



**MERRIMACK VALLEY REGIONAL  
INNOVATION GRANT**

**ASSET MAP FOR THE  
MANUFACTURING SECTOR**

**MARCH 2010**

Prepared by Mt. Auburn Associates, Inc. on behalf of the Greater Lowell and Merrimack Valley Workforce Investment Boards and the New Hampshire Office of Workforce Opportunity in conjunction with a US Department of Labor Regional Innovation Grant designed to support sustainability of manufacturing in the Merrimack Valley Region.

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## INTRODUCTION

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### PURPOSE OF THE REPORT

The Merrimack Valley region of Massachusetts and New Hampshire has played an important role in the industrial history of the U.S. for over 200 years. The region was historically a major center of the country's textile and shoe industries. In the early 20<sup>th</sup> century, textile mills and shoe manufacturers could be found up and down the Valley, including in the cities of Lowell and Lawrence, Massachusetts, and Manchester and Nashua in New Hampshire. The region was a source of innovation in the industrial revolution and was home to the beginnings of the nation's labor movement. The region's rich industrial history has been recognized through the development of the Lowell National Historic Park, which tells the story of America's early industrial history.

Today the Valley remains an important manufacturing region. However, instead of textiles and shoes (the legacy of which still remains today), the region is now a center of medical device manufacturing, defense-related manufacturing, and electronics. These industries continue to provide the residents of the region with access to high quality employment.

Similar to the evolution of the manufacturing base, the population base of the region has evolved, but remains rooted in some of the same characteristics that defined it for the past 100 years. The region was historically home to European and Canadian immigrants who came to take advantage of the jobs in the mills. Today the region remains a home to new immigrants, now largely from Southeast Asia and Central and South America. The manufacturing sector continues to be an important entry point for employment for many of these immigrants.

Just as in the past when the traditional industries of the Merrimack Valley declined as a result of changing competitive conditions, today's manufacturers in the region are facing new competitive threats. While 30 years ago the region was competing with the southern United States, today the competition is coming from China and other low-cost global locations. But, the impact is the same. Companies that are the foundation of the regional economy are closing down, laying off workers, and outsourcing their production.

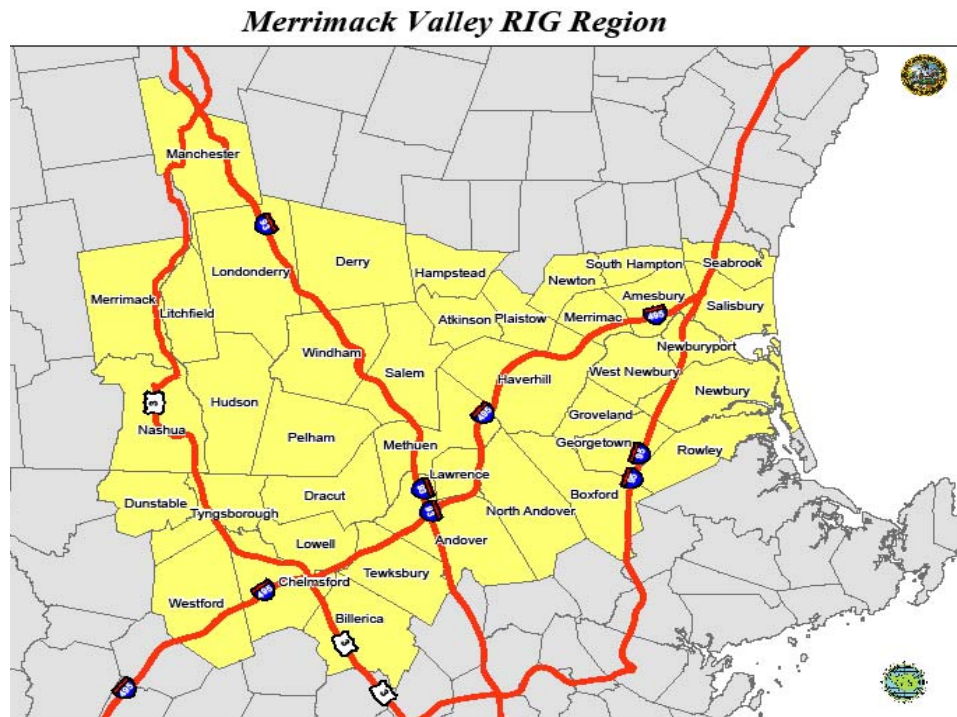
It is in this environment that the three Workforce Investment Boards (WIBs) that represent this Valley — the Greater Lowell Workforce Investment Board, the designated lead organization for this project, and its two partners, the New Hampshire Office of Workforce Opportunity and the Merrimack Valley Workforce Investment Board — came together to address the new challenges faced by the manufacturing sector. The three WIBs applied to the U.S. Department of Labor for a National Emergency Grant to better align the workforce and economic development resources in the region in light of the challenges presented by the decline in manufacturing.

This report represents a critical, initial step in responding to the regional challenges. Its purpose is to better understand the current workforce environment in the manufacturing sector. The report provides a comprehensive assessment of the needs of the manufacturing sector and the strengths and weaknesses of the support infrastructure related to that sector.

## METHODOLOGY

The Merrimack Valley Regional Innovation Grant (RIG) region includes all of the cities and towns covered by the Greater Lowell Workforce Investment Board and the Merrimack Valley Workforce Investment Board as well as 16 cities and towns in New Hampshire, including the cities of Manchester and Nashua. (See Map.)<sup>1</sup>

The time period between when the RIG proposal was developed and the grant activities were initiated was one of considerable economic upheaval. The region, like the rest of the United States, was being impacted by what is now being called the Great Recession. Not only were the region's manufacturers all dealing with a changed economic environment, but the region's workforce and economic development



providers were also scrambling to respond. Most notably, with the federal recovery funds available through the American Recovery and Reinvestment Act (ARRA), the priorities of the WIBs, the economic development agencies, and other educational providers focused on developing proposals and responses for their regions to meet the critical needs of businesses and jobseekers.

In this environment, it proved more difficult than anticipated to get those involved in the manufacturing sector — both employers and providers — to spend considerable time thinking about the future. As a result, the methodology for gathering data and information evolved over the course of this project. Specifically, employer input was primarily gathered through an online

<sup>1</sup> While some secondary data are available that conform to the boundaries of the workforce investment areas in Massachusetts, the 16 cities and towns included on the New Hampshire side are part of two different counties (Hillsborough and Rockingham) and part of different NECTA areas (New England City and Town Area). U.S. Census data, as well as other secondary data, are often provided on the basis of NECTA areas for New England. The Massachusetts WIB areas also do not correspond to the NECTA regions as defined by the U.S. Where possible, data are presented on the three sub-regions in the larger Merrimack Valley RIG region. However, some of the data are based either on counties (in the case of the New Hampshire employment data) or NECTA regions (some of the Census data).

survey, the number of focus groups was reduced, and individual telephone interviews became the most critical source of gathering qualitative information.

In the end, the consulting team was able to gather data and information from the following sources:

- Review of economic development and workforce reports on the region and on each of the states.
- Collection and analysis of secondary data from the U.S. Department of Labor, the Massachusetts Department of Labor, and New Hampshire Economic and Labor Market Information Bureau.<sup>2</sup>
- An online survey of manufacturers was completed. Relevant email contacts were collected for a total of 622 email addresses. This accounted for about one-third of total manufacturers in the region. Five hundred six emails were delivered, about 80 percent of those sent. Seventy-four responses were received for a response rate of about 15 percent of those receiving emails. These employers employed 11,000 individuals, about 12 percent of manufacturing jobs in the region. The survey respondents were representative of the industry makeup in the region.
- More in-depth, individual interviews were conducted with 19 manufacturers in the region.
- A focus group was convened with workforce development stakeholders from throughout the region that included 15 individuals.
- Individual interviews were conducted with 22 economic and workforce development stakeholders in the region.

## STRUCTURE OF REPORT

This asset mapping document looks at three areas of relevance to understanding the region's skills gaps:

1. the characteristics of the region's labor force and its relevance to the manufacturing sector;
2. the characteristics of the manufacturing sector in the region and its workforce needs; and
3. the characteristics of the region's workforce and economic development support infrastructure of relevance to manufacturing.

The report concludes with some of the key challenges and opportunities that can be addressed as part of the larger RIG Strategic Plan.

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<sup>2</sup> Regional employment and wage data in the report are from the U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages (QCEW). The geographic unit of analysis that yields the most accessible and reliable data from the QCEW is for the cities and towns included in the Greater Lowell WIB and Merrimack Valley WIB regions in Massachusetts and Hillsborough County and Rockingham County in New Hampshire. Note that Rockingham County stretches outside the Merrimack Valley RIG region and some of the QCEW data include these towns and cities. Individual company employment data are from Selectory, a proprietary database from Dun & Bradstreet.

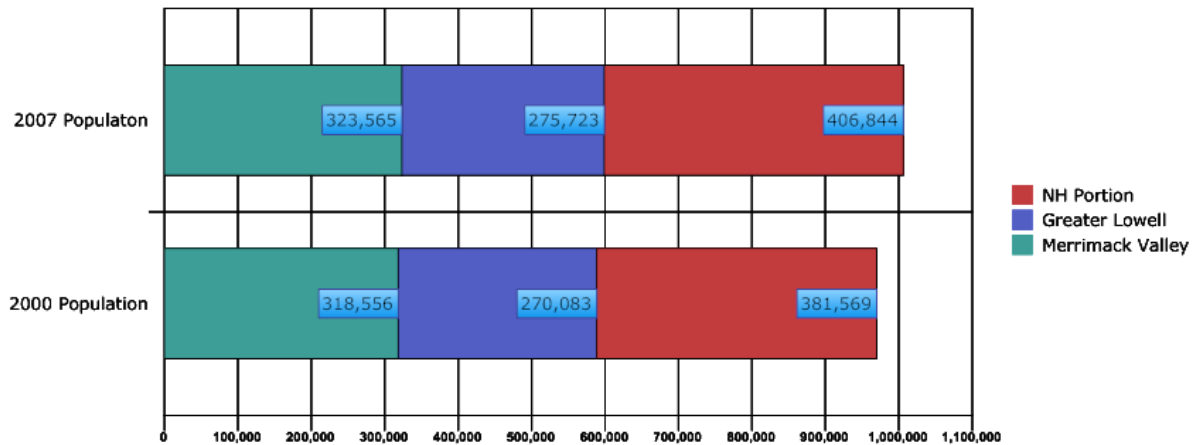
# PROFILE OF THE MERRIMACK VALLEY LABOR FORCE

## THE LABOR FORCE

### Demographic Overview

In 2007, the total population of the Merrimack Valley RIG region was slightly over one million. The largest numbers of residents live in the 16 cities and towns that are part of the New Hampshire portion of the region. This part of the larger region has also experienced the most growth. While both the Merrimack Valley WIB sub-region and Greater Lowell sub-region experienced very little population growth since 2000, the population in the cities and towns in the New Hampshire portion grew by close to 7 percent. (See Chart.)

Population of the Merrimack Valley RIG Region



While there are a number of commonalities in terms of the demographic profile across the region, there are also a number of differences.

➤ **Immigrants are an important component of the population base and are particularly concentrated in the larger cities of the region: Manchester and Nashua, New Hampshire, and Lawrence and Lowell, Massachusetts.**

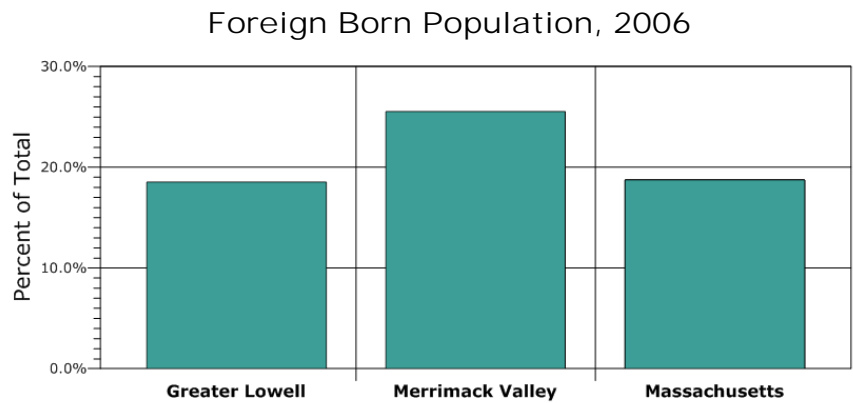
While a detailed understanding of the changing population base of the Merrimack Valley RIG region will have to wait until the completion of the 2010 U.S. Census, available secondary data provide evidence of the concentration of immigrants in the larger region. According to the 2000 U.S. Census:

- In 2000, 17 percent of the population of the Merrimack Valley WIB region were of Hispanic origin, compared to 6.8 percent statewide. In the city of Lawrence, Latinos made up the majority of the city's residents.
- In 2000, 7.8 percent of the population of the Greater Lowell region were Asian and about 5.9 percent were Hispanic or Latino. In the city of Lowell, in 2000, 16.5 percent of the

population were Asian, 14 percent were Hispanic or Latino, and 41 percent of the population over the age of five spoke a language other than English at home.

- In Nashua, New Hampshire, about 6 percent of the population in 2000 were Hispanic, another 4 percent were Asian, and 10 percent were foreign born. In the city of Manchester, about 9 percent of the population were foreign born and close to 20 percent spoke a language other than English at home.

More recent data are available for the Massachusetts WIB regions based upon the American Community Survey compiled by the Center for Labor Market Studies at Northeastern University. Its data provide evidence that since the 2000 Census, the region overall has continued to see a growth in immigrants. In fact, its analysis provides evidence that a significant portion of the growth in the working age population of the region (including both the Greater Lowell and the Merrimack Valley WIBs) was due to new immigrants.<sup>3</sup> (See Chart.)



Source: Northeastern University, Center for Labor Market Studies

While equivalent data are not available on the New Hampshire portion of the RIG region, there is evidence that the cities of Manchester and Nashua have also seen an increase in their racial and ethnic diversity over the past decade. For example, in Manchester, the percentage of Hispanic students in the school system increased from 7.6 percent to 13.8 percent between 2002 and 2009. During this same time period, in the city of Nashua the percentage of Hispanic students increased from 10.8 percent of the enrollment to close to 15.7 percent.<sup>4</sup>

➡ **The level of educational attainment varies across the region.**

The Merrimack Valley RIG region is one of large contrasts in terms of the educational skill levels of its residents. Data from the 2000 Census provide an overall picture of a region with a relatively high educational level when compared to U.S. averages. For example, while in the U.S. 80.4 percent of the population over the age of 25 had a high school degree or higher, in the RIG region the percentage was considerably higher. Similarly, the percentage of residents with a bachelor's degree or higher exceeded the U.S. average.

Data were collected for the Lowell and Lawrence metropolitan regions and Rockingham and Hillsborough counties in New Hampshire. While these do not match the exact geographic boundaries of the Merrimack Valley RIG region, they provide a good estimate of the region. In Rockingham County, 90.5 percent had a high school degree or higher and 31.7 percent a bachelor's degree or higher; in Hillsborough County, 87 percent had a high school degree or

<sup>3</sup> Center for Labor Market Studies, Northeastern University: *Labor Market Developments in the Greater Lowell Workforce Area* and *Labor Market Developments in the Merrimack Valley Workforce Area*, 2008.

<sup>4</sup> *New Hampshire Department of Education School District Enrollment Statistics*.

higher and 30.1 percent a bachelor's degree or higher; in the Lowell MSA, 83.7 percent had a high school degree or higher and 28.2 percent a bachelor's degree or higher. Finally, in the Lawrence MSA, 80.8 percent had a high school degree or higher and 28.2 percent a bachelor's degree or higher.<sup>5</sup>

More recent estimates from the American Community Survey compiled by Northeastern University show that the overall skill levels in the Greater Lowell WIB region and the Merrimack Valley WIB region exceed the U.S. average, but lag Massachusetts and New England.<sup>6</sup> (See Chart.)

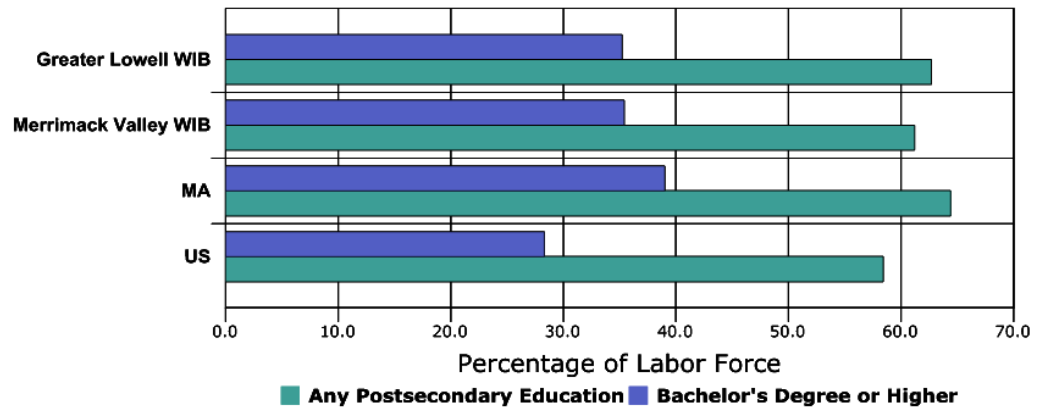
While overall skill levels are high, there is significant variation in the level of skills within the larger RIG region. For example, the percentage of residents over the age of 25 with a

bachelor's degree was very low in the major cities: Manchester, 22.3 percent; Lowell, 18.1 percent; and Lawrence, 10 percent. In contrast, some of the cities and towns in the region have over 30 percent of their residents with a bachelor's degree or higher.<sup>7</sup>

➤ **There is evidence that the labor market in the region may tighten over the next decade as a growing number of residents near retirement age.**

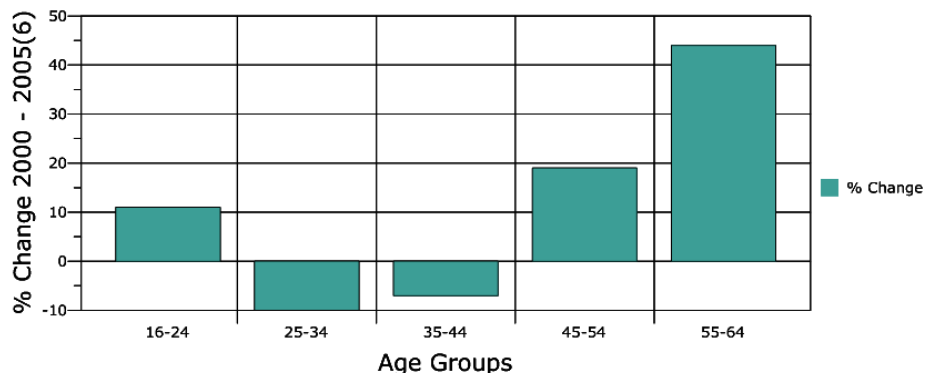
The age distribution of the region's population is a significant factor when looking at labor force availability. Evidence compiled by the Center for Labor Market Studies shows that the Massachusetts portion of the larger RIG region has an aging workforce, with the greatest population growth in the 45 years or older age group. This means that over the next

Educational Attainment, 2005-2006



Source: Northeastern University Center for Labor Market Studies

Changing Age Distribution: Greater Lowell WIB and Merrimack Valley WIB Regions



Source: Northeastern University, Center for Labor Market Studies

<sup>5</sup> 2000 U.S. Census.

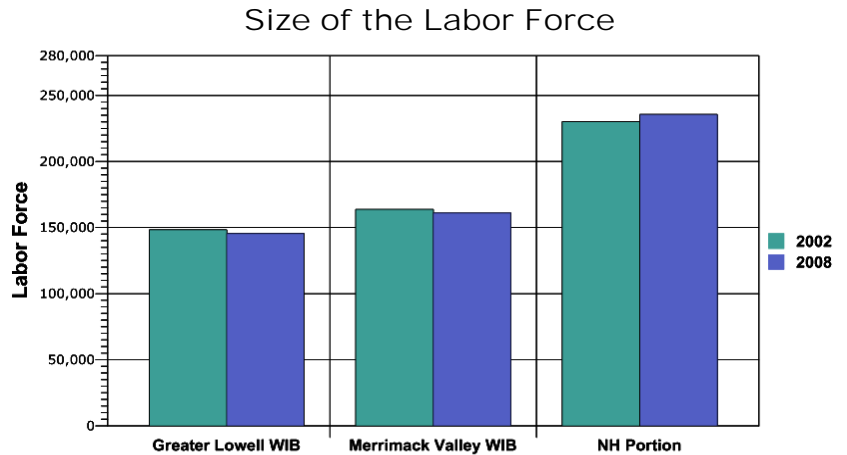
<sup>6</sup> Center for Labor Market Studies, Northeastern University: *Labor Market Developments in the Greater Lowell Workforce Area and Labor Market Developments in the Merrimack Valley Workforce Area*, 2008.

<sup>7</sup> 2000 U.S. Census.

decade there will be a growing proportion of the population that is of retirement age. This could potentially lead to significant gaps in the skilled workforce, an issue of relevance to the manufacturing sector.<sup>8</sup> (See Chart.)

## A Changing Labor Force Situation

The total size of the labor force in the Merrimack Valley RIG region has remained very stable between 2002 and 2008, staying at about 542,000 individuals throughout this timeframe. There was a very slight decrease in the Massachusetts portion of the region and a slight increase in the civilian labor force in the New Hampshire portion.<sup>9</sup> (See Chart.)

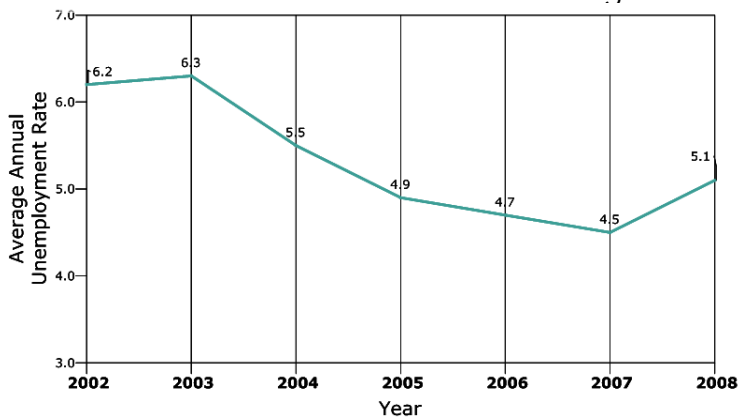


Source: NH Employment Security, Economic and Labor Market Information Bureau and Massachusetts Executive Office of Labor and Workforce Development

While the number of those in the labor force has remained stable, the region has seen some striking changes over the last decade. The communities in the Merrimack Valley RIG region experienced some significant economic declines in the recession in the early part of the decade.

However, between 2003 and 2007, the region was experiencing a rapidly declining unemployment rate and the number of unemployed residents declined by about 30 percent. (See Chart.) The result was a

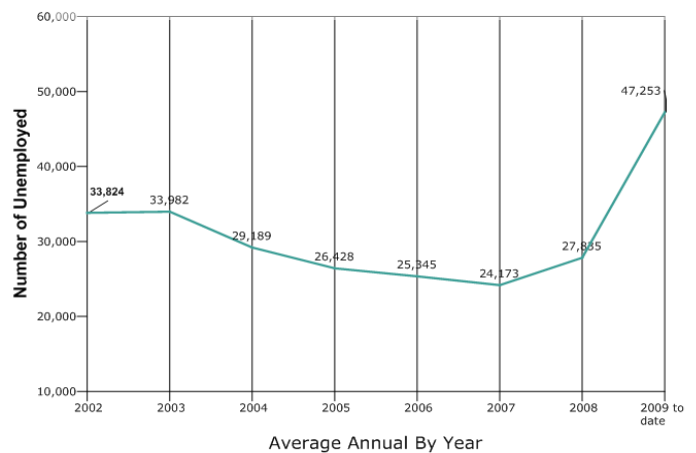
### Declining Unemployment Rate Through Much of the Decade in the Region



Source: NH Employment Security, Economic and Labor Market Information Bureau and Massachusetts Executive Office of Labor and Workforce Development

relatively tight labor market, with many employers finding it difficult to fill job openings, even in the manufacturing sector.

### Rising Unemployment Rate in the RIG Region



Source: NH Employment Security, Economic and Labor Market Information Bureau and Massachusetts Executive Office of Labor and Workforce Development

<sup>8</sup> Center for Labor Market Studies, Northeastern University: *Labor Market Developments in the Greater Lowell Workforce Area and Labor Market Developments in the Merrimack Valley Workforce Area, 2008.*

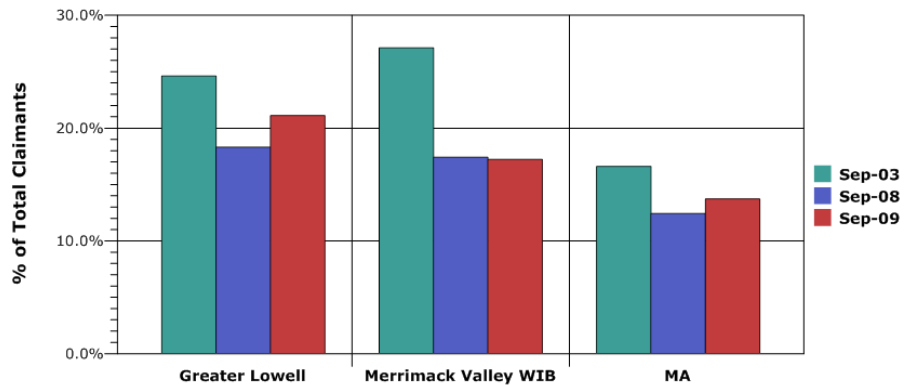
<sup>9</sup> Data on the employment status of the labor force are from the U.S. Department of Labor, LAUS Data 2002-2009.

The labor force picture changed dramatically by the middle of 2008 and the beginning of the Great Recession. The impact has been profound in the region. Looking at the entire RIG region, the average annual number of unemployed residents went from approximately 24,000 in 2007 to over 47,000 in 2009. (See Chart.) In the Greater Lowell sub-region, the number of unemployed has gone from 6,325 at its low in April 2008 to 12,412 a year later in April 2009. And, by September 2009, the number of unemployed had risen even further to over 15,000. The picture in the Merrimack Valley sub-region is similar, with the number of unemployed going from approximately 8,000 in April 2008 to 18,000 by October 2009.

This changing labor market situation creates a very different employment market in the region. With such a large number of unemployed residents, employers in the region have a greater pool of dislocated workers from which to choose when the economy turns around.

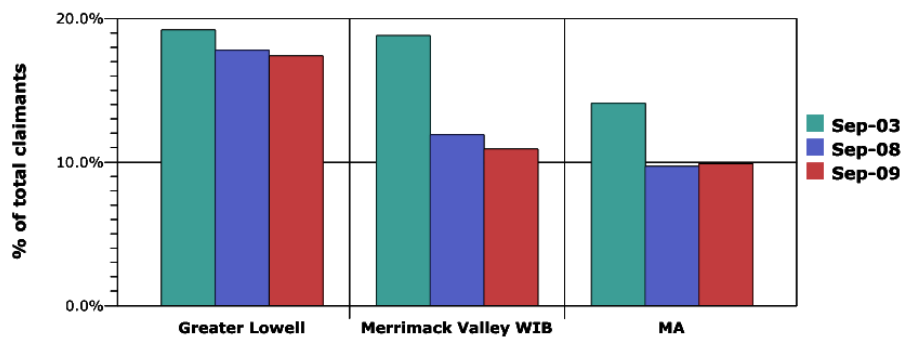
Also of relevance to the overall labor market situation are the characteristics of those who are unemployed. In the two sub-regions in Massachusetts, data on the characteristics of the unemployed show that the percentage of the individuals in these areas who are receiving unemployment benefits and who had been working in production occupations or in the manufacturing sector has, in fact, decreased since September 2003. In the case of the Merrimack Valley WIB sub-region, the actual number of claimants from the manufacturing sector was lower in 2009 than it was in 2003. In other words, in the current recession, while the percentage of claimants involved in manufacturing is a relatively high proportion of the unemployed, in percentage terms the increased level of layoffs in other sectors of the economy has meant that manufacturing is no longer as significant a source of unemployment in the region.<sup>10</sup> (See Charts.)

Percentage of Uninsurance Claimants Working in the Manufacturing Sector



Source: Massachusetts Executive Office of Labor and Workforce Development

Percentage of Uninsurance Claimants in Production Occupations



Source: Massachusetts Executive Office of Labor and Workforce Development

<sup>10</sup> Massachusetts Department of Workforce Development, *Annual Profile for Merrimack Valley Workforce Area*, May 2009 and *Annual Profile for Greater Lowell Workforce Area*, May 2009.

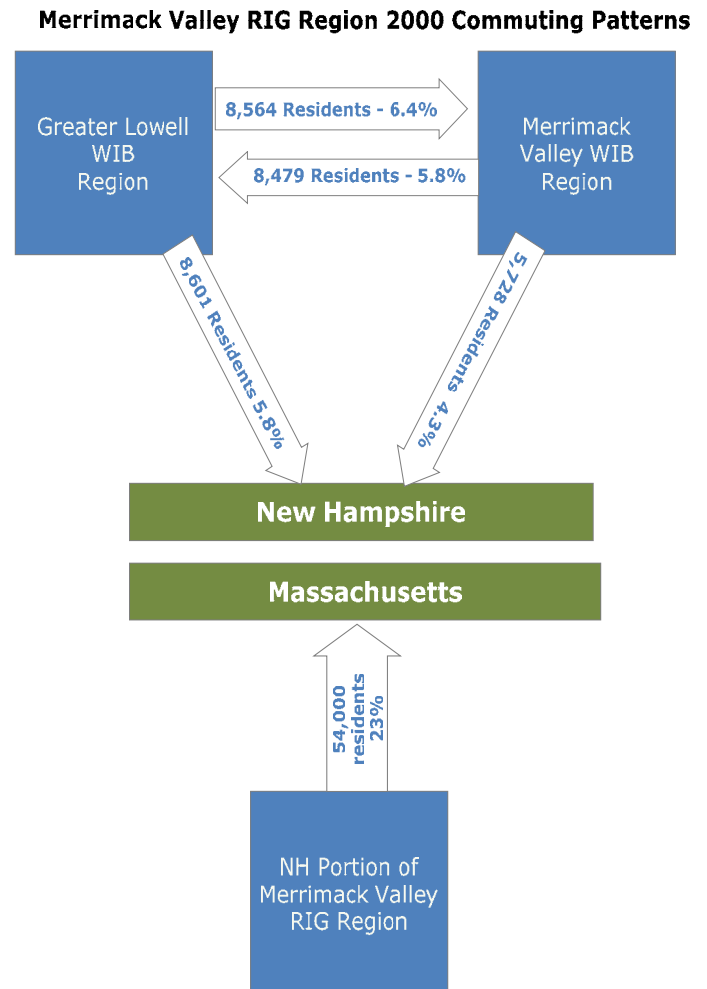
While regional data on the characteristics of the unemployed are not available in New Hampshire, in 2008, statewide, about 14.6 percent of the claimants worked in manufacturing. In terms of production occupations, there has been a rapid increase in the number of unemployment claims by individuals working in manufacturing, from slightly less than 1,000 in September 2008 to 3,000 by April 2009.<sup>11</sup>

## Mobile Talent Pool

When looking at the labor market conditions in the Merrimack Valley region, it is important to examine the commuting patterns of the residents. This has important implications for manufacturers in the region. In fact, it is when looking at where people live and where they work that the true regional nature of the larger Merrimack Valley region becomes clearer.

In 2000, over 10 percent of the residents of the Massachusetts portion of the RIG region worked in New Hampshire. There was also a relatively large number of residents in each of the Massachusetts sub-regions who lived in one WIB area and worked in the other.<sup>12</sup>

Of greater relevance, however, was the large number of residents living in the New Hampshire portion of the RIG region who worked in Massachusetts. While clearly not all of the residents of the New Hampshire portion of the RIG are working in the other two RIG sub-regions in Massachusetts, it is likely that a large number are. Moreover, it provides evidence that the labor pool in New Hampshire is a critical resource for employers in Massachusetts.



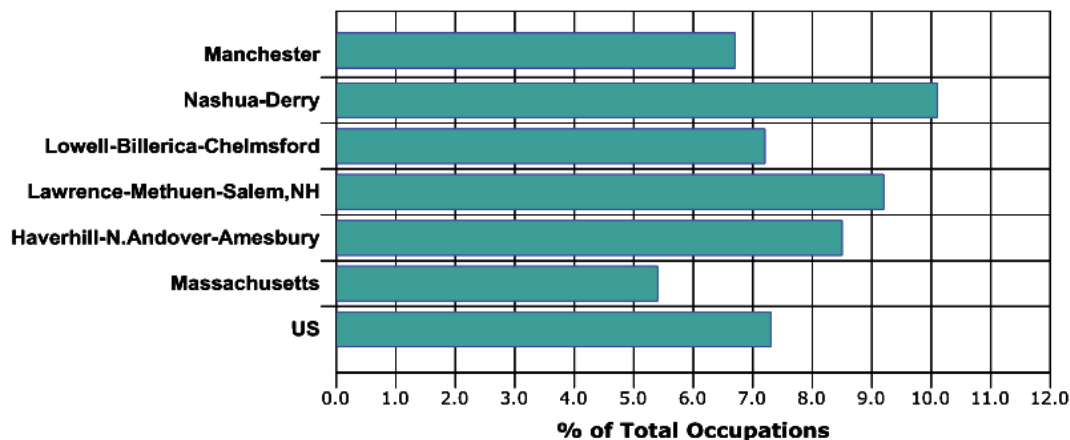
<sup>11</sup> New Hampshire Employment Security, Economic & Labor Market Information Bureau, *Where are We Now? New Hampshire's Economy in 2009*.

<sup>12</sup> Commuting data are based on analysis for the 2000 New Hampshire Census. Data on cities and towns in New Hampshire were compiled from New Hampshire's Economic and Labor Market Information Data System. Massachusetts' commuting data are from the regional profiles completed by the Northeastern University Center for Labor Market Studies.

## THE OCCUPATIONAL COMPOSITION OF THE WORKFORCE

Overall, the RIG region has a higher proportion of production workers in its labor force than is true of the state of Massachusetts, the state of New Hampshire, and the U.S. The Nashua-Derry area, in particular, has a high concentration of workers in production occupations.<sup>13</sup> (See Chart.)

Proportion of Production Workers by Sub-region



Source: New England NECTA Regions: NH Employment Security, Economic and Labor Market information Bureau and Massachusetts Executive Office of Labor and Workforce Development

An analysis of the occupational composition of the labor force of the region finds that there are specific occupations for which the region has very high relative concentrations:

- the RIG region has a particularly high concentration of first-line supervisors and production managers;
- the RIG region has an extremely high concentration of electrical and electronic equipment assemblers, machinists, and other metalworking and machine operators;
- the Haverhill, Lawrence, and Nashua NECTA areas have a very high concentration of extruding and drawing machine setters and operators; and
- the Lawrence area has a very high concentration of sewing machine operators and other textile production-related occupations as well as food production-related occupations.

<sup>13</sup> Current occupational data on the labor force are available based upon estimates from the May 2008 Occupational Employment Statistics Program of the U.S. Department of Labor. Unfortunately, the data are only available for states, counties, and NECTA areas for New England. While the NECTA geographic categories do not coincide exactly with the RIG region, they do provide a basic sense of the occupational composition of the region.

## KEY FINDINGS ON LABOR SUPPLY

➤ **The diversity of the labor force presents challenges for the region's businesses.**

The region is home to a large number of immigrants and residents with limited English language skills. This has in the past and can continue to present particular challenges in terms of the region's workforce needs.

➤ **While overall the RIG region has a relatively highly educated workforce, low skill levels in the urban centers are of concern.**

While educational skill levels remain a major issue for many of the residents of the urban centers in the Merrimack Valley RIG region, overall the RIG region has a relatively highly-educated workforce.

➤ **The region has a relatively high concentration of individuals with the skills needed by advanced manufacturers.**

The RIG region has a very high concentration of engineers and technical and managerial professionals. There are also skilled manufacturing workers, with the region having a high, relative concentration of machinists, electronic assemblers, and other metalworking and machine operating-related occupations. These skills will be critical to the long-term competitiveness of the region's advanced manufacturing sector and could be a competitive advantage for the region.

➤ **The aging of the workforce may prove to be a growing workforce issue of the next decade.**

Even if the manufacturing sector declines in terms of jobs, there may be many openings for skilled production workers as the existing skilled workers retire.

➤ **The high level of mobility in the regional labor force provides manufacturers in the Merrimack Valley RIG with a relatively deep labor pool from which to draw.**

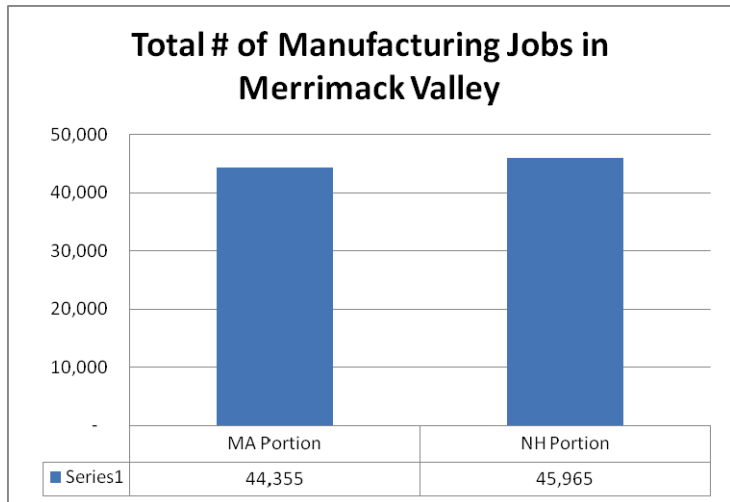
A large number of the residents in the New Hampshire area, which is growing more rapidly than Massachusetts in terms of population, already work across the border. Skilled production workers in the Massachusetts sub-region could also access the skilled manufacturing jobs that are located in New Hampshire.

# THE WORKFORCE NEEDS OF MANUFACTURERS IN THE MERRIMACK VALLEY RIG REGION

## OVERVIEW OF THE MANUFACTURING SECTOR IN THE REGION

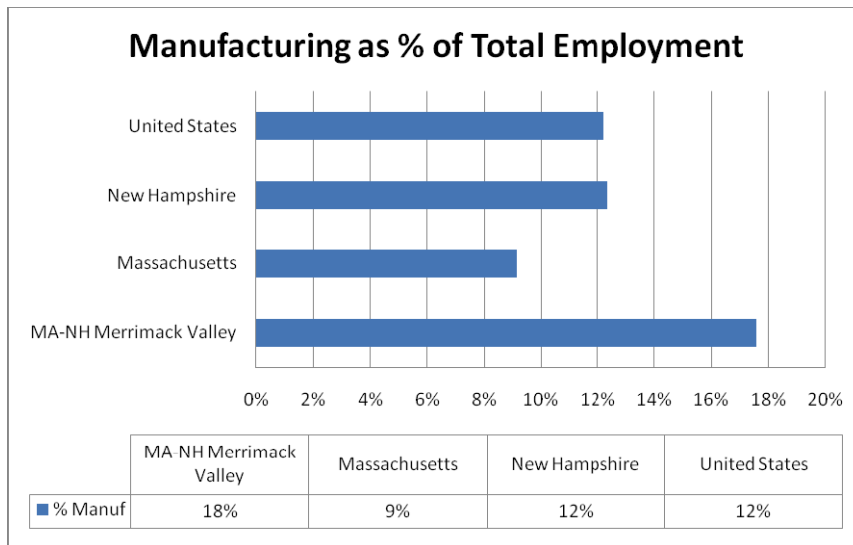
### Still an Important Wealth Generator for the Region

Manufacturing is critically important to the bi-state Merrimack Valley RIG region. This might seem to defy the prevailing narrative in the public realm, but the data support the industry’s significance. For one, there are 90,000 total jobs in manufacturing in the Merrimack Valley RIG region equally divided on each side of the border — the Massachusetts portion has 44,355 jobs, the New Hampshire portion 45,965 jobs.<sup>14</sup> (See Chart.)



More importantly, manufacturing is a key contributor to wealth generation in the 40-town, bi-state corridor. It provides over \$6.3 billion in earnings to workers and accounts for 18 percent of the region’s job base. That is one-third larger than the healthcare industry in

the region, 50 percent larger than education, and 75 percent larger than finance and insurance. Further, the region’s concentration of manufacturing activity, or industrial clustering, has



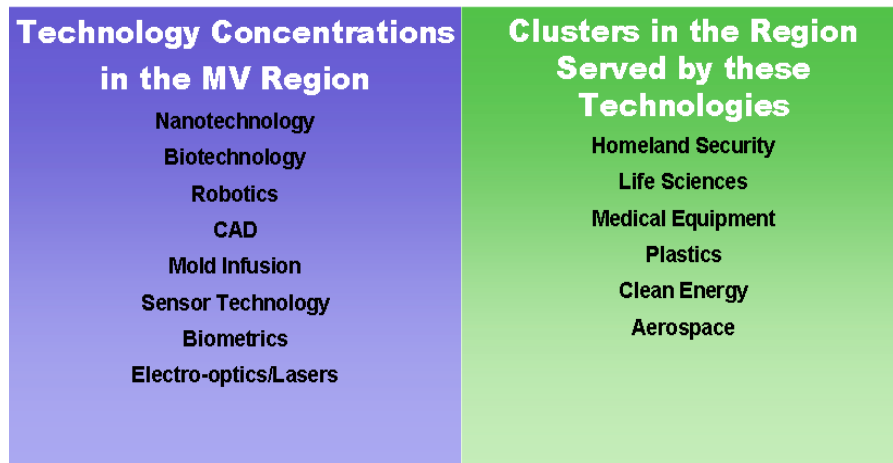
generated a highly developed set of shared assets and synergies that puts the industry in a position to maintain its competitiveness as it moves out of the recession. Manufacturing is 1.5 to two times more concentrated in the region relative to Massachusetts, New Hampshire, and the United States as a whole. (See Chart.)

The industry enjoys this concentration and will likely maintain a competitive advantage over other regions in the future

<sup>14</sup> Data on employment are from the U.S. Department of Labor Quarterly Census of Employment and Wages (QCEW).

because of the region’s innovation capacity, its position as a center of research, development, and design, and its talent base.

In fact, a large portion of the 2,123 manufacturing-based establishments located in the region deploy sophisticated technologies — nanotechnology, robotics, sensors, biometrics, electro-optics, and lasers — to spark innovation, maintain their competitive position, and grow markets. Of the 90,000 total manufacturing jobs in the region, roughly one-half are technology-based jobs. The presence of these technologies and innovation drives a number of manufacturing-related industry clusters that maintain a strong foothold in the region including homeland security and aerospace, the life sciences and medical equipment, plastics, and clean energy. (See Chart.)

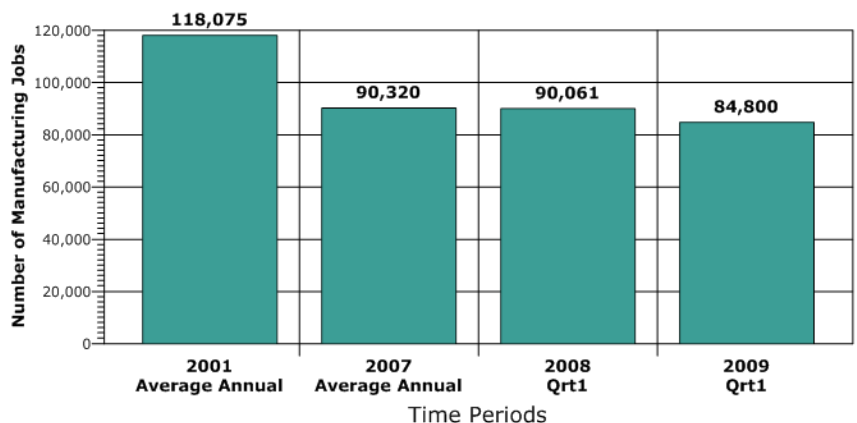


### Declines...but Really How Precipitous?

Despite these strengths, manufacturers in the region have not been immune from stiff global competition and a once-in-a-generation recession. Like many other places across the country, the region’s manufacturing industry lost many jobs, in part due to increasing productivity, the transfer of production to other parts of the country, and global outsourcing.

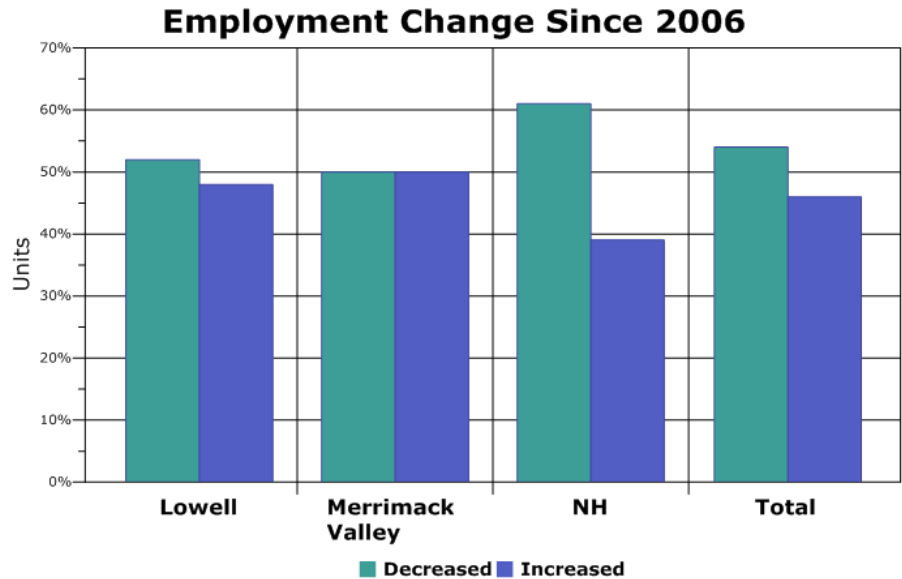
Loss of jobs from the recession has eroded the region’s manufacturing base by roughly 5,250 jobs, from the first quarter of 2008 through the first quarter of 2009 (for which the most recent data are available). That is on top of the 28,000 jobs that Merrimack Valley manufacturers shed prior to the recession, from 2001 to 2007. (See Chart.)

Declines in Manufacturing Employment in the RIG Region



These trends are supported by the results of the Merrimack Valley Manufacturing Survey of manufacturers in the region — over half the respondents reported a decline in employment since 2006. (See Chart.)

Employment data show that the largest declines came in computers, semiconductors and electronics, and traditional segments such as printing and paper. Much of the literature supports these levels of decline, and reports on the Massachusetts and New Hampshire economies indicate that many of these job losses came in the more automated, routine functions of manufacturing production that compete on low wages. Job categories that correspond include assemblers, fabricators, and other low-skilled production workers.



While the loss of jobs is a real concern, especially to those workers who became unemployed and those companies that lost some of their best talent, our research shows that the total loss of jobs in the region may be somewhat overstated. A portion of jobs reported as lost in manufacturing in official employment statistics may have actually just shifted to temporary employment and staffing agencies in the area and are thus being recorded in governmental data as service sector jobs.

This phenomenon, referred to as *the hidden manufacturing base*, is critical to understanding the manufacturing sector today. Over the last 15 to 20 years, and especially in the last ten years, many companies turned to staffing agencies such as Adecco and Manpower to help with hiring. Initially, most of this activity was to fill short-term, temporary positions. But, more recently, manufacturers have begun to turn to staffing agencies to fill a wide variety of their workforce needs. This trend has been particularly true among manufacturers in the Merrimack Valley. According to the results of the Merrimack Valley Manufacturing Survey, one out of every two manufacturers in the region uses a staffing agency. When asked how important staffing agencies were in their workforce recruitment process, a large percentage reported that they considered staffing agencies important

Importance of Staffing Agencies for Recruitment of Manufacturing Workforce				
	Do Not Use	Use, but of Minimal Importance	Use, Somewhat Important	Use, Very Important
Entry-level Positions	35.9%	12.5%	31.3%	20.3%
Silled Positions	33.9%	22.0%	18.6%	25.4%

Source: Merrimack Valley Manufacturing Survey, percentage of those responding to question

to their recruitment of both entry-level and skilled positions. (See Table.) Interviews also revealed that there are facilities where the entire workforce is hired and managed by a staffing agency and that some large manufacturers in the region have outsourced their human resource functions to staffing agencies.

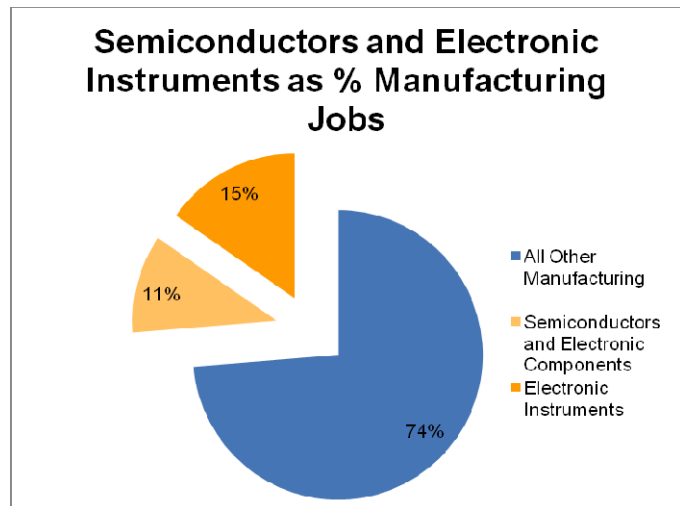
According to Mt. Auburn’s research, these hires can represent anywhere from one to 25 percent of a company’s total workforce — a hidden group of manufacturing jobs when tabulated for official employment statistics. One Lawrence manufacturer reported that his last 150 hires were through a staffing agency. Another manufacturer, from southern New Hampshire, reported that, on average, 4 percent of the company’s workforce is through a staffing agency. An interview with a staffing agency in the region revealed that it places roughly 1,000 individuals annually in manufacturing companies.

If a staffing agency is used, the jobs are coded as employment and income in the *service sector*, not as jobs or earnings in the manufacturing sector. Nationally, it is estimated that at least 25 percent of jobs in the “Employment Services Industry” are actually manufacturing-related workers. If this proportion was applied to the Merrimack Valley RIG region (which had about 12,000 jobs classified in the employment services industry), there are an estimated additional 3,000 manufacturing jobs in the region that are not accurately reflected in the data. This leads to an overall underreporting of the significance of the industry in the region and, if interviews conducted for this report can be generalized to many of the other manufacturers using staffing agencies, may overstate the overall decline of the industry.<sup>15</sup>

## Critical, Growing, Declining, and Emerging Segments

### Critical Segments in Manufacturing

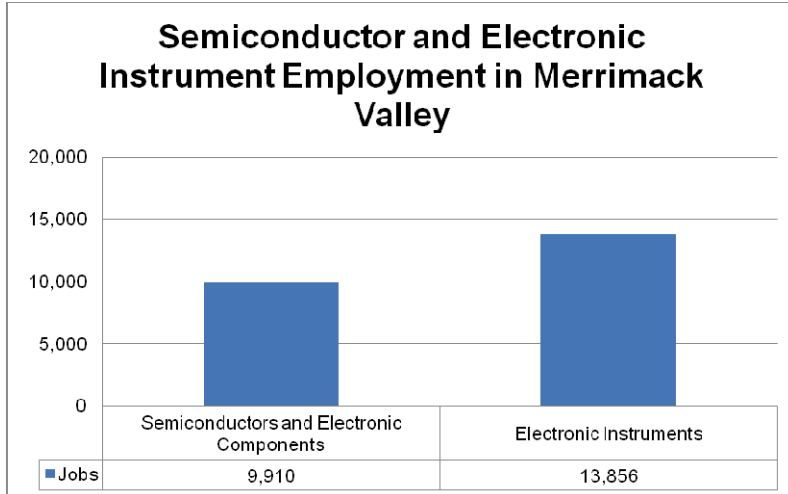
By far the largest segment of manufacturing in the region is **semiconductors and electronic instrument manufacturing**. There is a total of 23,700 jobs in these two industries combined, making up more than 25 percent of the manufacturing job base and representing 300 companies across the region. Of the 70 largest firms in this segment in the region, 50 are located in the Lowell-Nashua-Manchester corridor.<sup>16</sup> (See Chart.)



<sup>15</sup> Research on this phenomenon by Susan Houseman of the Upjohn Institute also finds that since the number of actual employees in the manufacturing sector is being seriously undercounted, the productivity data (which is calculated per employee) are being significantly overstated.

<sup>16</sup> Information on companies is based on data from the Selectory Business Database of Dun & Bradstreet.

Both segments are also highly concentrated in the region, gaining advantages from a clustering effect of similar suppliers, workforce talent, and research and development (R&D) capacity — all that help sustain and make the industry more competitive. The 9,910 jobs in the semiconductors and electronic components segment give it a concentration that is 4.9 times

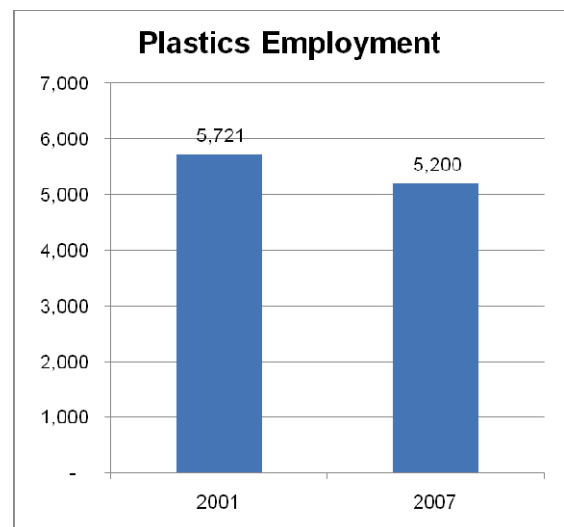


greater than the U.S. The 13,858 jobs in the electronic instruments segment give it a concentration that is 6.9 times greater. (See Chart.) Overall, these industries share technologies for production (e.g., sensor, optics, microwave, laser) and have close buyer-supplier relationships serving the homeland security, defense, aerospace, and computer clusters.

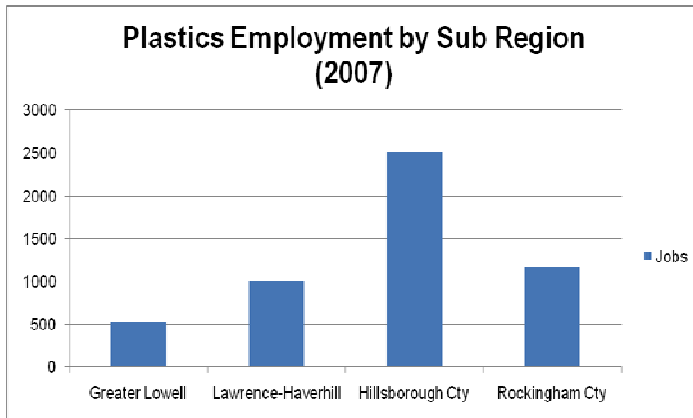
Although the region lost employment in the semiconductor segment over the past seven years, the electronic instruments segment gained jobs, almost offsetting the losses from the other. This trend will likely persist as it reflects a larger shift away from more automated functions of manufacturing as a whole (assembly of electronic components) and a higher importance placed on R&D and production of sophisticated electronic instruments. A number of favorable assets and conditions in the region make it likely that electronic instruments, and possibly semiconductors, will remain concentrated here. Some of these favorable assets and conditions include:

- presence of large contractors such as BAE, Elbit Systems, Raytheon, and GE that continue to spur innovation and demand services and products from a variety of small to mid-sized suppliers close-by;
- access to research institutions, labs, and technology shops in the region and greater Boston; and
- availability of a highly-skilled workforce adept at applying high-end technologies to product and automation improvements.

**Plastics** manufacturing is another one of the region’s larger segments of the sector. It consists of 83 companies and employs 5,200 workers, a concentration that is 50 percent greater than the national average. Since 2001, plastics companies have lost a net of 521 jobs. (See Chart.)



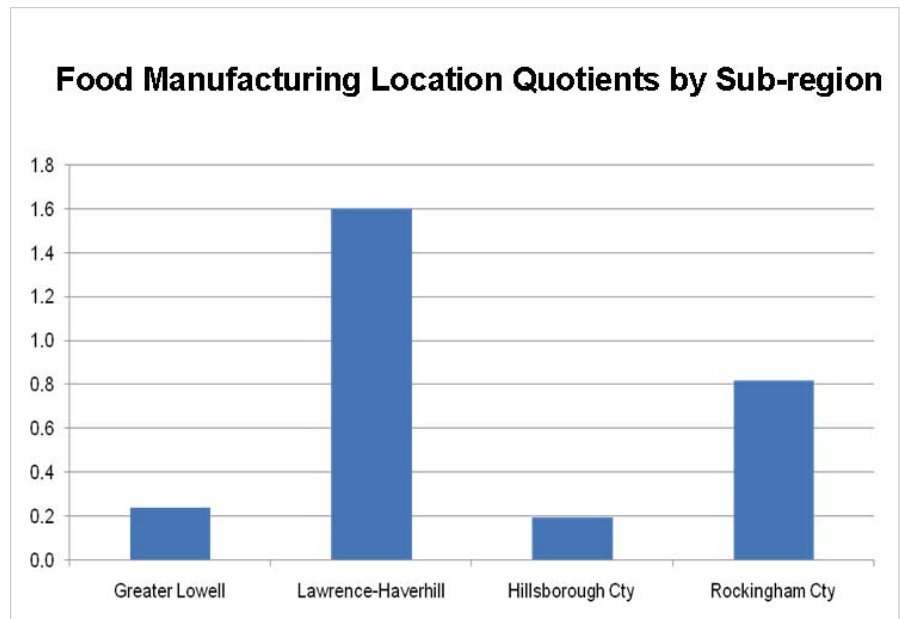
There is little commonality of product among the firms in the plastics segment, although it appears some of the larger firms produce injected molded and thermoformed plastic products.



Much of the plastics employment is concentrated in the southern New Hampshire portion of the bi-state region. Southern New Hampshire accounts for 71 percent of the plastics-related jobs, or 3,677 of the total 5,200 jobs in the greater region. (See Chart.)

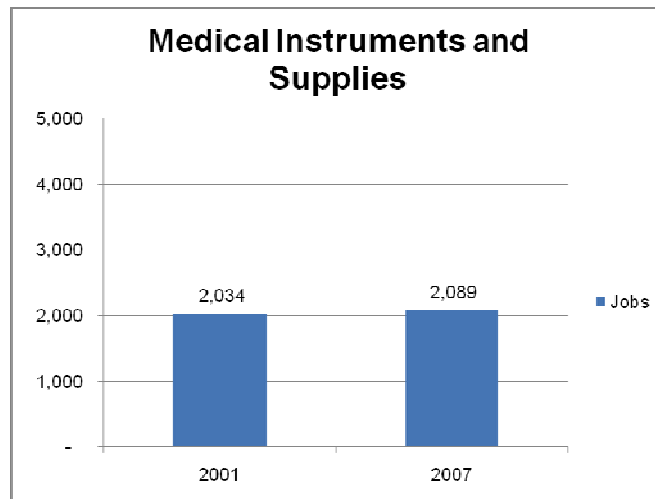
### Growing Segments in Manufacturing

**Food production** is one of two manufacturing segments in the region that experienced growth from 2001 to 2007. Companies in this segment grew their job base to a total of 4,387 jobs, or an 8.8 percent increase since 2001. This segment is comprised of 120 relatively small businesses focused primarily on perishable and prepared foods and high-end frozen items for consumers and restaurants. Most of the industry’s concentration in the region is in the Lawrence-Haverhill-Newburyport area. There are 47 food production companies with 2,350 jobs in this part of the Merrimack Valley — an employment concentration that is 1.5 times the national average. (See Chart.)



The Merrimack Valley’s food production industry is positioned to remain stable largely because of a national trend toward fresh food production. The region’s transportation access and proximity to Boston, New Hampshire, and southern Maine make it an attractive area to food manufacturers seeking quick, frequent access to major customer markets (e.g., greater emphasis on freshness and proximity to market). However, strong price competition in the industry is expected to place continuing pressure on manufacturers to automate and reduce labor costs. Nationally, job growth in food processing is expected to be low in the coming decade despite increased demand from population growth.

The region's **medical instruments and supplies** companies grew by 2.7 percent from 2001 to 2007, the only other growing manufacturing segment in the region. The segment's total employment base of 2,089 jobs is about half that of food production. Companies in the region manufacture medical devices and instruments and are involved in research, development, selling, and repairing healthcare equipment. The largest companies in this segment are Smith & Nephew in Andover (approximately 350 jobs), Atrium Medical in Hudson (275 jobs), and BdBiosciences in Billerica (200 jobs). (See Chart.)



Overall, the medical equipment and supply industry is tightly connected to **life sciences**, an emerging industry that includes a broader classification of the fields of biotechnology, pharmaceuticals, biomedical technologies, life systems technologies, nutraceuticals, cosmeceuticals, environmental, and biomedical devices. Moreover, there is indication that some of the region's high precision instrument manufacturers previously serving the computer and defense industry are also making electromedical and electrotherapeutic devices to reach new markets in the life sciences. Some of the larger companies transitioning to these markets include ZOLL Medical in Chelmsford (1,000 jobs) and Millipore Corporation in Billerica (585 jobs). The strongest concentration of these companies is in the Haverhill-Andover-Newburyport corridor of the Merrimack Valley.

Another indication of the growing emergence of the broader life sciences industry in the region is the number of **chemical manufacturing** jobs. In 2007, there were 3,604 jobs in chemical manufacturing, slightly down from 3,673 jobs in 2001. A portion of these jobs is centered on pharmaceutical and biological product R&D and fabrication.

There are three other emerging industries and technologies of note in the Merrimack Valley. The first among them is **nanotechnology**. This involves the building of devices on the scale of atoms and molecules. Currently, nanotechnology primarily involves basic research and development sponsored and supported by corporate, university, and federal collaborations. Greater Lowell was recently named as one of the five top "Nano Metro" areas in the U.S. by the Project on Emerging Nanotechnologies. The region is home to Konarka Technologies, a spinoff of UMass Lowell's incubator, and considered to be among the more commercially advanced nanotech companies. In addition, UMass Lowell is planning an \$80 million bio- and nano-manufacturing center on its campus. In the Lawrence-Haverhill-Newburyport area there are two companies classified as nanotechnology — Advance Reproductions Corporation in North Andover and Strem Chemicals in Newburyport.

The second emerging industry is **robotics** and, unlike nanotechnology, already has a solid track record of company growth in the region. Robotics is the convergence of engineering, electronics

production, and software. The corridor running from Burlington through Nashua is recognized as a strong corridor for robotics companies because of its concentration in each of these technologies and process capabilities. Companies in this segment include Intelitek in Manchester, Mobile Robots in Amherst, North End Technologies in Nashua, Harvest Automation in Groton, Brooks Automation in Chelmsford, and iRobot located just south of the region in Bedford. Just as important, many of the region’s larger manufacturers produce robots as part of their line of products servicing the aerospace and homeland security industries. These companies include BAE Systems and Insight Technologies, among others.

A third emerging industry of note is **clean energy**. National and state policies have focused on new investments that will be devoted to developing renewable energy sources, including wind, solar, biomass, and geothermal power, and other clean technologies. Most of these applications have manufacturing components, such as development of advanced materials, solar cells, and hydrogen technologies. A recent analysis of green employment by county put Middlesex County in Massachusetts as number one for green jobs in the nation. It has about twice the national average green employment as a percentage of total employment at 6.3 percent. Hillsborough County also has a high level of green employment at 4.3 percent of total employment; Essex County has 3.9 percent; and New Hampshire’s Rockingham County is at 3.2 percent.<sup>17</sup> Companies in the bi-state Merrimack Valley region already a part of this emerging segment include GT Solar in Merrimack, New Hampshire, Solectria Renewables in Lawrence, Nuvera Fuel Cells in Billerica, and Borrego Solar Systems in Lowell.

## OCCUPATIONAL AND TRAINING NEEDS OF THE SECTOR

### Occupational Composition of the Manufacturing Sector

While most people think that the manufacturing sector is dominated by blue collar jobs, in fact, a large proportion of jobs in the manufacturing sector are white collar and professional jobs. In Massachusetts, for example, production workers only comprise 42.6 percent of the workforce in manufacturing. (See Chart.) While production workers clearly make up the largest category of employees in the sector, manufacturers in the region have a workforce that also includes a large number of engineers, managers, and computer-related occupations.<sup>18</sup>

Occupational Composition of the Manufacturing Sector in Massachusetts	
	% of Total Jobs in the Sector
Production Occupations	42.6%
Office and Administrative Support Occupations	12.3%
Architecture and Engineering Occupations	9.5%
Management Occupations	7.3%
Transportation and Material Moving Occupations	5.4%
Computer and Mathematical Occupations	5.3%
Sales and Related Occupations	4.7%
Business and Financial Operations Occupations	4.1%
Other	8.9%

While data on the composition of the manufacturing base in the RIG region

<sup>17</sup> Gittell, Ross, Matt Magnusson and Matt Shump, *New Hampshire's Green Economy and Industries: Current Employment and Future Opportunities*, Whittemore School of Business & Economics, University of New Hampshire, January 2009.

<sup>18</sup> Massachusetts Executive Office of Labor and Workforce Development, *Massachusetts Industry Staffing Patterns*, September 2005.

are not available, given the makeup of the sector, it is likely that the occupational composition of the sector is more heavily weighted to engineering and other professional occupations. As noted, the largest industry within the region's manufacturing sector is related to computer and electronic product manufacturing. Nationally, this industry has the following occupational make-up:

- 30.8 percent in production occupations, the largest of which is electrical and electromechanical assemblers who comprise about 11 percent of total jobs in the industry;
- Engineers, many of whom are computer software engineers, comprise about 15 percent of all jobs in this industry; and
- management, business, and financial occupations account for about 21 percent of the jobs.

The Center for Labor Market Studies at Northeastern University examined occupational staffing patterns of the manufacturing sector in the Merrimack Valley WIB region and the Greater Lowell WIB region. This analysis, based upon estimates from the 2005 and 2006 American Community Survey, also found that a greater proportion of the manufacturing jobs in the region were in more highly-skilled occupational categories. (See Chart.)

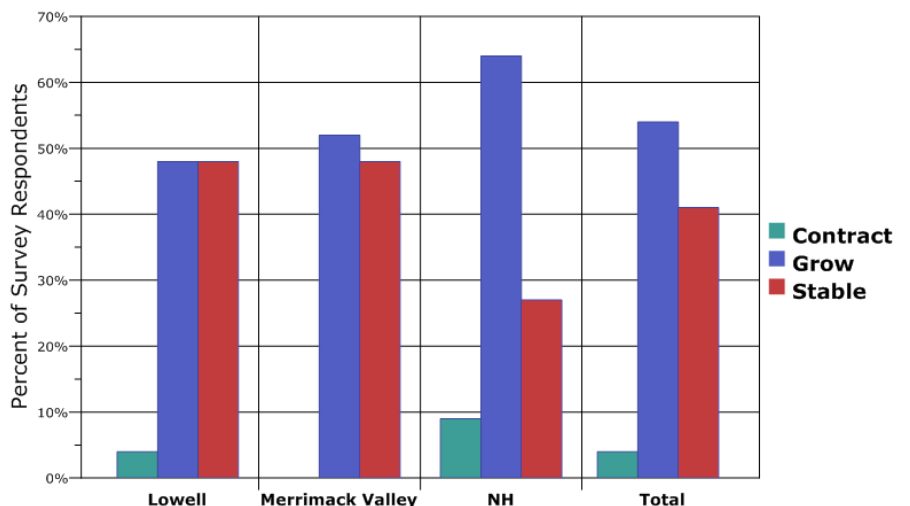
Occupational Composition of Manufacturing Sector in Massachusetts RIG Sub-regions		
	Greater Lowell WIB	Merrimack Valley WIB
College labor market and high level sales	43.2%	62.8%
Service and low level sales	2.6%	0.9%
Office and administrative support	10.5%	9.6%
High skill blue collar (construction, installation, & repair)	3.5%	1.7%
Production, transportation, and material moving	40.1%	24.4%

### Concerns for Future Workforce Supply and Skills Needed

Employers in the region are surprisingly optimistic about future prospects for employment growth. A majority of manufacturing employers responding to the Merrimack Valley Manufacturing Survey reported that they expected to grow jobs in the next three years. (See Chart.)

Yet, manufacturers also report that developing a high performance workforce is only one among many important factors affecting business success over the next three years. The importance of a high performance workforce followed the basic need of

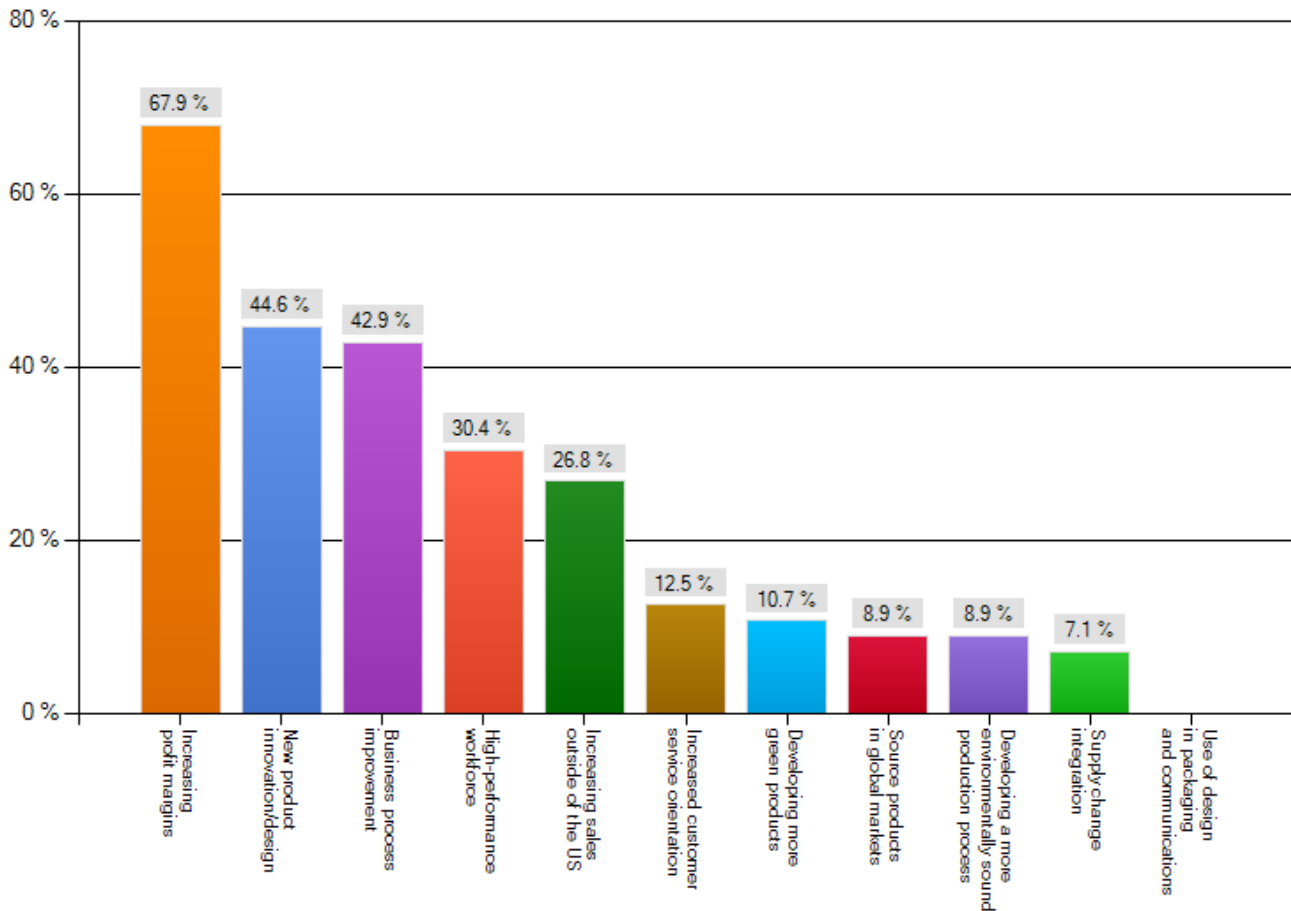
Employment Expectations in Next Three Years



Source: Merrimack Valley Manufacturing Survey

increasing profit margins (recovering market position from recession) and the need for process improvements and new product innovation/design. In short, many manufacturers in the region may not see as strong a link between a trained workforce and profits as others. (See Chart.)

**Most Important Factors Affecting Business Success Over the Next Three Years**



Source: Merrimack Valley Manufacturing Survey

Within this overall operating environment, manufacturers in the region point to some very consistent occupational, training, and workforce supply needs.

### **Unskilled, entry-level workers**

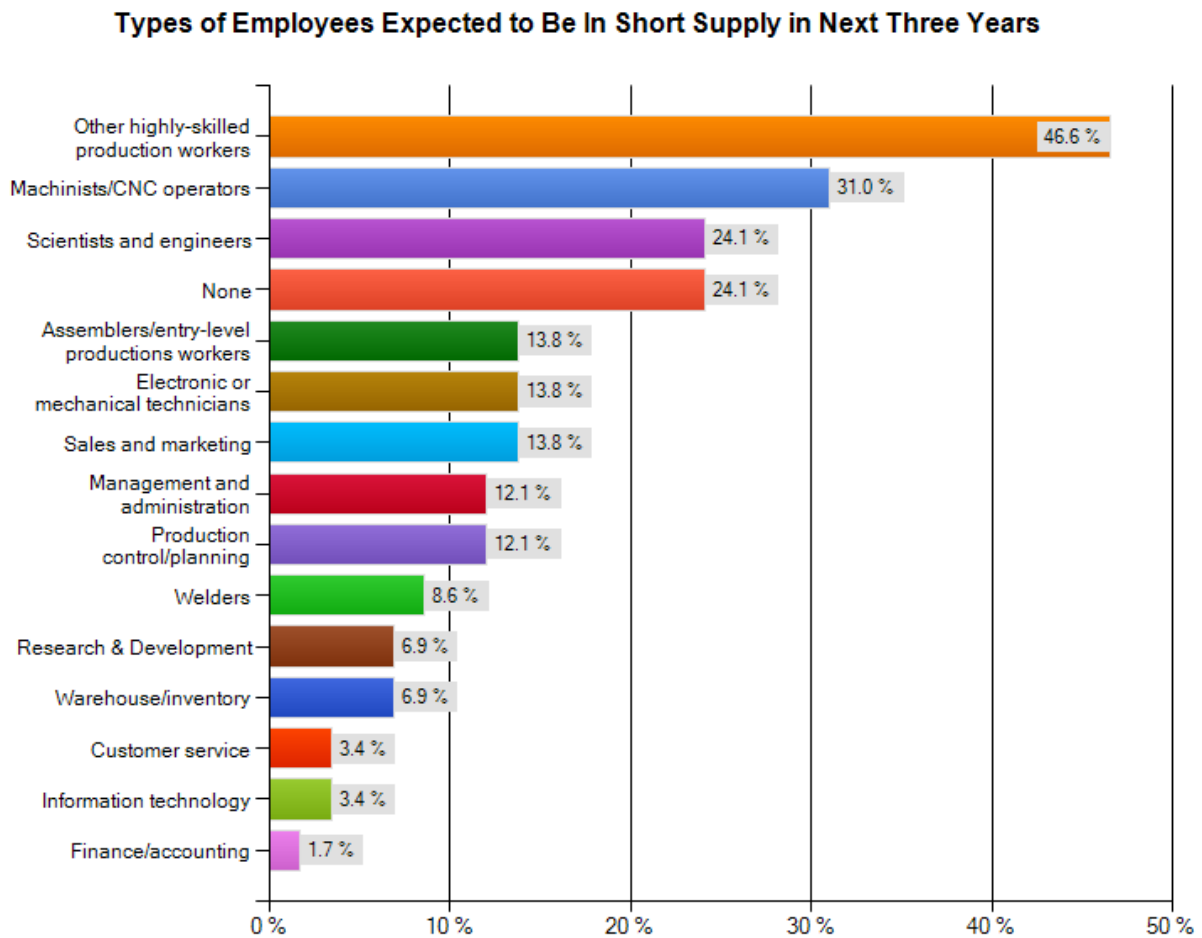
Overall, manufacturers do not place high priority on the need to expand or build the pool of unskilled, entry-level workers for the industry. In this economic environment, employers report that their current and future need for unskilled, entry-level workers is less significant. However, when the need does arise for unskilled, entry-level workers, manufacturers in the region often use staffing agencies. About 49 percent of the survey respondents reported using staffing or temporary agencies. Interviewees report that staffing agencies give the employer flexibility with hiring, serve as a first screen for potential employees, and provide an ample supply of potential hires on an as-needed basis.

There was some interest among manufacturers interviewed to firm up basic workplace literacy skills among new employees coming into a company. When asked to identify those types of skills needed among newly recruited employees, manufacturers identified basic employability skills and work ethic as a top priority. Related, there was some interest among manufacturers interviewed to adopt an employability credential for the industry, much like the National Association of Manufacturers' (NAM) recently endorsed the Manufacturing Skills Certification System. The credential is a standards-based approach to defining, measuring, and certifying readiness for entry-level work that can be applied to the manufacturing industry.

Finally, although not a primary source for entry-level workers, a subset of manufacturers surveyed reported using the career centers. When utilized, manufacturers use the career centers as a source for entry-level workers more so than as a source for more skilled, management, and other higher wage workers.

### Skilled production workers

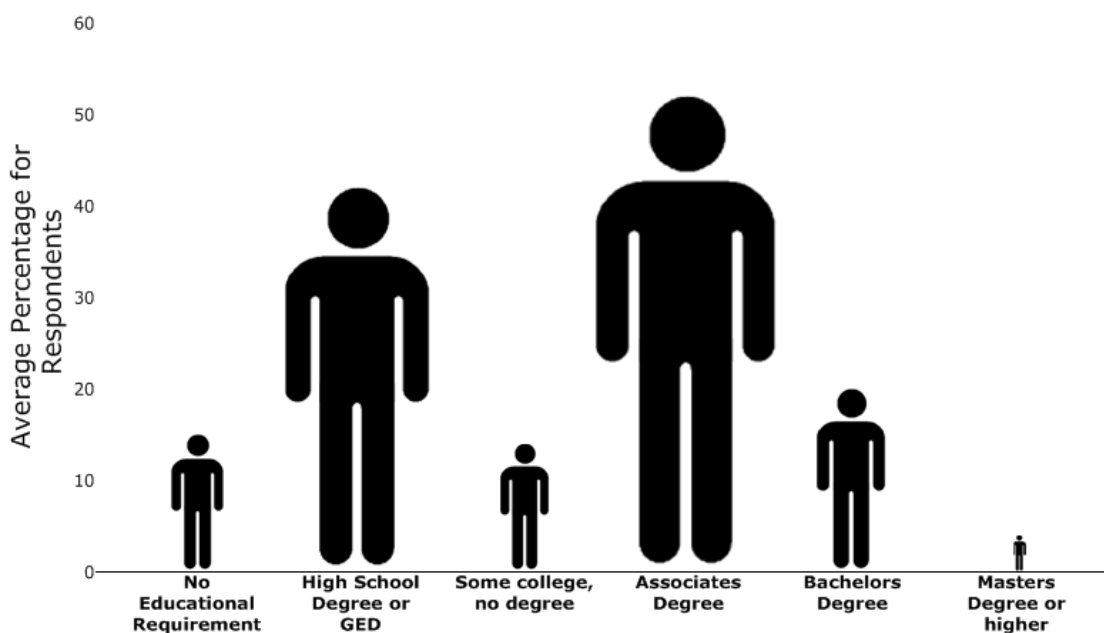
In contrast, according to the survey, a surprisingly high number of manufacturers are anticipating shortages in skilled production workers and machinists. This is a major concern for a number of manufacturers. (See Chart.)



Source: Merrimack Valley Manufacturing Survey

In interviews, manufacturers identified a number of technical level fields that correspond to this level of production worker in need, such as inspectors, engineering technicians, lab technicians, and machinists. Requirements for workers such as these can include an associate’s degree or a one-year postsecondary credential. As the results of the Merrimack Valley Manufacturing Survey show, most of the positions in manufacturing require at least a high school degree, with the largest percentage requiring an associate’s degree. (See Chart.)

Educational Requirements of Employees



Source: Merrimack Valley Manufacturing Survey

Manufacturers also identified curriculum content important to these positions, ranging from blueprint reading to fundamentals of operating CNC machines to trigonometry and other basic mathematical skills. Other important skills are the ability to work in teams and compliance with industry standards, such as the increasingly complex requirements manufacturers need to meet for defense contract work (e.g., ISO 9000, ISO 1345, ISO 14000) and life science procedures (Federal and Drug Administration protocols).

Companies interviewed and those that responded to open-ended issues in the survey of manufacturers also expressed a consistent concern over the thinning supply of skilled production and technician-type workers in the region, with many expressing a particular concern for the future supply of machinists. The reasons for the overall thinning supply of skilled production and technician workers varied. For one, many manufacturers say they have an aging workforce and retirements in the coming years will begin to siphon-off a significant portion of their existing skilled production workforce. They also say that popular media’s constant attention to the loss

of jobs, off-shoring, and negative competitive pressures in the industry has dampened worker interest to enter the industry and consider it as a career option. This effect has been particularly acute among the very youngest of the workforce pipeline. Employers that were interviewed say not enough (in fact, very few) high school students are choosing the industry as a career and that the most common narrative of the industry as dirty and dangerous turns students away. This, of course, does not match the reality of today's modern, high-technology orientation of manufacturing in the region, these same employers say. Employers also cite the relatively weak links with high schools as a detriment to building a future, skilled workforce. Industry-wide efforts to improve enrollment, develop training programs, and correct misperceptions among students are largely missing in the region.

### **High-wage, skilled workers**

When it comes to the highest skilled and educated workers in the bi-state labor market, there appear to be some differences in level of demand defined by state lines. Manufacturers in southern New Hampshire, for example, report some level of difficulty in recruiting engineer-type workers with four-year degrees or greater. This is, in part, because they are competing with bigger companies and a higher paid workforce in Massachusetts. Some companies that were interviewed also report that distances between their southern New Hampshire location and the workforce is too great to attract the right type of skilled, educated engineers needed. Recruitment can take a long time for these higher level engineers. For their part, manufacturers on the Massachusetts side of the border generally say they are pleased with the level and quantity of highly-educated workers for the industry. They have access to workers with bachelor's and graduate degrees coming from Boston's world-renown universities, engineering programs, and the trained workforce residing in the city and its close suburbs.

### **Inconsistent and Underdeveloped Employer-Workforce Provider Connections**

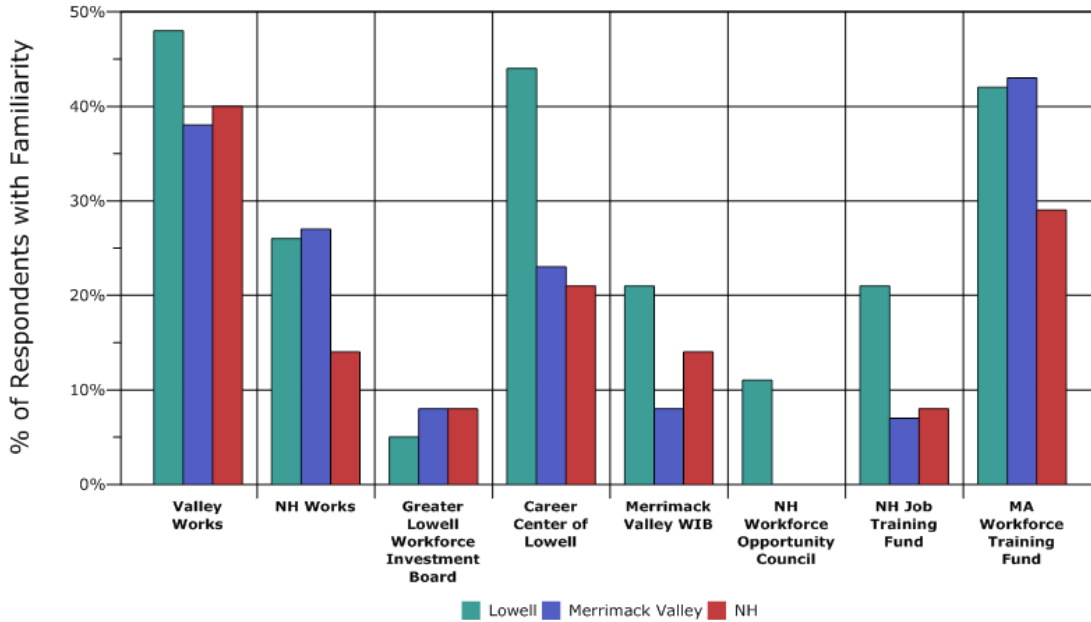
Manufacturing employers in the region have a mixed relationship with education, training, and employment resources in the Merrimack Valley. For one, manufacturers from our interviews and respondents to the survey say they have limited familiarity with the public workforce system. But, at the same time, they also report a strong desire to improve relatively weak connections to the region's high schools and build upon somewhat underdeveloped relationships with the area's colleges and universities. Other training resources, such as adult education programs and training from community-based organizations, are rarely utilized.

### **Public workforce system**

The manufacturing survey shows manufacturers in the region have limited familiarity with the public workforce system. Roughly 20 to 45 percent of the manufacturers surveyed recognized or were familiar with the career centers, whether in Lowell, the lower Merrimack Valley, or southern New Hampshire. A smaller share of the industry was familiar with the Workforce Investment Boards in each region, ranging from roughly a 15 percent familiarity with the Lower Merrimack Valley WIB, to 7 to 8 percent with the Greater Lowell WIB, and under 5 percent with the New Hampshire Office of Workforce Opportunity. The Massachusetts Workforce Training Fund was recognized by 40 percent of Massachusetts manufacturers surveyed. The

New Hampshire Job Training Fund was recognized by a smaller share of New Hampshire companies — less than 10 percent said they had familiarity with it. (See Chart.)

Familiarity with Public Workforce System



Source: Merrimack Valley Manufacturing Survey

### High schools and technical schools

Area manufacturers have more familiarity with Merrimack Valley high schools and technical schools. Of the 74 companies responding to the manufacturing survey, 20 state they have received students from or are working with local vocational and secondary schools. Those mentioned include Whittier Regional Vocational Technical High School; Greater Lowell Technical High School; Greater Lawrence Technical School; Shawsheen Valley Technical High School; Manchester School of Technology; Nashoba Valley Technical High School; and Alvirne, Milford, and Nashua high schools. With that said, interviewed

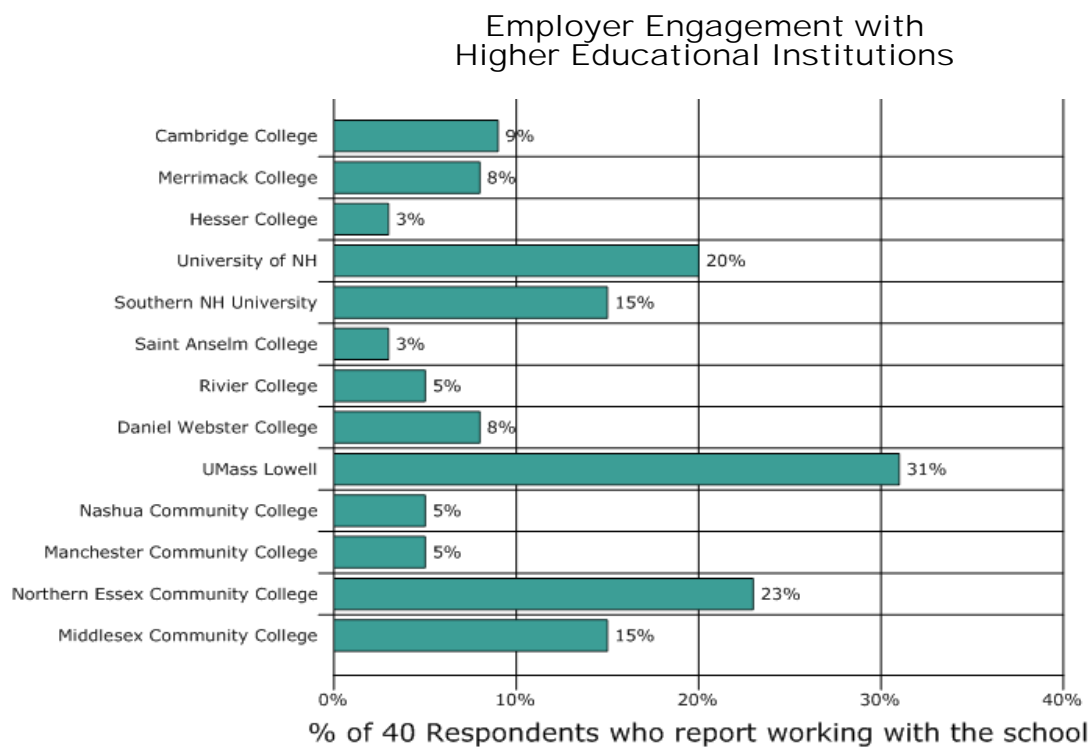
manufacturers also say that the region’s industry and secondary schools could be working more closely to create wider interest, good programs, and a pipeline of local talent for the career paths in the sector. There is also concern that the level of engagement is not enough to address the

**Internship Programs**  
 An exception to the lack of internship programs in the region has been the efforts of one of the region’s larger defense manufacturers. This company developed an internship program with area high schools that started out with a number of other companies in the industry. It was a close partnership with guidance counselors, administrators, and company officials. But, after initial planning, all but participation from the largest manufacturer faded. This was due, in part, to the lack of resources, support, and jobs from the smaller companies in the effort

underlying shortage of career information, ongoing and updated training needs adaptable to industry technologies and practice, and the connections to students, guidance counselors, and employers that the industry needs.

### Two- and four-year colleges and universities

Industry relationships with postsecondary institutions are more mixed. On the one hand, companies most frequently cited UMass Lowell as the postsecondary institution with which they had worked or were aware. In the survey of area manufacturers, 31 percent of respondents reported some connection to the university — through student training or otherwise. Companies interviewed reported linking workers to specific classes at the university (such as plastics engineering) to drawing on the technical workers that the school produces and having a general connection to the engineering program. (See Chart.)



Outside of UMass Lowell, the level of employer connections to area postsecondary institutions is less certain. Other colleges and universities in the Merrimack Valley get mentioned sparingly, both in the manufacturers' survey and one-on-one interviews. For example, it is not clear if area manufacturers have strong connections with area community colleges, a seemingly important workforce resource for the industry and its need for technically-trained workers. Further, a host of companies interviewed indicated that despite some preliminary connections with community colleges in their area, industry-education relationships never materialized. Others point to the availability of information about offerings and resources as a challenge to closer connections to and more utilization of colleges and universities in the region.

## Interest in partnerships

Despite the mixed industry connections to high schools, technical schools, and colleges and universities in the region, manufacturers recognize the benefits of building stronger relationships. Interviews revealed an overall consistent and strong interest in developing partnerships and improving information exchange with the region's postsecondary institutions. Seven of the 20 companies interviewed explicitly stated a strong desire to develop better relationships with the region's community colleges and universities — to identify common interests and programs, to explore education and training for existing workers, and/or to build a better pipeline of skilled workers for their companies. Eight of the 20 companies interviewed said they wanted to build deeper relationships with the high schools and technical schools. This interest centered on a

*We are interested in building stronger connections between the company and the community colleges. Right now there are relationships, but not partnerships.*

Manufacturer in Southern New Hampshire

desire to increase student knowledge about career choices in the industry and provide up-to-date and industry-relevant curriculum and training to educators in the schools.

## KEY FINDINGS ON TRENDS AND WORKFORCE DEVELOPMENT NEEDS OF MANUFACTURERS

### ➤ **The future economic health of the Merrimack Valley RIG region depends upon the continued competitiveness of its manufacturing base.**

Manufacturing remains a critical component of the Merrimack Valley RIG region, and the jobs and wages associated with the sector are critical to the region's economic vitality now and in the future.

### ➤ **There is a mismatch between the perceptions of manufacturing in the region and the reality.**

While the region has seen its share of manufacturing plant closures and layoffs, the region has a relatively diverse and innovation-based manufacturing sector that is serving more stable sectors such as homeland security, defense, life sciences, and environment industries. Employers in the manufacturing sector in the region remain relatively optimistic about the future. Moreover, the level of job losses has not been as high as commonly reported since employment through staffing agencies, a growing component of workforce for manufacturers in the region, is not counted as manufacturing employment.

### ➤ **A skilled workforce is just one of the multiple success factors critical to manufacturers.**

While close to one-third of the manufacturers in the region reported that having a high-performance workforce was critical to their future vitality, other factors such as new product innovation and business process improvements were ranked as more important.

- **Basic workplace competency skills, such as basic work readiness, industry familiarity, and work ethic essentials are seen as a critical gap in the region.**

While not necessarily specific to the manufacturing workforce, many employers report that the entry-level workforce is not prepared for the world of work and lacks some of the basic skills needed on the job.

- **Employers are concerned that in the long run there will be a gap in the supply for skilled production workers.**

With the aging of the workforce and the decline in the training pipeline for skilled production workers, employers are concerned that there will be a deficit in the region for technician-level production workers and engineers, such as one- and two-year credentialed machinists, industrial engineers, and lab technicians.

- **The region's manufacturers are not effectively utilizing the available resources in their states and regions.**

The region's manufacturers had limited familiarity with the public workforce system and did not make extensive use of the region's technical schools, community colleges, and community-based providers. However, there was a strong interest amongst manufacturers in developing partnerships and improving information exchange with the region's high schools and higher educational institutions.

# THE SUPPLY SIDE — PREPARING THE WORKFORCE FOR JOBS IN THE MANUFACTURING SECTOR

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## OVERVIEW OF MANUFACTURING WORKFORCE RESOURCES

As part of the environmental scan for the RIG process, Mt. Auburn Associates conducted an assessment of the workforce development resources in the region that can be drawn upon to support a strategy of investment in the manufacturing sector. This assessment included:

- an asset inventory that identifies the existing entities within the region that a) are currently working to train and place people in manufacturing or b) have the infrastructure and potential capacity to work with manufacturers to help individuals develop the skills needed for future manufacturing jobs;
- a focus group of education and training providers in the region; and
- individual interviews with representatives of vocational-technical schools, community colleges, economic development agencies, and community-based organizations.

This section describes the education and training resources catalogued by Mt. Auburn's asset inventory and that are used, directly and indirectly, by manufacturing companies seeking workers. They include:

1. Public vocational-technical high schools
2. Institutions of higher education, including two- and four-year colleges
3. Community-based and nonprofit education and training providers
4. Proprietary vocational and technical programs
5. Staffing/temporary agencies
6. Resources of the public workforce system
7. Economic development and planning agencies

Each type of organization and its role with regard to manufacturing training is described below. An analysis of the region's education and training resources in terms of their ability to train individuals along a spectrum of skill levels and industry occupations follows.

### Public Vocational-Technical High Schools

Vocational-technical high schools traditionally have been an important source of manufacturing-related training for the region's residents. The region is home to nine such schools, all of which offer programs of study that relate to manufacturing.

Though courses are bundled in a variety of ways within each institution, many offer machine technology, metal fabrication, pre-engineering, biotechnology, computer aided drafting and design (CADD), and others. Five of the nine schools are in Massachusetts and four are in New Hampshire.

It is important to note that three of these schools are unable to offer programs in basic machining because they lack machine shops (Greater Lawrence Technical School, Greater Lowell Technical High School, and Salem Vocational Center at Salem High School). This is a significant gap in the infrastructure needed to develop a labor pool to fill the future expected demand specifically for machine tool operators and skilled machinists. Whittier Regional Vocational Technical High School has close to 100 students in manufacturing-related classes as well as adults who attend machine technology and welding classes in the evening. According to the school, it is able to place all students who graduate from the machine technology program in jobs. In fact, there is considerably more demand for Whittier’s students from local companies than it can meet with only one instructor available to teach these classes.

School	Location	Machine Shop	Specific Courses of Study Related to Manufacturing
Greater Lawrence Technical School	Lawrence		Metal fabrication and joining technologies; biotechnology.
Greater Lowell Technical High School	Tyngsboro		Technical programs include CADD Design, electrical and electronics technologies.
Shawsheen Valley Technical High School	Billerica	•	Technical programs include electronics, machine technology, metal fabrication, CADD.
Whittier Regional Vocational Technical High School	Haverhill	•	Machine technology, robotics, CAD, metal fabrication. Evening courses for adults in machine technology and the trades.
North Shore Technical High School	Middleton	•	Machine tool technology.
Manchester School of Technology	Manchester	•	Robotics and machine tool technology.
Salem Vocational Center (at Salem High School)	Salem, NH		CADD
Nashua Technology Center	Nashua	•	Machine technology program, based at NTC/Nashua South High School.
Milford High School, Applied Technology Center	Milford	•	Biotechnology, precision machining, pre-engineering.

## Institutions of Higher Education

### Community Colleges

The region is home to six community colleges, offering an array of manufacturing-related courses and associate degree and certificate programs in areas including machine technology, biotechnology, manufacturing engineering, fiber optics, lean manufacturing, and quality control.

Of these six institutions, only those in New Hampshire house machine shops, allowing them to offer training for machinists or machine operators, as indicated by the bullets in the third column of the chart below. Of those, Nashua Community College offers a machine technology degree and two certificate programs. Manchester Community College currently offers only non-credit machine certificates, but is working toward credit-granting programs. New Hampshire Institute of Technology in Concord is also actively working toward a CNC certification program. In Massachusetts, Middlesex Community College offers coursework with manufacturing applications but not full degree or certificate programs, nor training for machinists.

In addition to their academic programs, the community colleges also provide customized training for local businesses at their work sites as well as continuing education classes (most of which are not for credit). There have also been some examples of the community colleges providing customized training to a group of employers, often in the areas of ESOL and adult education. For example, Middlesex Community College helped three local manufacturers apply for and implement a Massachusetts Workforce Training Fund grant to provide ESOL and adult education services for their employees. By working with three companies, the community college was able to offer more levels of ABE. This community college also provided a wide array of classes for Raytheon. Overall, however, the demand for customized training by employers has lagged considerably as a result of the recession.

<b>Organization</b>	<b>Main Campus Location</b>	<b>Manufacturing Credential?</b>	<b>Relevant courses, degrees, and certificate programs</b>
Manchester Community College	Manchester	•	Basic Machine Mechanic Training Course. Engineering, technology, and management AA degrees and certificates, including several non-credit manufacturing courses, approved for ITAs.
Nashua Community College	Nashua	•	AA in Advanced Machine Tool Technology and two manufacturing certificates: 38-credit Computer Numerical Control Program Certificate (machinist training); and 24-credit Advanced Machine Tool Technology (machine operator training).
New Hampshire Technical Institute	Concord	•	AA in Manufacturing Engineering Technology, articulates with (and offers dual-enrollment with) UNH-Manchester's BA in Engineering Technology. Currently offers some machine tool courses and is developing a CNC machining certificate.
Northern Essex Community College	North Andover, Lawrence & Haverhill		Customized corporate training through the Institute for Community and Workforce Development, which partners with business and local planners to design industry-specific education and training.
Middlesex Community College	Bedford and Lowell		Business and Industry Center offers customized training. AA and certificates in biotech and CAD technology. Related manufacturing courses include lean manufacturing, quality control, applications, printed circuit design.
North Shore Community College	Danvers		Customized training through Institute for Corporate Training and Technology. Certificates include sterile processing and biotechnology.

## Four-Year Colleges and Universities

Many of the region’s four-year colleges and universities have degree or certificate programs in fields related to and supportive of workforce development in manufacturing, including engineering and management programs. Bachelor’s programs at these institutions fulfill the high-skilled labor needs of manufacturers in the region and articulate with machining, pre-engineering, and other programs at vocational-technical high schools and community colleges. They include:

Organization	Location	Manufacturing Related Degrees & Certificates?	Relevant courses, degrees, and certificate programs
University of Massachusetts Lowell	Lowell	•	Offers many manufacturing-related degree and certificate programs, including AS and BS degrees in mechanical and electronic engineering technology; certificates in manufacturing technology, computer-assisted manufacturing, and project management. Certificates, courses, and seminars through the Corporate Training department include bio-manufacturing; plastics manufacturing, design and quality control; and courses in various industry-specific topics.
Daniel Webster College	Nashua		Host to regional Small Business Development Center. Offers counseling, enterprise forums, and workshops for growing businesses. Also offers customized, corporate training.
Southern New Hampshire University	Manchester	•	Various AA, BA, and certificate programs in business, arts, and health. Graduate certificates in operations management and project management. BS degree in technical management.
University of New Hampshire	Manchester	•	Offers customized professional training. Materials Science programs include nano-manufacturing and nano-technology certificates.
Merrimack College	North Andover	•	Certificates in production, project, inventory, and supply management.

## Community-based, Nonprofit Education and Training Providers

The focus of many of the community-based organizations (CBOs) in the region is on building the English language skills of non-native speakers and the basic academic skills of individuals who are lacking a high school diploma or GED.

Some CBOs also provide vocational training for entry-level jobs in specific service sectors (healthcare, hospitality) and have developed employer partnerships in those areas. Only one community-based program in the region, Community Teamwork in Lowell, is working to develop services to prepare residents for entrance into manufacturing careers.

Many of the providers interviewed expressed interest in learning more about the entry-level needs and opportunities in the industry. With a greater focus on alignment among programs and

with industry employers, these organizations could play an important role in preparing people with the basic math, English, and basic technical skills required for entry-level jobs in manufacturing or for admission into industry-focused technical training programs.

Organization	Primary Service Delivery Location	Current Services				Other
		ABE/GED	ESOL	Manufacturing Training	Other Training	
Community Teamwork	Lowell			•		In the process of developing pilot program
Merrimack Valley Central Labor Council	Lawrence				•	Layoff prevention initiatives
Greater Manchester Professional Development Center	Manchester	•			•	Computer Training Programs
Greater Lawrence Community Action Council	Lawrence				•	Computer Training Programs
Vocational Rehabilitation Services	Lowell				•	Job training, resume building, and job search assistance
Asian Center of Merrimack Valley	Lawrence		•		•	Citizenship Classes
City of Lowell: ESOL	Lowell		•			Citizenship Classes
City of Lowell Adult Education	Lowell	•				
Adult Literacy Program: Pollard Memorial Library	Lowell	•	•			
Cambodian Mutual Assistance Association	Lowell	•	•			
Adult Learning Center	Nashua	•	•		•	Medical office, computers, accounting
Lawrence Community Works	Lawrence		•			Community building, leadership development
Salem School for Continuing Education	Salem	•	•		•	Computer classes
International Institute of New Hampshire	Manchester		•			ESOL, including work-based ESOL at Stonyfield Farms, Derry, New Hampshire
Derry Center for Adult Studies	Derry	•	•			
Center for Adult Learning in Manchester	Manchester	•	•			
Manchester School District Adult Education	Manchester	•	•		•	Apprenticeships in plumbing and electrical work
Career Center of Lowell	Lowell			•	•	Various apprenticeships
LARE Training Center	Lawrence	•	•	•	•	Training and services including for individuals with developmental disabilities
Notre Dame Academy	Tyngsboro	•				ESOL, including partnership serving New Balance and Gillette, with Worksource Partners and the Merrimack Valley Project

## The Public Workforce Development System

Supported by major sources of public funds (local, state, and federal), the public workforce development “system” is overseen by numerous local and state agencies, coordinated through regional workforce investment boards. Collaboration among the entities that manage these funds will be critical for the success of the RIG initiative.

### The Department of Labor (DOL)

U.S. Department of Labor funds allocated to the states and through competitive grant solicitations support the majority of workforce development activities under the oversight of the **region’s three workforce investment boards (the Greater Lowell and Merrimack Valley Workforce Investment Boards and New Hampshire Works)**. DOL is a significant source of funding for the career assistance, job placement, and training activities provided by the career centers and chartered by the WIBs. Strategic use of Workforce Investment Act training vouchers and other DOL formula and grant funds will help to build a more effective and interconnected set of programs leading to manufacturing careers.

### State Departments of Education

**The New Hampshire Department of Education and Massachusetts Department of Elementary and Secondary Education** oversee an even larger share of the regional funding for vocational training. Each of these departments funds the system of vocational and technical schools through management of the U.S. Department of Education Carl Perkins Career and Vocational Education funding (formerly known as Tech Prep). These funds are managed locally by the New Hampshire Department of Education and Massachusetts Department of Elementary and Secondary Education. Vocational programs at community colleges are also funded by Perkins funds.

### Quasi-public Agencies and Public Private Partnerships

In New Hampshire, the Governor’s Advanced Manufacturing Education Advisory Council has undertaken an initiative to develop manufacturing career pathways beginning with New Hampshire’s career and technical schools. The Department of Education’s Tech Prep office works with career and technical centers to implement newly developed curriculum and standards for several manufacturing career paths of study. The effort also involves the development of articulation agreements with certificate and associate’s degree programs in New Hampshire’s community colleges. Those degrees, in turn, would articulate to engineering programs at University of New Hampshire and Southern New Hampshire University. The initiative includes a marketing campaign to help students understand the real opportunities in the industry for a host of jobs at all levels of skill.

In Massachusetts, Commonwealth Corporation, through the Workforce Competitiveness Trust Fund, supports the Innovative Post Secondary Education Models (IPSEM) grants that are designed to support postsecondary institutions in developing and testing models for accelerating the acquisition of degrees and certificates that address a persistent labor market demand. Grantees have initially received planning grants. They will use this planning grant support to develop curricula and program design over a period of six months. They will then apply for

implementation grants of up to \$315,000, which will support them in piloting the models for two to three years and in developing sustainability strategies. IPSEM grantees have agreed to provide curricula and program materials for dissemination to other Massachusetts postsecondary institutions. The initiative will result in stronger ties between vocational-technical schools, community colleges, and industry through support of partnerships to develop more effective postsecondary transitions and pathways to careers.

Commonwealth Corporation's youth division is working to build more effective career pathways by promoting stronger ties between vocational-technical schools, community colleges, and industry. Methods being implemented around the state include articulation agreements, dual-enrollment models, industry internships, and others.

In the Massachusetts portion of the region, an innovative new group has recently been organized — the Merrimack Valley Partners for Progress Coalition. This group is seeking to build stronger partnerships between industry and community colleges. Partners include Middlesex and Northern Essex community colleges, the chambers of commerce of Greater Haverhill and Merrimack Valley, the Merrimack Valley Economic Development Council, and the Merrimack Valley, Greater Lowell, and Metro North WIBs

### **Manufacturing Extension Partnerships**

The **Manufacturing Extension Partnerships in New Hampshire and Massachusetts (MEPs)**, funded, in part, by the Department of Commerce, are an important source of technical assistance for regional planners and employers. The MEPs also provide training programs for incumbent workers and residents seeking to enter jobs in manufacturing. The Massachusetts MEP uses a mobile training unit to provide high school students with hands-on exposure to jobs available in manufacturing, using machines that are currently in use in modern machine shops. The New Hampshire Manufacturing Extension Partnership (NH MEP) Mobile Outreach Skills Training (M.O.S.T.) program, which trains unemployed workers for existing manufacturing jobs using a state-of-the-art mobile training unit, was featured at President Barack Obama's White House Forum on Jobs and Economic Growth in January 2010.

### **State Workforce and Economic Development Cabinets**

The workforce development divisions of each state (**Massachusetts Executive Office of Labor and Workforce Development** and the **New Hampshire Division of Economic Development**) oversee federal and state-funded grant programs, including training funds (the Workforce Training Fund in Massachusetts and the Workforce Development Training Fund in New Hampshire). Employers can apply for grants to address the training needs of their workforce

In Massachusetts, the Commonwealth Corporation's **Workforce Competitiveness Trust Fund** provides funding for sector partnerships. A two-year grant (\$500,000) received in 2007 by the Merrimack Valley Workforce Investment Board supported the training of 369 new and incumbent machinists and other manufacturing workers in partnership with 10 employers, Whittier Regional Vocational Technical High School, North Shore Community College, MA MEP, and other local organizations.

## Economic Development and Planning Agencies

Several economic development and planning agencies play a role in supporting business growth in the region. Many of these entities, which include municipal and regional planning agencies, have developed helpful supports for manufacturing startups, expansions, and relocations. For example, several entities are involved in assisting industry through supports such as tax credits, small business loans, and grant information/proposal development assistance for employers. These entities are listed in the three charts below:

- Chart 1: Economic development entities offering sector-specific supports.
- Chart 2: Entities offering other types of support to manufacturing employers.
- Chart 3: Entities offering economic development support to all industries.

By building a strong working relationship with these entities, the RIG can help channel workforce development resources and a well-trained workforce toward the manufacturing employers that are expanding their businesses with the assistance of the economic development players in the region.

<b>Chart 1: Economic Development Resources for Manufacturing Employers (MEs) in Merrimack Valley: Sector-Specific Supports</b>						
<b>Organization</b>	<b>Area</b>	<b>Sector</b>				<b>Primary Service Notes</b>
		<b>Biotech</b>	<b>Analytic Instrumentation</b>	<b>Food Businesses</b>	<b>Science and Technology</b>	
Advanced Technology + Manufacturing Center	MA				•	To leverage UMass resources for industry development in Massachusetts.
EntreTech Forum (Northeastern University)	MA	•			•	
Massachusetts Biotechnology Council	MA	•				Connects business with resources (tax incentives, loans, etc.) Encourages and facilitates economic development of the Massachusetts biotechnology industry.
MassInstrumentation	MA		•			MassInstrumentation promotes public policies, collaborative efforts, and other supportive actions that will assist in increasing the competitiveness and sustained business growth of the analytic instrumentation industry within Massachusetts
Merrimack Valley Venture Forum	MA				•	Connects startups to venture capital. Facilitates business growth in science and technology.
New England Extension Food Safety Consortium	NE			•		Support for food manufacturing entrepreneurs.

**Chart 2: Economic Development Resources for Manufacturing Employers (MEs) in Merrimack Valley:  
Other Supports**

Organization		Areas of Interest			Notes
		Transit + Housing	Legislative and Advocacy	Business Services, Planning + Development	
Associated Industries of Massachusetts	MA		•		Employer association; also home to MA Alliance for International Business, helping businesses expand globally.
Association for Manufacturing Excellence, NE Region				•	Knowledge exchange forum for manufacturers.
MA Executive Office of Housing and Economic Development	MA			•	Connects to resources for businesses starting, growing, or relocating in Massachusetts.
Manufacturing Advancement Center	NE			•	Helps small manufacturers through hands-on training in lean manufacturing, partnerships for technology transfer, and strategic plans for the manufacturing organization.
MV Transportation Management Association	MA	•			Helps employers provide transportation services for employees (Andover).
NH Business and Industry Association	NH		•		A chamber for all New Hampshire businesses.
NH Division of Economic Development	NH			•	Connects to resources for businesses starting, growing, or relocating in New Hampshire.
NH Manufacturing Resource Portal	NH			•	Comprehensive business and community assistance resources for those interested in starting, relocating, expanding, or enhancing their manufacturing business in New Hampshire.

**Chart 3: Economic Development Resources for Manufacturing Employers (MEs) in Merrimack Valley: Regional Planning and Economic Development**

Organization	Type of Assistance for MEs				Geographic Focus	Notes
	Local / Regional Planning	Expansion Assistance	Startup Assistance	Broker + Navigate resources		
Mass. Alliance for Economic Development				•	MA	Site selection.
Merrimack Valley Economic Development Council					Northeastern MA	Promotes collaborative efforts to grow economy of Merrimack Valley.
Merrimack Valley Planning Commission	•			•	Northeastern MA	Regional planning commission.
Nashua Regional Planning Commission	•				Nashua region, NH	Coordination/planning in land use, transit, etc.
Northern Middlesex Council of Governments	•	•	•	•	Billerica, Chelmsford, Dracut, Dunstable, Lowell, Pepperell, Tewksbury, Tyngsboro, Westford, MA	Wide range of community development and planning services for a regional community collaborative.
Tri-Town I-93 Interchange Development Task Force	•				Andover, Tewksbury, Wilmington, MA	Coordinates efforts to develop underutilized land contiguous to these three communities.

## Other Workforce Development Providers

### Proprietary Vocational and Technical Programs and Consulting Firms

Many of the industry educators and employers interviewed indicated that most of the training of skilled manufacturing employees occurs on-the-job. Two organizations located in southern New Hampshire, a private vocational training provider and a consulting firm, are among those that assist employers to meet their on-the-job training needs and were referenced by interviewees as specialists in manufacturing: Worksource Training Resources and Scientific Management Techniques. The latter provides on-site, customized training for employers, while the former offers training to incumbent workers and community residents through a partnership with Intelitek, Inc. (See Chart for details of that partnership.) Lincoln Technical Institute, a private postsecondary school, does not currently offer training in any manufacturing-related occupations

with the exception of culinary arts, which may apply to the region’s growing food production sub-sector.

Organization	Primary Service Delivery Location	Current Services				Notes
		ABE/ GED	ESOL	Manufacturing Training	Other Training	
Worksource Training Resources LLC	Manchester			•	•	Training for entry-level precision manufacturing technicians, computer aided machine operators, automation and robotics technicians offered in partnership with Intelitek, Inc.
Scientific Management Techniques, Inc.	Londonderry			•	•	Training for industrial mechanics, operators, and electricians.
Lincoln Technical Institute	Lowell				•	Health sciences, business, and IT certificates.

### Staffing/Temporary Employment Agencies

Many employers interviewed indicated that temporary agencies were a primary source of workers for entry-level and skilled positions. In some cases, individuals hired for a three- to six-month period are brought on as permanent staff. Some employers indicate that they will continue to rely upon the staffing agencies, while one employer expressed concern about the quality of the workers he got from these agencies as well as the problem of a long training time coupled with a short employment contract.

## OPPORTUNITIES AND IMPLICATIONS FOR TRAINING BY SKILL LEVEL

Viewed in their totality, the schools, colleges, and organizations of the Merrimack Valley possess much of the organizational infrastructure and potential to train people in the full range of skills required by the industry, starting with basic math and job-readiness skills to advanced skills such as engineering and management. They currently fall short of a system that can create a pipeline of workers to the industry as a result of their geographic fragmentation, lack of alignment with each other and specific industry sectors, and, in some cases, outdated infrastructure. This section discusses the region's education and training resources in terms of its ability to produce workers with the requisite skills for jobs at all skill levels and highlights efforts that can be built upon to create the partnerships and the alignment needed to support the industry as a vibrant sector in the regional economy.

“I am reaching out to the parents now — trying to help them understand that the manufacturing industry holds tremendous opportunities for their kids. Good starting pay and we place every kid we train. Some of them keep going. It's also a great pathway to engineering.”

— Shawsheen Tech Program Director

### Basic Skills for Entry-Level Positions in the Industry

Entry-level positions in the industry include such positions as assembly and machine operator. Employers with needs at this level indicate that while training occurs on-the-job, job candidates need strong basic math skills and work ethics. While the community-based organizations in the region are well-positioned to recruit and prepare workers with these skills for entry-level positions, they are not yet engaged in that effort for a variety of reasons. Focus group participants had very little knowledge of the needs of the industry and were largely unaware of the opportunities there. Many providers have a personal recollection of manufacturing layoffs during earlier recessions and, as a result, retain the idea that there are not sufficient opportunities in the sector to warrant outreach or program development on behalf of their students. Furthermore, due to the general perception among the public that the industry is shrinking and not a source of stable employment, there is little demand for programming that would provide entrée to the industry.

In addition, the design of some education programs creates a barrier to better alignment with industry. As described by one interviewee, current ESOL programs are designed to prepare students for college placement, a next step that often requires many years of study. Many adult immigrants are unable to attain proficiency at that level in a reasonable period of time and, in his view, would benefit from programs that provide industry-targeted curriculum that would more quickly lead to sufficient English skills for entry-level occupations. This dynamic is also at work among many ABE/GED programs, which tend to be more focused on college entry as the next step for their students and do not typically offer curriculum that is contextualized to specific industries. Efforts to help ESOL, ABE, and GED program providers develop curriculum that is contextualized to manufacturing would help their students access employment while providing employers with a supply of well-prepared entry-level workers.

Temporary agencies are another commonly used source of entry-level workers. Employers have found them to be a good source of employees and a way to provide a trial period for new

employees prior to making a hiring commitment. In the view of many providers whose goal is to help their clients secure steady employment with benefits, the increased use of temporary agencies is a disturbing trend and a disincentive to helping their constituents seek employment in the manufacturing sector. The RIG and other planning efforts need to recognize the role that temporary agencies play as a valuable source of workers, while also working to mitigate the impact on workers and the proliferation of jobs lacking in security or benefits.

Once introduced to the RIG effort and industry data on labor market needs, the organizations that participated in Mt. Auburn's focus group and interviews expressed enthusiasm for working with the region's WIBs to better understand the role they can play in preparing workers for the manufacturing sector. They were also eager to continue a dialogue among themselves, acknowledging the limited degree to which they communicate and collaborate. Finally, they recognized the concerns employers have expressed regarding the need for stronger work-readiness skills and attitudes and agreed that this was an area where they were well-positioned to make a contribution to the readiness of the entry-level manufacturing workforce.

By aligning curriculum with the requirements of industry employers, these organizations could play a vital role in helping young and disadvantaged workers understand their options and the employment opportunities available in the industry and in supporting their entry into family-sustaining wage careers.

### **Entry-level Vocational Skills**

Vocational-technical high schools have served as the traditional source of workers with basic machine skills and knowledge of manufacturing processes. Many employers and school administrators noted, however, that while the aging of the manufacturing workforce will increase the need for workers with these skills, some vocational-technical high schools do not offer machine technology programs and those that do have seen dwindling enrollment. It is of particular concern that two of the five vocational-technical high schools in the Massachusetts part of the region, Greater Lowell and Greater Lawrence technical schools, do not have machine shops in which to train machine operators. Among Massachusetts community colleges, three do not have machine shops — North Shore, Middlesex, and Northern Essex. This lack of infrastructure will need to be addressed by the RIG through creative partnerships that utilize facilities in other parts of the region.

The reasons school officials cited for the lack of interest in manufacturing among young people include a perception that manufacturing is a dying industry and a lack of understanding regarding the nature of the work. Many schools provide basic instruction on old machines that are no longer in use in the industry. Students do not get exposure to advanced manufacturing techniques and equipment, which requires more advanced skill and provides cleaner, quieter working conditions. Administrators interviewed felt that students' negative perceptions of the industry were shared by their parents, who often encouraged their children to pursue white collar careers. This was also true among parents who were machinists themselves, and who had experienced the hardships of cyclical layoffs.

In the view of voc-tech educators and an official at MA MEP, another barrier to building a larger pipeline of workers from voc-tech schools to the industry is the reluctance of employers to

provide internships to students and job opportunities to recent graduates. Manufacturers require that machine operators be at least 18 years of age and some are unwilling to sponsor internships out of concern for liability (although, according to one industry expert, liability insurance provides an exception for situations such as co-ops and internships). Educators working to place students, and employers themselves, also indicated a disinclination among manufacturers to hire young adults with limited work experience due to a perception that they lack appropriate work ethics and habits such as punctuality and regular attendance.

The initiatives of the Governor's Advanced Manufacturing Advisory Council in New Hampshire and the IPSEM Initiative in Massachusetts are promising efforts to overcome these barriers and to develop vocational schools as an effective source of entry-level workers.

One program in Manchester provides an opportunity for students to learn on the machines in use by today's manufacturers. Worksource Training Resources, (WTR) has developed a relationship with a local manufacturer and supplier of machine tools, Intelitek, Inc. WTR recruits individuals for training as entry-level precision manufacturing technicians, computer aided machine operators, and automation and robotics technicians. Training occurs in Intelitek's state-of-the-art facility, delivered by educators and curriculum designers on staff at Intelitek. WTR remains in contact with the trainees and places them in jobs upon completion of the program.

## Skilled Production Workers

Many employers interviewed by Mt. Auburn indicated that most of their skilled production workers were trained on-the-job, having worked their way up within their current company or at another company in the region. To meet the training needs of their incumbent workers, many employers utilize consulting firms and proprietary schools to assist them in developing in-house training programs. These entities represent important industry partners with great industry knowledge that could contribute to the RIG effort.

Several employers noted the negative impact that the migration of skilled workers from one company to another company has on the industry. One employer described it as a process of "cannibalizing" other manufacturers in the region by luring workers with promises of a wage increase or other benefits. This activity creates a disincentive for some manufacturers to invest in training their workforce.

As mentioned previously, employers are concerned about a serious labor shortage among skilled machinists in coming years as current employees begin to retire. While the supply of skilled workers is adequate at present, machinist training is an important area for RIG attention. As described above, there are significant resources at the community colleges and vocational-technical schools for programs to train machinists and other skilled production workers in a variety of manufacturing sectors. The challenge for the RIG will be to work with those programs to build their relationships with the industry to ensure that courses of study and curricula are responsive to industry trends and capacity is built with an understanding of the industry's job forecasts.

## Highly-skilled Workers

The industry also offers opportunities for highly-skilled individuals with bachelor's and master's degrees in fields such as engineering, business, and operations management, degree programs

that are currently offered by the region's colleges and universities. The educators working with students at the high school level indicated that those with mechanical interests and aptitudes were pursuing higher education and careers in engineering in favor of more immediate entry into the industry as production workers. Interviewees engaged in designing career pathways in manufacturing saw the high-level occupations in manufacturing as an important part of a career path that can be used to attract young people to the field.

## KEY FINDINGS ON WORKFORCE DEVELOPMENT SUPPORT SYSTEM

### ➔ **The considerable resources in the region are an asset, but lack of alignment and knowledge of the sector constrain their effectiveness.**

The Merrimack Valley RIG region is home to a diverse array of institutions focused on the education, training, and employment of the region's residents. These organizations represent a tremendous asset in terms of the potential for growth and competitiveness of the manufacturing sector. While there are a number of collaborative initiatives and efforts on the part of individual organizations to address the workforce development needs of manufacturing employers, there are fewer training resources for manufacturing now than there once were, and there is a general lack of awareness among many providers and their constituencies of the needs and opportunities in the sector.

### ➔ **Declining enrollment in manufacturing-related skills training programs is a concern.**

Employers have reported that the average age of their skilled workforce is over 50 years old, and they are concerned that a new generation of workers is unprepared to replace current workers as they retire. Meanwhile, one of the most commonly cited concerns facing industry advocates and training providers is the declining enrollment in machinist programs at vocational-technical high schools.

### ➔ **Lack of adequate infrastructure with which to train a new generation of machinists.**

Many of those interviewed indicated that the lack of up-to-date equipment was partially responsible for the misperception held among young people of jobs in the industry. While contemporary facilities involve sophisticated, computer-assisted machinery and work takes place at computer screens in clean rooms, the image of the oily machine shop is supported by the reality at many schools. In addition, in some parts of the region, particularly in Massachusetts, machine shops simply do not exist among vocational-technical schools and/or community colleges.

### ➔ **Lack of knowledge of manufacturing among the region's community-based organizations.**

The CBO community represents a real opportunity to strengthen the pipeline of skilled workers, yet many CBOs are unaware of opportunities in manufacturing. Organizations that provide individuals with English language, basic math, literacy, and job-readiness skills lack the capacity to design career pathways to specific industry sectors and do not have the forums to learn about the needs of industry, share information with others in the region, and plan to meet industry needs in a coordinated fashion.

## IMPLICATIONS FOR THE STRATEGIC PLAN

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### CHALLENGES AND OPPORTUNITIES TO SUPPORT THE SECTOR

The analysis completed for this study provides strong evidence that manufacturing continues to be a critical sector to the Merrimack Valley RIG; that while facing challenges, the manufacturing sector in the region remains relatively strong and has some segments that remain competitive in light of growing international competition; and that the region's labor force is a potential source of competitive strength for the sector. In addition, viewed as a group, the schools, colleges, and organizations of the Merrimack Valley already have the organizational capacity and infrastructure (equipment, curriculum, etc.) to train sufficient numbers of workers in the full range of skills required by the area's manufacturing companies, starting with basic math and job-readiness skills and working up the ladder to advanced skills such as engineering and management.

However, according to the education and training and economic development providers themselves, the current system is not yet meeting the needs of employers. The challenges and opportunities in the Merrimack Valley add up to a not-yet-well-developed system for creating a pipeline of workers to the industry and a globally competitive manufacturing sector.

There are five broad challenges and opportunities that emerge from this study:

#### ➤ **Address the mismatch between the perceptions of manufacturing and the reality.**

Misperceptions about manufacturing are widespread in the region. From employers, to community-based organizations, the high schools and colleges, and the region's residents, the perception is that manufacturing is dying, that the U.S. is no longer able to "make things" competitively, and that the economic future of the region will depend on developing entirely new industries. The reality is very different. Many of the employers noted that there are many miscalculations being made by employers who are outsourcing production to China. Few understand that the region's capacity to innovate is actually tied to its capacity to make things. And, most notably, few in the region fully understand that the manufacturing sector in the Merrimack Valley region is relatively strong and has strengths in some areas, such as life sciences, homeland security, energy, and robotics, which have the capacity to grow.

To counter these misconceptions, it is important that basic information about the region's manufacturing economy becomes more widely shared in the region.

Some activity is already taking place. Efforts are underway to educate young people and parents about the opportunities in manufacturing, such as the New Hampshire Governor's Advanced Manufacturing Advisory Council and the Boston Foundation's manufacturing forum and report on the industry, "Staying Power." A public relations campaign that builds on those efforts could go a long way toward shifting the perception that manufacturing is a dying industry. The mobile training unit available through the Massachusetts MEP could also be used throughout the region to present a more realistic picture of manufacturing today. An effort to engage manufacturers in

internships and other programs to offer workplace exposure could also help to change current attitudes.

### ➤ **Fill the current skill gaps.**

Mt. Auburn's review of the data showed at least two areas of skill deficits or skill gaps in the existing workforce.

The first skill gap is in workplace competency skills, such as basic work readiness, industry familiarity, and work ethic essentials. Workforce, business, and educational leaders in the bi-state region have an opportunity to build a credentialing system that validates basic workplace competencies, is easily recognized, and will be adopted by a broad representation of area manufacturers. One way to pursue this opportunity is to build on an existing national model and adapt it to the needs of manufacturers in the region. One such national model that exists is the Manufacturing Skills Certification System recently endorsed by the National Association of Manufacturers (NAM). This credentialing system often is managed by workforce investment boards on behalf of educators, industry associations, and statewide business groups.

The second skills deficit in the region is technician-level production workers and engineers, such as one- and two-year credentialed machinists, industrial engineers, and lab technicians. Data from secondary sources, interviews, and the survey show that this is the greatest workforce skills challenge in the region's industry. Either not enough new workers are interested in attaining these credentials, especially among youth, or the incumbent workers who have previously earned one- and two-year credentials are graying and will be leaving the industry for retirement. There is a promising opportunity to use the scale of the bi-state region to aggregate demand for new postsecondary programs and recognized credentials to fill the skill gaps. For one, it will take a coordinated effort across state lines to reach this "scale" for postsecondary programs and then continue the effort so that industry can communicate the changing trends and demands of its practice, technologies, and skill needs on an ongoing basis. But, it will also take renewed effort to identify and address some of the institutional barriers that may block workers, employers, and educators from achieving success in credentialing and skilling up its workforce. That is, research shows that often the largest group of these workers is "some college, no degree" adults. These workers need better on-ramps to get and keep them on the path to earning an industry-recognized credential. Retention and on-ramp innovations that can be adapted to postsecondary credentialing of this workforce include credit recovery programs, employer/financial forgiveness, compressed class work time, and remediation redesign.

### ➤ **Ensure the next generation workforce.**

Mt. Auburn's data also show a convincing need to reach the area's youth by going into high schools and technical schools to correct the image and perceptions of the future viability of and career opportunities in the region's manufacturing sector. This is about building a pipeline of skilled, trained workers to be the next generation of innovators, managers, and skilled production employees for the industry and giving them good jobs and wages to generate wealth for their families and the region's economy. There are a number of opportunities to build this next generation workforce.

The first opportunity is to build a sustained communication strategy with area high schools and technical schools to correct the misinformation and supply schools with cutting-edge equipment and curriculum. These efforts will have to reach students, guidance counselors, and administrators of the schools. One goal will be to better describe the changing role of the industry — the new technologies used; the clean, hi-tech working environment; and the opportunities for career-sustaining jobs. Another goal will be to bring curriculum and equipment in the schools up to current industry practice, to make sure students are trained properly, and to ensure that teachers use curriculum and processes that are relevant to where industry standards are moving.

The second opportunity is to facilitate better links between high schools, technical schools, and postsecondary institutions so that more students transition successfully between learning environments, thus increasing student/worker retention, and earn industry-relevant credentials along the way. This will require a two-part focus: the first will be to build the commitment among employers to recognize, encourage, and hire for credentials; the second will be for high schools, colleges, and universities to create better transition programs (such as 2+2, remedial, and summer youth transition programs) and flexible, stackable courses and curriculum (such as shortened modules and online and nontraditional learning venues and times).

### ➤ **Support innovation and product development/design.**

The data show that the key to the manufacturing sector's competitive advantage in the Merrimack Valley is its reliance on product innovation, high technology, and the research and development assets of the region. These are the types of companies and jobs in the sector that will stay, grow, and thrive in the region going forward. This trend toward innovation, creativity, and technology, and away from traditional, routine production functions as the long-term future of the sector in the region is also an opportunity for the public workforce system to reposition itself. The opportunity is this — the public workforce system can maintain and provide core workforce services to traditional segments of the sector, but at same time make a strategic decision to support the workforce (and other) needs of the hi-tech segment of the sector in the region. This likely expands the role of the public workforce system into efforts to create niche services that support the research and development needs of the sector. It also means building connections to university research centers. A key starting point likely will be to use existing WIB connections to universities and to build new ones where they do not exist so that it can build programs and coursework to increase workforce capacities for product development, design, and creativity in the sector.

One of the first opportunities will be to convene employers and then aggregate demand for existing and new technology capacities critical to future growth and competitiveness of the industry. The key to success will be to get the big employers to take a leadership role and allow the WIBs and economic development community to provide the “glue” to keep the effort moving.

### ➤ **Develop new partnerships and collaborations.**

The RIG can also increase its impact on the sector if it works to build its relationships with the region's active economic development partners. While strengthening workforce development is essential, an effort that supports the industry by strategic alignment of economic development

planning and workforce development initiatives will hold great promise in addressing each of the challenges noted above.

The significant resources that do exist will better serve job-seeking residents and the industry if they coordinate their efforts and collaborate to provide a continuum of needed services and to ensure that all parts of the region have access to appropriate training facilities. For example, while machine shops are lacking at Middlesex Community College and Greater Lowell and Lawrence technical schools, UMass Lowell operates a machine shop that offers certificate programs. Collaboration among those institutions may be able to make training available to a broader array of students. In the eastern part of the region, neither North Shore nor Northern Essex community colleges have machine shops, but Haverhill's Whittier Regional Vocational Technical High School does. The program in Manchester, in which individuals are trained at a manufacturing site, could also be explored for possible replication.

In terms of filling current gaps, the region needs to look at the staffing agencies as a critical part of the manufacturing sector in the region. The staffing agencies are both major employers as well as important training providers. They understand the needs of the manufacturers as well as the capacity of the regional labor market. And, increasingly, they are providing some of the basic entry-level training that is needed by individuals seeking employment in manufacturing. Efforts to address the region's manufacturing workforce must include them.

Lack of facilities is not the only issue that can be addressed through partnerships. In an industry that offers significant on-the-job training and opportunities for low-skilled workers, building collaborations between industry and the region's community-based organizations will help the industry tap into a new supply of labor while opening up an important source of jobs for the region's residents. Many of the region's providers are interested in working with employers to develop skills standards and in coordinating with college-based certificate programs to create avenues to further training and employment in the industry.

## CONCLUSION

Overall, the Merrimack Valley is rich in resources to support the manufacturing sector as a strong, vibrant engine of economic growth for the region. The means exist to produce workers at all levels needed in the industry, and numerous organizations exist to develop those resources and support industry with financing, planning, and other advice.

Rather than give up on manufacturing, it is time that employers involved in manufacturing in the region, the region's workforce development system, education and training providers, and the state and regional economic development organizations work more collaboratively to ensure that manufacturing remains a core economic engine in the region. An effort to build and align existing resources to create stronger pathways to manufacturing employment can ensure that the region fully leverages its capabilities to be home to a thriving manufacturing sector.