansion of the biotech industry.⁴ A list of low-skilled occupations and their respective skills are given in the tables below.⁵

Table 5. Low-Skilled Occupations by Industry

NAICS	Industry	Occupation
5111	News, Periodical, Book & Database Publishers	<ul style="list-style-type: none"> • Printing Press Machine Operators & Tenders
3254	Pharmaceutical & Medicine Manufacturers	<ul style="list-style-type: none"> • Chemical & Equipment Tenders • Crushing, Grinding, and Polishing Machine Setters, Operators and Tenders
4881-4884	Support Activities for Air, Rail, Road, and Water Transportation	<ul style="list-style-type: none"> • Reservation and Transportation Ticket Agents
441-444, 446-448, 451-452	General Retail, Except Food & Beverage & Miscellaneous	<ul style="list-style-type: none"> • Retail Salespersons
5415	Computer Systems Design & Related Services	<ul style="list-style-type: none"> • Billing, Posting, and Calculating Machine Operators
5417	Scientific Research & Development Services	<ul style="list-style-type: none"> • Agricultural Technicians • Biological Technicians

According to Table 6, the most important skills needed by prospective employees are: reading comprehension, math, operation & control, writing, and active listening. Except for retail sales positions, where a high level of speaking, math, and active listening skills are required, all occupations entailed low to mid level mastery of skills.⁶ A description of these skills is given in the table below.

⁴ This is not an exhaustive list of all the low-skilled occupations that could result from the expansion of the industries, however, it acts as a basis for describing the skill sets that are necessary to be employed in such positions.

⁵ The Department of Labor's O*Net Database classifies the importance of skills based on a 100 point scale. Only skills with an importance level of 40 or above are marked off in the table.

⁶ The level of proficiency in skills is based on O*Net's scale of 1 to 100. A score between 1 and 33 signifies a low level of mastery, 34 to 66 is indicative of a medium level of mastery, and 67 to 100 denotes a high level of mastery.

Table 6. Skills by Occupation

	Printing Press Machine Operators & Tenders	Chemical Equipment Tenders	Crushing, Grinding, and Polishing Machine Setters, Operators & Tenders	Reservation and Transportation Ticket Agents	Retail Sales Persons	Billing, Posting, and Calculating Machine Operators	Data Entry Keyers	Biological Technicians	Agricultural Technicians
Reading Comprehension	M	M	M	M	M	M	M	M	M
Math	M	M	L	M	H	M		M	M
Operation & Control	M	M	M			M	L	L	L
Writing		M		M	M	L		L	L
Active Listening				M	H			L	L
Equipment Selection	M	M						L	L
Science		M						M	M
Quality Control Analysis	M	M	M				L		
Equipment Maintenance	M	M	M						
Monitoring						L	L		
Operation Monitoring	M	M	M						
Social Perceptiveness				L	M				
Speaking				M	H				
Active Learning					M				
Critical Thinking					M				
Installation	M								
Instructing					M				
Judgment & Decision Making					M				
Learning Strategies					M				
Management of Personnel Resources	M								
Negotiation					M				
Service Orientation				M					
Time Management					M				
Troubleshooting		M							

L = Low Level of Skill Required
M = Medium Level of Skill Required
H = High Level of Skill Required

Source: Department of Labor: O*Net

Table 7. Description of Skills

<u>Skill</u>	<u>Description</u>
Reading Comprehension	Understanding written sentences and paragraphs in work related documents
Math	Using mathematics to solve problems
Operation & Control	Controlling operations of equipment systems
Writing	Communicating effectively in writing as appropriate to the needs of the audience
<u>Active Listening</u>	Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times

Source: Department of Labor: O*Net

VII. CAREER LADDERS FOR LOW-SKILLED APPLICANTS

The term “career ladder” is used to describe a series of occupations that are linked together by a common or complementary set of skills. They are especially important for workers who are looking to advance from low-skilled, entry-level positions, to higher skilled jobs. Career ladders are also beneficial to employers because they reduce turnover rates and improve employee retention.

Career ladders can refer to a set of occupations in a specific firm, within an entire industry, or across different industries. Career ladders are a collaborative effort between workers, firms, and workforce intermediaries⁷. Although they require the conscious effort and cooperation of all parties involved, the value added to the labor market is significant (WINS, 2003).

A. Single-Firm Career Ladders


Single-firm career ladders provide companies with an internal mechanism for recruiting for higher-tiered positions. A strong relationship between management, staff, and training providers give entry-level workers the opportunity to advance through the ranks and develop higher-order skills by filling vacancies through internal promotion.

Cape Cod Hospital in Hyannis, Massachusetts utilizes an internal career ladder program that gives workers in non-professional occupations the opportunity to become eligible for higher-level positions in the health care industry. For example, housekeepers are offered the chance to take classes that could make them eligible for promotion to higher-level positions as medical records clerks or pathology technicians. Cape Cod Hospital facilitates the development of its workforce by permitting employees to move between departments and across occupational groups, presenting workers with even greater opportunities for advancement. The hospital’s commitment to the success of their career ladder program has resulted in 80 percent of all job openings being filled by promotions from lower level positions (WINS, 2003).

⁷ Examples of workforce intermediaries include employer organizations, labor-management partnerships, community colleges, career centers, non-profit organizations, community organizations, and placement firms.

B. Single-Industry Career Ladders

Single-industry career ladders require a collective effort among several firms within an industry. This type of career ladder gives workers the training necessary to fill positions, not just within their respective companies, but also throughout the entire industry. These ladders create an even greater opportunity for advancement by facilitating the collaboration of numerous firms that would recruit workers through the career ladder process. Key participants in the single-industry career ladder process include employers, employee representatives, workforce intermediaries, and training providers.

 A non-profit workforce development organization, San Francisco Works, in collaboration with Volunteer Legal Services (VLS), the pro bono arm of the San Francisco Bar association, utilizes an industry-level career ladder to address labor shortages among local law firms. SFWorks and VLS contract with local institutions to provide comprehensive training programs to low-skilled, low-wage workers. Graduates of the training program are placed in a 12-week internship with one of 16 participating law firms. Since the program's inception in 1998, 63 graduates have earned full-time employment in the industry, in such positions as accounting assistant, billing clerk, case assistant, document clerk, receptionist, and records clerk, with wages ranging from \$24,000 to \$36,000. In 2003, SFWorks expanded the training program to include legal skills training. This addition will provide program graduates with the opportunity to learn additional skills that will prepare them for careers as paralegals, legal secretaries, and office administrators (WINs, 2003).

C. Cross-Industry Career Ladders

Cross-industry career ladders focus on giving entry-level workers in one industry the opportunity to advance to higher-level positions in another industry. Because basic skills, such as communication and business etiquette, are valued across all industries, cross-industry career ladders focus on their development to aid workers in advancing to upper level occupations. This type of career ladder requires workforce intermediaries to have strong relationships between the industry from which workers are recruited and the industry in which workers are obtaining higher-skilled jobs.

Education Data Systems, Inc. (EDSI) operates a "tiered employment" career ladder in various cities across the nation. EDSI's program facilitates the movement of workers from low-skilled, low-paying jobs in certain industries, to higher-skilled, higher-paying jobs different industries. Tier 1 occupations are entry-level positions that pay \$6.75 per hour and help participants develop work experience and skills. Program participants that maintain a 95 percent attendance rate and demonstrate skill development become eligible for Tier 2 employment. At this level, employees are paid between \$6.75 and \$9.00 per hour plus benefits, and have the ability to further develop their skill sets. Participants who meet attendance and skill development criteria become eligible for Tier 3 employment, where they obtain positions that have the potential to lead to a career, such as nurses assistants and bank tellers (WINs, 2003).

D. Implications for Biotech Suppliers

In the context of the biotech industry and its suppliers, career ladders offer a tremendous amount of potential to low-skilled workers who are looking to advance in the field. Single-firm career ladders offer a way for low-skilled workers to gain experience and develop higher-order skills in order to excel to supervisory or managerial positions. Single-industry career ladders provide workers with industry-specific experience that would benefit not only their current employer, but also other employers in the field looking to fill upper-level positions. Cross-industry career ladders offer the potential for employees of biotech suppliers to transition into the biotech field itself.

VIII. LOW-SKILLED WORKERS: EMPLOYMENT PROJECTION & WAGE

Table 8 details the hourly wage and projected growth in employment for the low-skilled jobs identified in section VI.A of this report. Agricultural Technicians, who typically earn \$14.08 per hour, are expected to realize the greatest expansion in employment by 2010. Chemical and Equipment Tenders, who earn the highest wage relative to the other positions, is expected to grow a meager 3 percent during the 10-year period.

Table 8. Low Skilled Occupations: Wage and Projected Change in Employment⁸

Occupation	Hourly Wage	'00-'10 % Change in Employment
Agricultural Technicians	\$14.08	42
Biological Technicians	\$13.76	20
Reservation and Transportation Ticket Agents	\$11.72	12
Retail Salespersons	\$8.34	12
Billing, Posting, and Calculating Machine Operators	\$13.17	10
Crushing, Grinding, and Polishing Machine Setters, Operators and Tenders	\$16.20	4
Printing Press Machine Operators & Tenders	\$14.81	4
Chemical & Equipment Tenders	\$19.56	3
Data Entry Keyers	\$10.99	3

Source: Department of Labor: O*Net

⁸ Median hourly wage information is for the Baltimore Metro Area. The projected percent change in employment from 2000 to 2010 is for the state of Maryland.

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