



The Pathways Project For Advanced Manufacturing - Final Report

June 2017



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The Center for Economic Growth

PATHWAYS PROJECT

An Advanced Manufacturing Careers Study

*The Capital Region Workforce Development
Boards supporting Albany, Rensselaer,
Schenectady, Columbia, Greene, Saratoga,
Warren & Washington Counties*

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Introduction

The Pathways Project for Advanced Manufacturing is a project of the Capital Region Workforce Development Boards supporting Albany, Rensselaer, Schenectady, Columbia, Greene, Saratoga, Warren & Washington Counties and managed by the Center for Economic Growth. Funding for the project was provided by NYS DOL through a USDOL grant and managed through Columbia Greene Community College. The leadership team for this project included:

M.A. Wiltse, Director, Workforce Development, Columbia-Greene Community College
Bob Wildermuth, Executive Director, Albany-Schenectady-Rensselaer Workforce Development Board
Bill Resse, Executive Director, Saratoga-Warren-Washington Workforce Development Board
Phil Stenglein, Organizer, Sheet Metal Workers Local #83
Robert Weinman, Technical Training Specialist, GLOBALFOUNDRIES

CEG was selected as the project manager through a competitive RFQ process. Project work began in late February and completed in late June. The report was submitted to NYS DOL on June 30, 2017. During the five months of the project, we had the pleasure of interviewing 17 manufacturers in the Capital Region and 2 community college programs. We would be remised if we did not properly thank these dedicated partners for opening their doors to us. Without them, this study would not have been possible.

Our most sincere thank you to:

- Applied Robotics, Schenectady County
- Ball Metal Beverage Container, Saratoga County
- Blasch Precision Ceramics, Albany County
- Digifab Shop, Columbia County
- Espey Manufacturing & Electronics Corporation, Saratoga County
- Frank Murken Products, Schenectady County
- General Electric, Schenectady County
- GLOBALFOUNDRIES, Saratoga County
- Greno Industries, Schenectady County
- Mohawk Paper, Albany County
- PGS Mill Work, Columbia County
- Pretium Packaging, Columbia County
- Quad Graphics, Saratoga County
- Simmons Machine Tool, Albany County
- Specialty Silicone Products, Saratoga County
- Transtech Systems, Albany County
- Sheet Metal Workers Local #83, Albany County
- Hudson Valley Community College
- Schenectady County Community College

Additionally, we would like to thank Christine Peng, Brian Lee, and Mark Borst of Metrix Learning for their assistance with the transferable skills survey and pathways product; Ted Bauer and Leslie Parady of Mass MEP for sharing their knowledge on MACWIC; Martha Ponge of MACNY for sharing her knowledge on the MACNY Apprenticeship Program; Dr. James Huerkamp of East Mississippi Community College for sharing his knowledge on the Manufacturing Skills Basic course; and, James Schlett of CEG for his research assistance.

Pathways Project Research Methodology

The Pathways Project conducted the following research: 1) a transferable skills analysis; 2) interviews with CEOs and HR professionals at manufacturers in the project's outlines counties; and, 3) interviews with members of the manufacturing workforce in the project's defined region.

The transferable skills analysis sought to identify the overlap of skills that exist across a variety of manufacturing positions. This was accomplished via an online survey that was built by Metrix Learning and distributed by CEG and the Pathways Project leadership team.

The interviews with manufacturing CEOs and HR professionals allowed us to develop an understanding of what the strengths, challenges and opportunities are surrounding manufacturing from a top-down perspective. This information also helped inform our pathways product, transferable skills analysis, and key recommendations. Because much of this information was qualitative in nature, we chose to analyze specific questions by reviewing each response and assigning it a respective category. This allowed us to perform a quantitative analysis of specific questions.

Finally, we also interviewed members of the non-exempt, manufacturing workforce, which we have summarized into a profile of individuals currently working in manufacturing. These additional personality and lifestyle questions helped us develop a better understanding of the current employee that is already working in manufacturing, as well as future employees who are not yet in the workforce pipeline but should be. Also, this information helped inform the various other deliverables of this project by giving us a "bottom-up" perspective of the industry. Similar to the HR interviews, because this information was qualitative in nature we analyzed participant's responses to specific questions and assigned them respective categories. This allowed us to perform a quantitative analysis of specific questions.

Questions for both the HR and Workforce Interviews can be found in APPENDIX 1. We would like to note that while only *some* of the responses were pulled into quantitative analysis, *all* of the questions & responses were used to help inform this report.

Executive Summary

The Pathways Project is a project by the Capital Region Workforce Development Boards supporting Albany, Rensselaer, Schenectady, Columbia, Greene, Saratoga, Warren & Washington Counties and managed by the Center for Economic Growth. This five month long study analyzed the transferable skills between manufacturing and advanced manufacturing in the Capital Region; explored the opinions and needs of manufacturing CEOs and HR representatives; and, analyzed the interests, hobbies, media consumption habits, and career experiences of the region's non-exempt manufacturing employees.

Overall, the goals for the Pathways Project for Advanced Manufacturing were to:

- Analyze and identify the transferable skills needed by manufacturers in the Capital Region
- Create a defined pathway for individuals seeking to enter into the manufacturing labor market
- Provide key recommendations to help maintain a strong manufacturing labor pipeline

The CEG project management team (Amanda Vitullo and Michael Lobsinger) visited a total of 17 manufacturers in the project's study region, and spoke to 17 CEOs and/or HR executives at each respective facility. We also spoke to a total of 46 non-exempt, manufacturing focused employees. Overall, we performed 34 hours of interviewing at across four of our eight counties. We also distributed a transferable skills survey via email to 200+ of the region's manufacturers, which resulted in 44 responses.

Key findings

Through our CEO/HR interviews, we found the following:

- The most common reason for employee loss was more competitive pay and retirement
- The most serious problem facing our sample's workforce was retirement and availability of qualified candidates
- The most desired resource would be expanded access to apprenticeship programs and company specific training

Through our non-exempt employee interviews, we found the following:

- The most common hobby among participants is outdoor activities
- Participants primarily watched local news, either in print or on TV
- The most common non-news media consumed is **YouTube**
- The most commonly used social media is Facebook
- Participants most commonly grew up in a rural environment
- The most common childhood interest was "building things"
- Participants were mostly influenced by family/friends when they chose this career path
- Participants felt that a career in manufacturing was viable as a prosperous career, however, they were uncertain if they would recommend it to their own child
- They primarily received negative/misunderstanding reactions when they share with the general public what they do for a living.

Key Findings Continued

Through our transferable skills survey, we found the following:

- The most commonly needed jobs are in production
- The most commonly needed skills are communication, math and computer skills

Key recommendations

The main recommendations developed as a result of this study are the following:

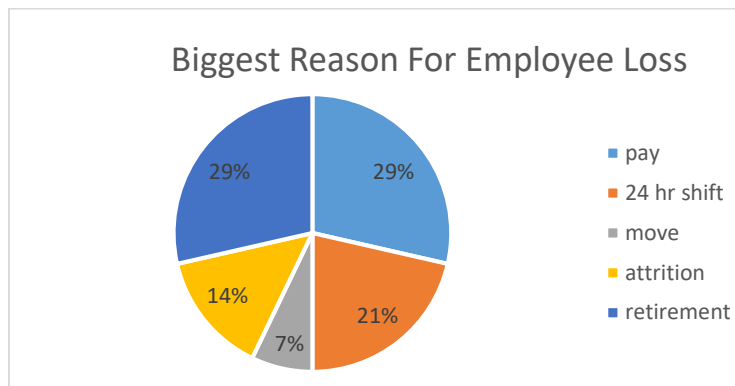
1. Encourage incentivized referral programs
2. Expand current apprenticeship programs
3. Perform targeted outreach to potential pipeline candidates
 - a. Ages: 25-45
4. Continue to grow sample of non-exempt employee interviews
5. Continue to support programs that highlight and promote manufacturing and increase awareness of opportunities
6. Implement a manufacturing bootcamp that aligns training with workforce agencies and employers and implement universally recognized assessment and credentials
7. Continue refining career pathways
8. Identify new and alternate funding programs

Research: HR/CEO Interviews

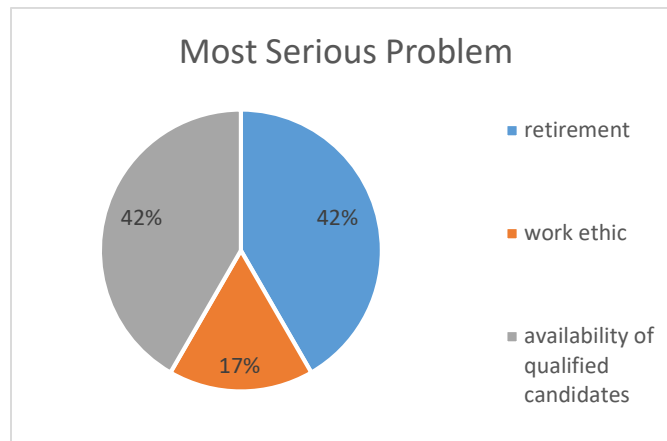
For the human resources/CEO portion of our focus group, we asked participants about their biggest reason for employee loss; most serious problem facing their current workforce; and, the resources they most desire from the public sector. We also asked them questions related to their most needed entry-level job titles and bare-minimum competencies, which are covered in the transferable skills portion of this report.

The most common answer to the first question, *biggest reason for employee loss*, was split evenly between pay and retirement. In regards to the “pay” response, we heard that some manufacturers were losing employees to other companies with more competitive hourly pay and better benefits. This is to be expected considering many of these individuals are in such high demand, but we recognize that this issue may be most adversely affecting our smaller manufacturers, who are limited in how much they can pay their employees.

The other most common response, retirement, was not particularly surprising to us. According to Deloitte and the Manufacturing Institute’s 2015 Manufacturing skills gap report¹, roughly 2.7 million jobs will be needed as a result of retirements of the existing manufacturing workforce.

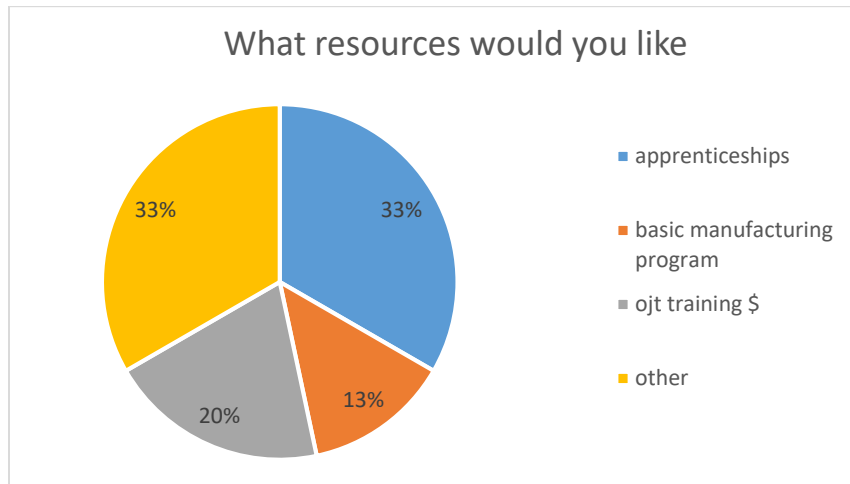


The most common answer to the second question we asked them, “what is the biggest problem facing your organization’s workforce,” was, unsurprisingly, impending retirement of their workforce, and the lack of availability of qualified candidates. These two issues go hand-in-glove and will only continue to get worse if we continue to struggle with attracting young people to the labor pipeline. The third most common answer was work ethic—primarily that employers struggled to retain new employees. Some of the reasons shared was that they were unreliable or were disinterested in working to the standards expected.



HR/CEO Interviews Continued

The third question that we asked was what resources would they would like in regards to workforce training/programs. The most common answer to this question was split between apprenticeship programs and “other”, which included a variety of company specific training. The 3rd most desired was expanded on-the-job training funding, followed by some sort of basic manufacturing program that would provide training on a basic set of skills.



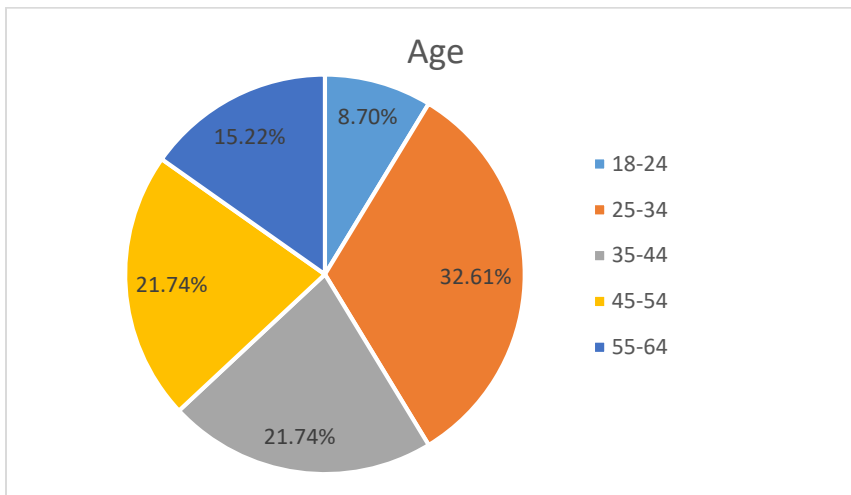
Research: Non-Exempt Employee Interviews

As part of our research, we asked our participating employers to allow us access to 2-3 of their non-exempt, manufacturing focused employees. In these hour-long interviews, we asked participants questions regarding their hobbies, interests, and media consumption habits, as well as questions about their career path, who influenced them, and what their overall thoughts were on the manufacturing industry. Below are our findings.

Demographics of sample

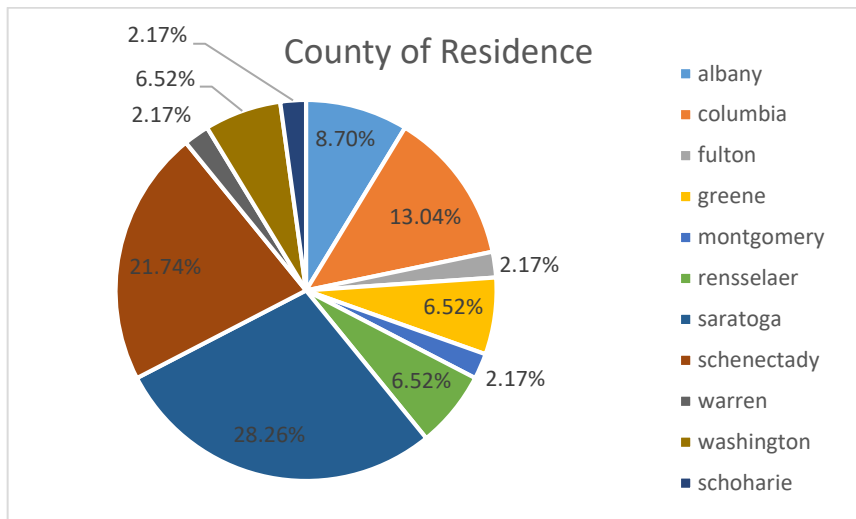
Age

We interviewed a total of 46 individuals who were employed at one of the 17 participating employers. The sample size consisted of 5 females and 41 males. They ranged in age from 18-64. The highest concentration age bracket was 25-34, followed by 45-54.



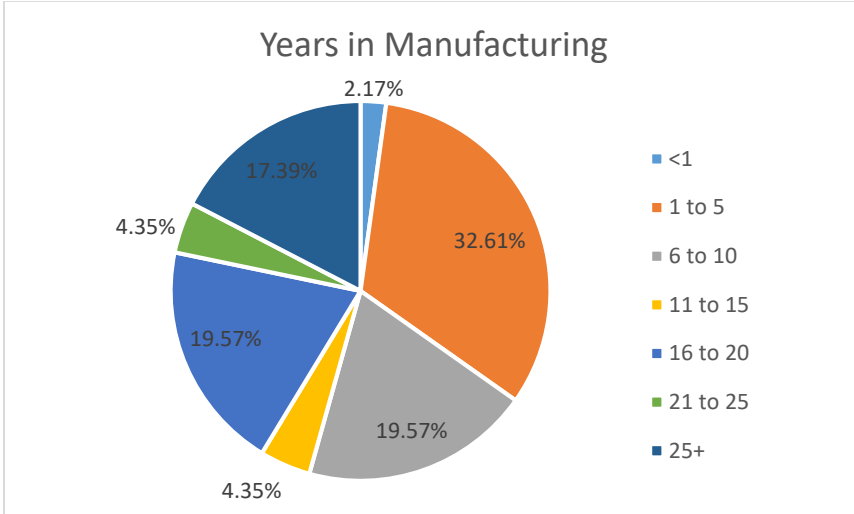
County of Residence

Interview participants hailed from a variety of Capital Region counties. The majority identified as residing in Saratoga County. The second most common county of residence was Schenectady County, followed by Columbia County.



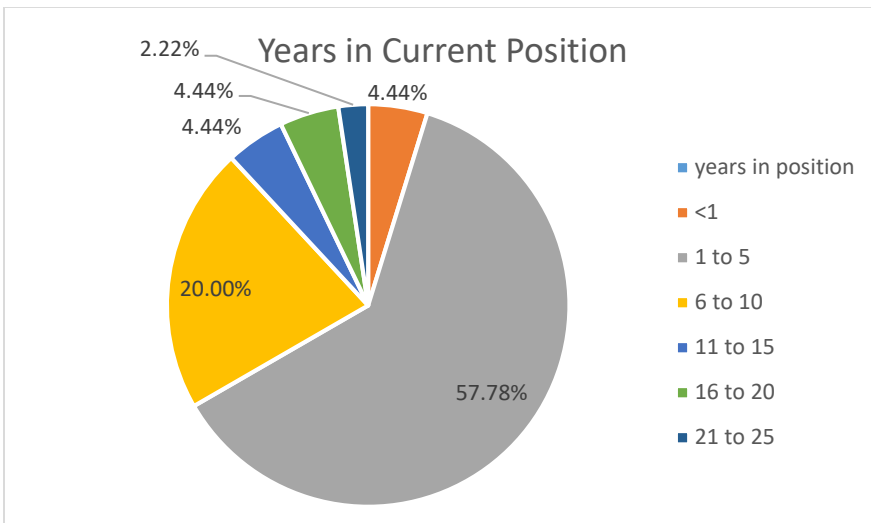
Years of manufacturing experience

Overall, our survey respondents were relatively new to manufacturing. Over half identified as having less than 10 years in manufacturing, and of that 52%, 32% identified as having 1 to 5 years of experience in manufacturing.



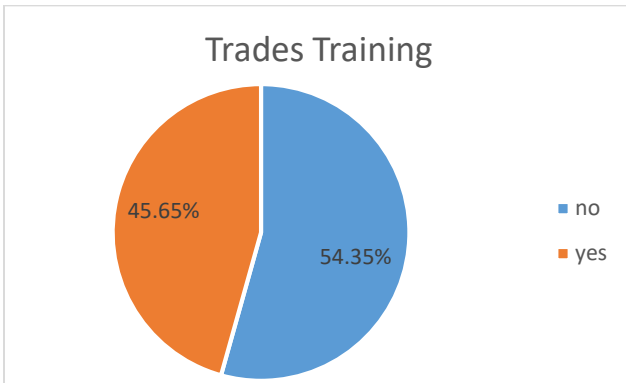
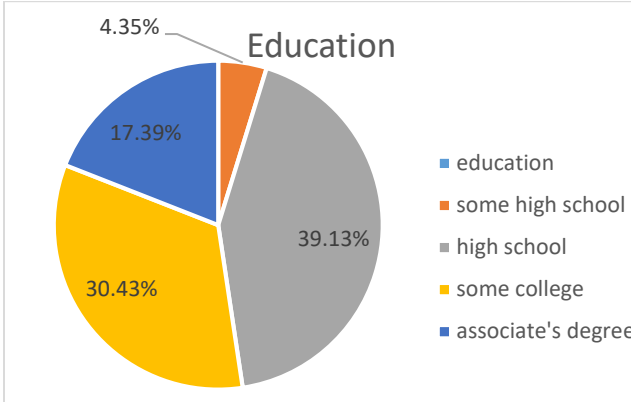
Years in Current Position

Unsurprisingly, a majority of the sample size was also relatively new to their current position. Over half of participants identified as being in their current position for 1-5 years, followed by 20% that identified as being in their current position for 6 to 10 years.



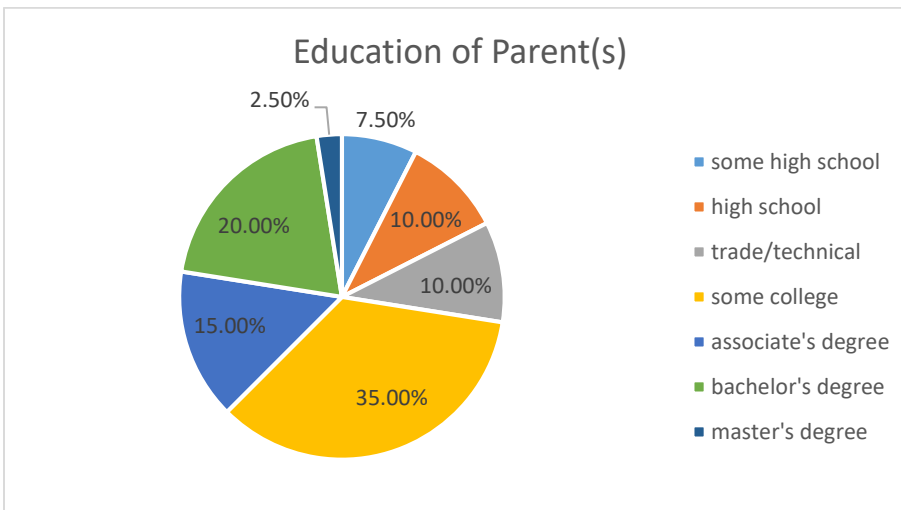
Education

A vast majority of interview participants identified their highest completed education level as high school. This was followed by some college and associate's degree. We also asked participants if they completed trades/technical training. This response was nearly split down the middle, with ~46% responding that they completed trades training, and ~54% responding that they did not.



Education level of parents

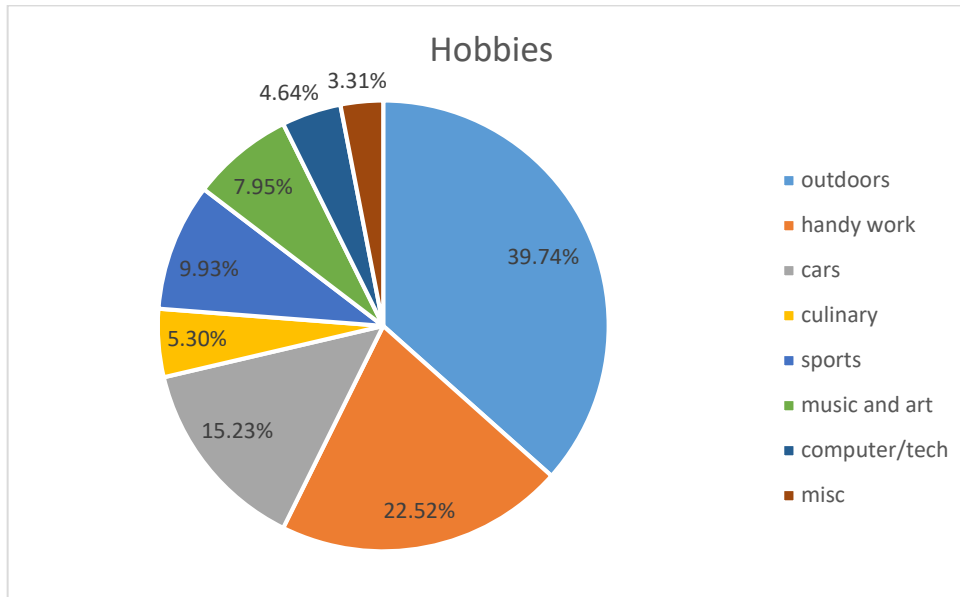
When asked about the highest completed education level of participant's parent(s) or guardian(s), the majority response among those that answered was "some college", followed by bachelor's degree.



Qualitative Interviews

Hobbies

Of the 46 interviews, we captured observations of 35+ hobbies for a total of 164 different hobby responses. We have consolidated these hobbies into the following categories: outdoors; cars/motor vehicles; handy work; sports; culinary; computers/technology; music and art; and miscellaneous.



The outdoors category was clearly the most common response category, however, it is important to note that this category contained the most sub-categories (fishing; camping; biking; hunting; hiking; kayaking; biking; recreational vehicle; and shooting). The second most common response was “handy work”, whose sub-categories include house work (which included a variety of home maintenance hobbies); antiquing; and gardening/landscaping.

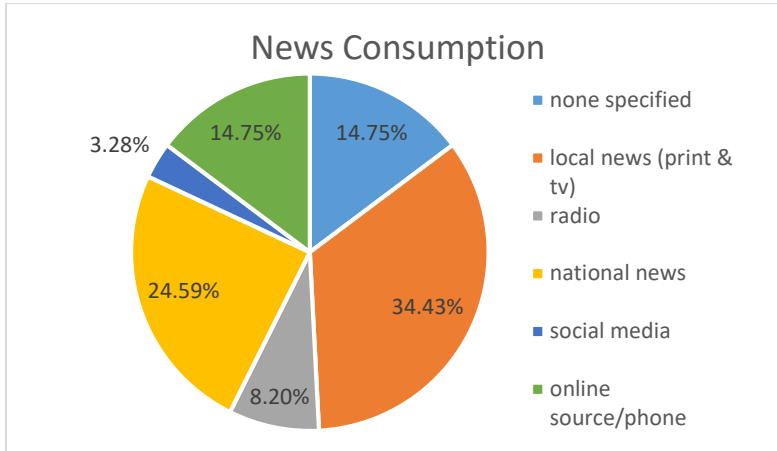
Although the cars category came in third we feel there is some intriguing information within this response. Of its two sub-categories (general working on cars and car races), the working on cars category had the most responses out of any of the sub-categories (outside of handy work, which, again, included a number of different home maintenance hobbies). 17 individuals identified as having an interest in working on cars. That is over 1/3 of respondents. Therefore, we feel that there may be an opportunity to increase awareness of manufacturing at the various car related events we have in the region, as there may be people who share this hobby/interest that are not currently engaged in the labor pipeline and may be a good fit.

Additionally, overall we observed more than half of respondents (65%) identified that their hobby involved “working on” something. We feel that this is a particularly compelling observation because it indicates that these individuals use their hands-on approach to work at home as well.

Media consumption

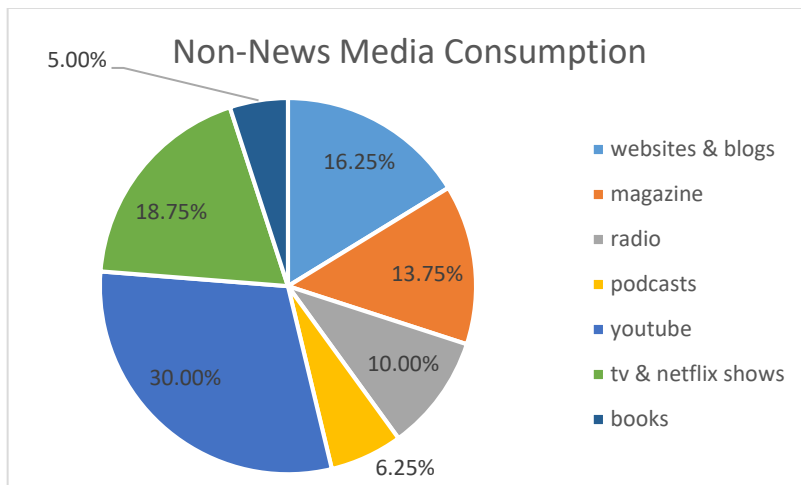
News

In general, we did not find participants to be overly “plugged in” to news. While there were a small handful of individuals who were self-described “news junkies”, a majority of respondent’s demeanor was lackadaisical when it came to the news. It was observed a majority of respondents identified local news (either print or TV) as their main source of news, followed by national news sources.



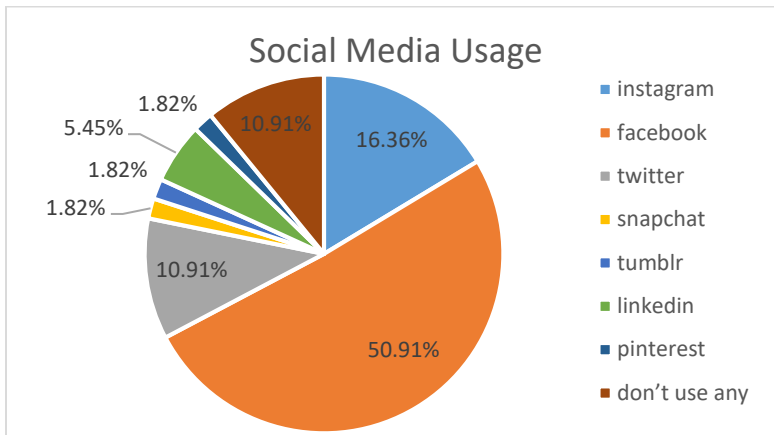
Non-News Media

We captured a total of 76 responses from the 46 participants in regards to their “non-news” media consumption. We consolidated these responses into the following categories: websites and blogs; magazines; radio; podcasts; YouTube; TV & Netflix shows; and, books. We pulled YouTube into its own category as it was the single most common sub-category, with 24 unique responses- over half of all interview participants. Based on our interviews, the sample is primarily using YouTube as a reference tool when they are learning how to do something. This ranged from learning how to do electrical work in their home to changing the brakes on a car. We feel that this presents an exciting opportunity to engage potential pipeline candidates through this social network, by either advertising on other videos or creating original content that may be of interest to this population.



Social Media

Although social media can technically be classified with the non-news media consumption, we chose to pull it into its own category since there is such a robust array of social media platforms, and we see value in knowing which specific ones are being utilized so that we can do additional targeted marketing. Not to our surprise, it was observed that Facebook is the most commonly used social network amongst our sample. There have been numerous reports that Facebook is the most popular social network platform, with ~2 billion active usersⁱⁱ. Of the responses we captured, Facebook reigned supreme, with 28 of the 46 participants reporting that they use the site.



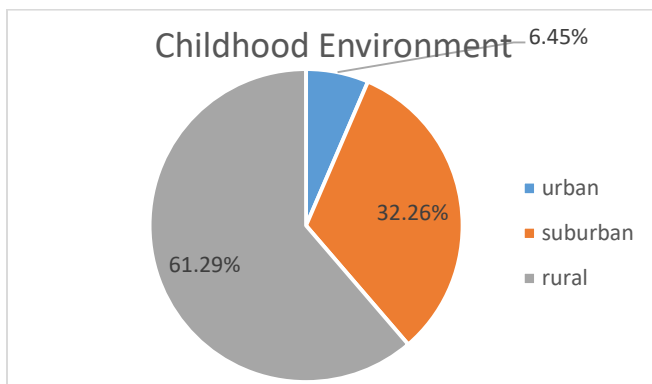
Career Path

In order to understand their career path, we felt it was important that we understand a bit more about their background, particularly their childhood interests.

Childhood Environment

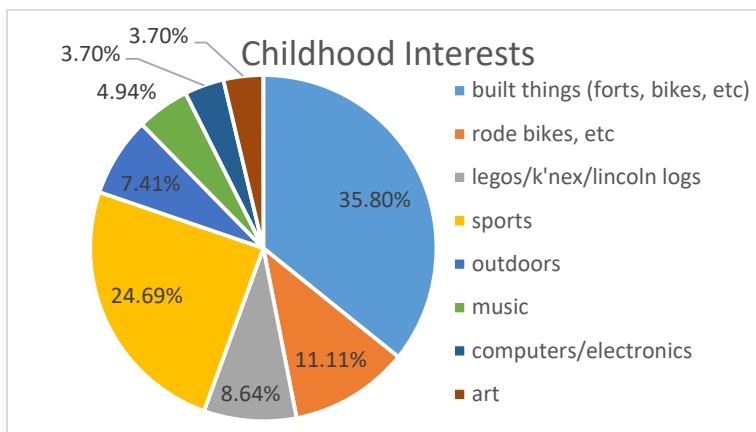
Of the participants that we asked (questioning evolved slightly after the 3rd or 4th interview), 61.29% reported to have grown up in a “rural” environment. Although this data can only be classified as an observation, we feel that it may indicate an opportunity to continue engaging our rural communities as potential sources for pipeline candidates.

One theory as to why this was so common among our sample is that individuals who grow up in a rural environment do not have the same conveniences that urban/suburban areas have, and therefore individuals develop a certain “self-sufficiency” that promotes mechanical aptitude at an early age.



Childhood Interests

In regards to childhood interests, we captured 81 unique responses from our participants. We put these responses into the following categories: building things; riding bikes, etc; legos/k'nex/lincoln logs; sports; outdoors; music; computers/electronics; and, art. “Building things” was the most common childhood/youth interest among the group, with 29 of the 46 individuals reporting that either building something (like forts), fixing something (like bikes), or working on/repairing something (like cars) was a major childhood/youth interest of theirs. This hints to the fact that mechanical aptitude is often something that is developed in childhood, and that individuals who develop this aptitude in their childhood/youth are often excellent candidates for the manufacturing industry.

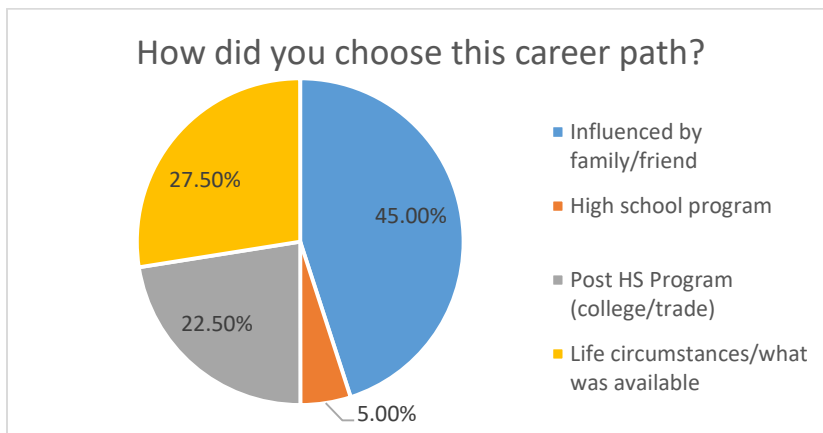


Childhood Interests cont'd

Another interesting observation that is important to bring attention to is the number of individuals who indicated that they had a family member (either parents, grandparents, aunts or uncles) that worked in the industry and/or in trades & skilled labor. 25 of our 46 participants shared that they had a family member who worked in these areas.

Choosing Career Path

Keeping in this train of thought, our next interview question was: “how did you choose this career path?” Overall, we found that 18 of the 44 respondents (we did not obtain this information from 2 of the participants) identified influence from family and/or friends as the primary reason they chose the manufacturing/skilled labor/trade career path. Second to this was outside life circumstances that led them to take what was available to them at the time.



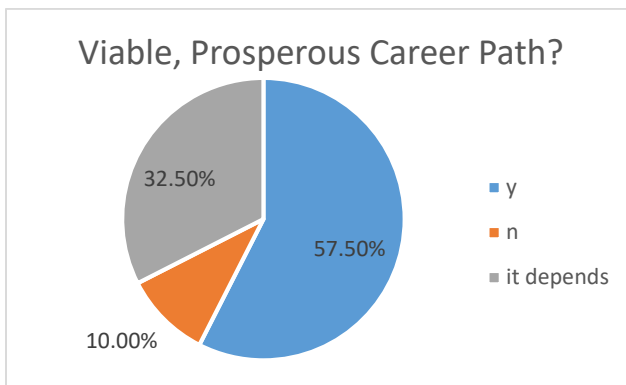
Additionally, we observed 19 instances where the participant was working at their current employer because they were referred to by someone, either by simply hearing from a family member or friend that it was a good place to work, or being directly referred by a family member/friend who was working in the company. We want to put emphasis on this observation as this could be something that our manufacturers could capitalize on. It’s reasonable to assume that like-minded people “flock together”, so it is worth serious consideration by the manufacturing community to implement incentivized referral programs within their companies, so that this potential pipeline opportunity can be maximized to the fullest.

Manufacturing Perception

Our final area of questioning focused on the overall perception of manufacturing from the non-exempt employee's perspective. We asked them 3 specific questions in order to evaluate this: 1) is a career in manufacturing viable as a life-long, prosperous career; 2) would you recommend this career path to your child or another youth; 3) what do you think are some of the overall perceptions of manufacturing—when you tell people what you do what are their overall reactions?

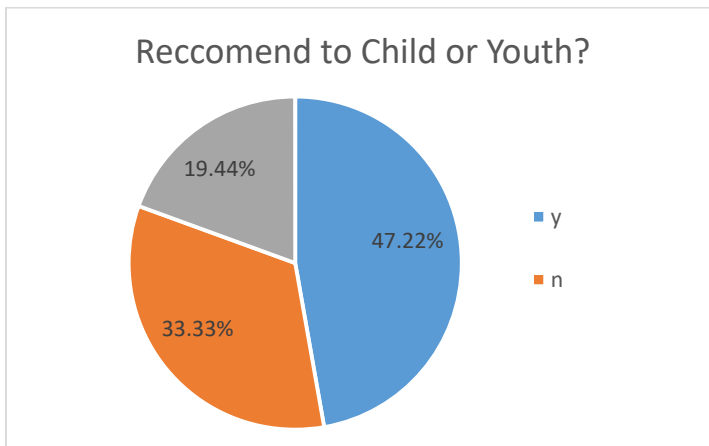
Viable as a Career Path

We are happy to report that a majority of participants that answered this question (40 total responses) feel that a career in manufacturing is viable as a life-long, prosperous career path. It is reasonable to assume that most of the participants in this study felt satisfied with their career choice and what it has afforded them in life. These factors may include pay, benefits, work environment, and overall satisfaction with the nature of their work.



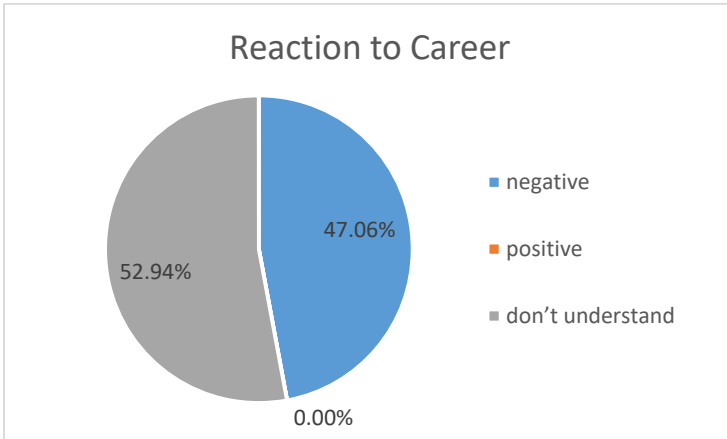
Recommend to a Child or Youth

Interestingly, when we asked participants if they would recommend this career path to their child or to a youth that may have similar characteristics to them, the response was relatively mixed. A majority of the responding participants responded that they would not or are uncertain if they would recommend it. In some instances they explained that it would require some very specific circumstances for them to recommend the career path (bad at school, 4 year degree wasn't an option), others said it would very much depend on exactly what trade they wanted to pursue, and some said it would depend on exactly where they would be going to work.

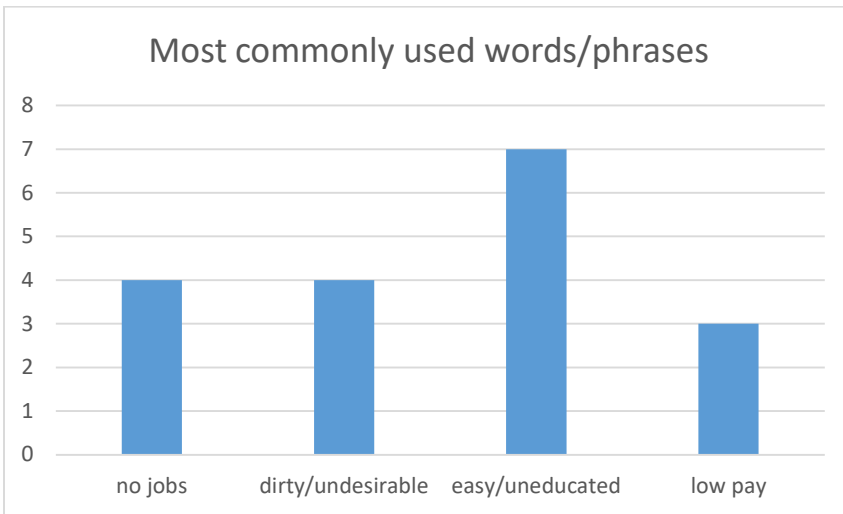


Reaction to Career

When we asked participants our final, most direct perception question, the results clearly outlined that we must continue our efforts to improve overall awareness of manufacturing and skilled labor/trades careers in our region. The 34 participants that responded to this question reported that in general, members of the general public (outside of the manufacturing community) expressed an inability to understand what they (the participant) does for a career. The only alternative response that participants reported was a negative response/reaction.



Below are some of the most commonly used words/phrases to explain what they thought the general public thought of manufacturing and/or these career paths:



Clearly, there is a tremendous disconnect between what the general public believes about manufacturing and what is actually true. What we find to be the most interesting is that although participants reflected feeling that this was a viable career path, they were hesitant to recommend it to a child. This perception issue may be the underlying force.

Transferable Skills Analysis

As part of Pathways Project, a goal was set to develop and understand what trade, vocational, and middle skill manufacturing skillsets would lend themselves to be transferable into advanced manufacturing environments and have a pathway for growth within a manufacturing career. To understand this, we developed a research plan that involved three steps.

- 1) Interview manufacturing executive teams about most desired job openings and skills required for those jobs
- 2) Using data gathered from these interviews, develop a survey tool to conduct a broader response to desired entry level jobs and skills required for those jobs
- 3) Research nationally recognized manufacturing workforce development programs

Upon gathering this data and cross comparing it, CEG developed a basic framework of manufacturing skills shared across or transferable to different manufacturing industries within the Capital Region. Below are summaries of the resulting research for each step outlined above.

Interviews with Manufacturing Executives & Non-Exempt Employees

CEG conducted 17 interviews with CEO's, Presidents, HR Managers and 46 non-exempt employees from a variety of manufacturing industries in the Capital region. These companies included:

- Applied Robotics
- Ball, Inc.
- Blasch Ceramics
- Digifab Workshop
- Espey Manufacturing
- Frank Murken Products
- General Electric
- GLOBALFOUNDRIES
- Greno Industries
- Mohawk Fine Papers
- PGS Mill Work
- Pretium Packaging
- Quad Graphics
- Simmons Machine Tool
- Specialty Silicon Products
- Sheet Metal Workers Local #83
- Transtech Systems

The interview outline can be found in Appendix 1. Three key questions for the pathways and transferable skills analysis included:

1. What current technical/trade/skills job title are most desired?
2. What training do you provide internally for all staff and special job titles?
3. What are the bare-minimum competencies/skills that someone going into an entry-level position at your company must possess?

These questions helped frame an understanding of the range of positions, skills, and training required for manufacturing jobs in the Capital Region that would guide the development of the basic transferable skills and pathways product.

Basic findings from the Interview with Executive Staff and HR

Below is a chart that summarizes the various responses to the three questions outlined above. Many of the job titles and skills were repeated among the interviewees:

<u>Job Titles Sought</u>	<u>On the Job Training</u>	<u>Skills Desired</u>
Assembler, Production Technician, Production Operator, Welder, Cabinet Maker, Technician, Engineer, Machine Operator, Machinists, Instrumentation Specialist, Machine Maintenance, Production Support, Electronics Technician, Tool and Die Maker, Electronics Technician, Maintenance Technician, Facilities Technician	Safety Training, OJT Equipment Training, Manufacturing Management Software Training, Industry Specific Vocabulary and Blue Print Comprehension, LEAN, ISO, Crane & Rigging, Fork Lift, CDL	Basic Computer Skills, Microsoft, Mechanical and/or Electrical Aptitude, Blue Print Reading, Soldering, Problem Solving (Troubleshooting), Basic Tools and Measurement, Basic Assembly, Team Work, Work Ethics, Reading and Comprehension of Instructions, Basic Math, Basic Algebra, Attention to Detail, Self-motivated, Dependable, flexible, Basic Statistics, fast paced

An observation of the data is the numerous technician and maintenance level positions. Another common title was production operator, assembler, and machine operator. On the job training provided revolved around specific equipment use, safety training, and process oriented training unique to the organization or industry. Finally, the skills desired were split between hard skills like basic math, blue print reading, mechanical aptitude to softer skills like attention to detail, dependable, and team work.

These data were used to help inform the next phase of developing the broader transitional skills survey and early insights for developing the Pathways Product.

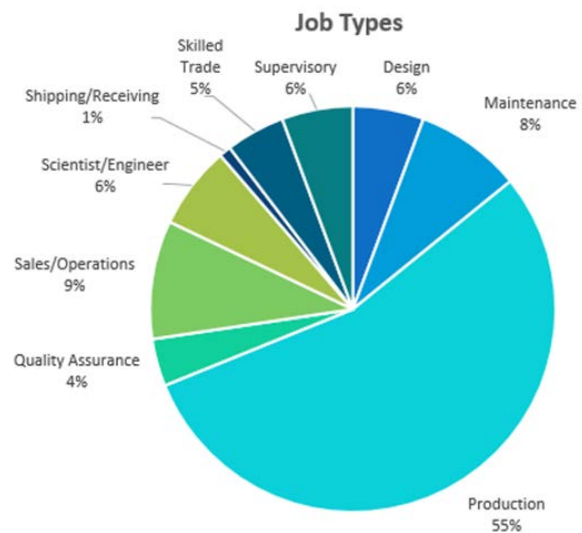
Broader Survey of Manufacturing Executives

After conducting about three quarters of the manufacturing interviews, CEG, working with Metrix Learning, deployed a broader survey of manufacturing executives. The survey was designed to determine entry-level manufacturing positions, high-need positions, and the skills required. The survey was sent out on May 16, 2017. In total, there were 55 responses. Some companies submitted multiple entries by different people. Some companies did not fully complete the survey. There were 43 viable responses from 40 unique companies, listing 172 current job openings. The majority of the companies were small to mid-size companies (under 500 employees).

The full summary of the results provided by Metrix can be found in Appendix 2a & 2b. Some key takeaways from the data.

- 55% of open jobs are for production positions
- Minimum required skills for entry level positions: Communication, Math, Computer, Safety, and Process skills
- The skills with the most number of responses included: Safety, Communications, Mechanical, Math, and Process skills.

This survey asked about 106 job types over entry-level, mid-level, and high-level positions. The number one entry-level position was Production Worker/Technician, the number one mid-level position was Machinist, and the number one high-level position(s) was Scientist/Engineer and supervisory.



Further, the survey assessed specific skills required by job types identified. Some of the key highlights include:

Skill Category	Most Common Skillset Identified
Communication	Basic Reading Comprehension, Basic Writing, Interpersonal Skills
Mechanical	Equipment and Tools, Mechanical Systems – Basic, Hydraulics, Lathes
Math	Basic Math (MFG), Measurement / Metrics (MFG), Precision Measuring
Process	Advanced Manufacturing, Assembly Process, Forklifts, Lean Manufacturing

These data were used to help inform the next phase of assessing other national, public, private workforce development programs/platforms/tools and early insights for developing the Pathways Product.

Research of Manufacturing Workforce Development programs

Through CEG's research and feedback from both the Pathways leadership, Pathways partners, and the NIST Manufacturing Extension Partnership, three programs were identified that have shown success in developing a stronger pipeline of manufacturing skilled labor. CEG would use these programs as "references" to successful implementation of best practices for identifying transferable skills and the development of a more robust future Pathways Product. The three reference program identified:

1. ToolingU

- ToolingU is a comprehensive training platform for instructor led, online, assessment and certification for manufacturing skills. It is utilized by several fortune 500 companies and recently partnered with the NIST Manufacturing Extension Partnership program. Manufacturer's and workforce development organizations can work with ToolingU to develop a prescribed training program. For example, ToolingU developed the *Accelerated Advanced Manufacturing Program* focusing on machining, industrial maintenance, welding, and manufacturing fundamentals. See Appendix 3 for flyer example.

2. MACWIC (Manufacturing Advancement Center Workforce Innovation Collaborative)

- MACWIC created the *Applied Manufacturing Technology Pathways Certification* program. The program started as a basic 60 hour manufacturing skills certificate program that has evolved to a three level 144 hour apprenticeship program offering certification and stackable credentialing leading to college credit. See Appendix 4 for program graphic.

3. East Mississippi Community College, *Manufacturing Basic Skills* program

- Operating over 10 year with 2000 graduates, the program was created at the request of manufacturers. It leverages the WorkKeys test to assess initial aptitude to enter the program. Each class is approximately 85 hours, 8 weeks, four days a week, 3 hours a day. Students take several tests through the course, Basic Measurement, Precision measurement, Print Reading, Hi-Performance Manufacturing (LEAN Techniques) and OSHA. Each test must be passed at 80% or greater. The objectives of the course are outlined in Appendix 5.

These programs have been successfully providing training resources for several years and they share some common attributes: 1) Initial focus on basic manufacturing skills, 2) Program leading to certification, and 3) Bootcamp style delivery program with balance of online and hands on training, 4) Developed by alignment with regional employer needs.

Recommendations for Transferable Skills

During the study three major consensus stood out during our interview process: 1) Insufficient pipeline of qualified candidates, 2) Candidates lacked the basic manufacturing skills, 3) Lack of a qualified structure training program existed for entry-level manufacturing jobs.

CEG recommends that the workforce partners begin developing a level-one manufacturing certificate program, leveraging resources such as ToolingU, Metrix Learning, WorkKeys, etc. This basic program should cover many of the skills identified in our transferable skills analysis as well as best practices employed by the programs highlighted. Below are examples of course topics.

- Basic Measurement
- Basics of Manufacturing Costs
- Basics of Tolerance
- Blueprint Reading
- Essentials of Communication
- Working in an Manufacturing Environment
- Intro to LEAN Manufacturing & Process
- Intro to Abrasives
- Intro to Additive Manufacturing
- Intro to Assembly
- Intro to Fluid Systems
- Intro to Hydraulic Components
- Intro to Mechanical Systems
- Intro to OSHA
- Intro to Pneumatic Components
- Intro to Robotics
- Intro to CNC Machines
- Intro to Mechanical Properties
- Intro to Metals
- Intro to Physical Properties
- Intro to Welding
- Math Fundamentals
- Math Fractions & Decimals
- Quality Overview
- Troubleshooting
- Units of Measurements

The developing program should provide a universally recognized assessment that aligns specific competency models that cross industry sectors.

Pathways Product

The next step from above research as well as gathering an inventory of education programs assets in the region, would then be to develop a “Pathways Tool” or “Template”. This tool would be used to identify an entry level manufacturing position and identify a “Pathway” towards career growth within manufacturing and advanced manufacturing. The tool would identify various job descriptions, education, certifications, and experience required, regional assets and programs available, as well as the work-life expectations of the jobs.

The purpose of the tool is for our partners to use it as a template and modify it for marketing advanced manufacturing careers and education. The Capital Region workforce development boards intend to use and further develop this tool to deploy on their websites and in their centers.

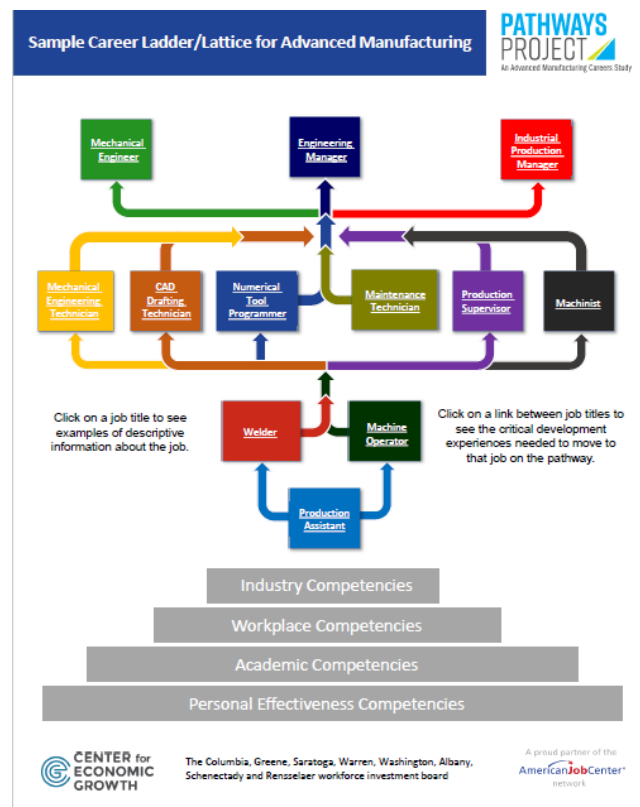
From our research and discussion with the leadership team it was identified to begin with the **Production Assistant with initial pathways into Welding and Machine Operator**, keeping in mind that this is also a template that can be modified for different job titles and paths and updated as our education assets change.

The graphic shown is the current Pathways Tool. CEG completed this tool with the assistance of Metrix Learning. The tool was formatted as a Microsoft Power Point file. This will allow for our partners to easily modify the content without the need of any special software.

When saved as a PDF file, each job title links to specific detail on that job, including; job description, minimum education required, work experience, salary, and in some cases specific programs for obtaining the level of education.

As this tool develops, CEG envisions deploying it on a regional web portal such as Tech Valley Connection for Education and Jobs as an interactive pathway using a platform such as PREZI.

The complete Pathways Tool is in Appendix 6.



SWOT Analysis

As part of the main deliverables of the Pathways Project, we were asked to complete a SWOT (strengths, weaknesses, opportunities, threats) analysis of the Capital Region's manufacturing workforce. We have based this analysis on information from our own research, statistics from various sources, and news articles.

SWOT - Strengths

There are a number of contributing factors that lend themselves to making the region's manufacturing workforce strong contender within NYS and nation-wide.

Strong number of programs

A main deliverable of this project was to develop a project inventory of our manufacturing-focused programs. We extended this definition to focus on the broader spectrum of STEM-focused programming because these competencies are generally important to the manufacturing industry. It was immediately evident that there is no shortage of education resources here. We estimate that there are 20+ programs at the high school and BOCES level that offer training that lends itself to manufacturing. There are 44+ programs at the community college level. In regards to 4-year degree programs, we believe there are 62+ programs housed at the region's higher education institutions that lend themselves to the STEM & manufacturing industries. In regards to apprenticeship training programs, as of June 2017, there were 27 apprenticeship program opportunities region-wide.

These manufacturing-focused program statistics are based on online searches, and there are probably many more programs that were not counted. Either way, the variety of resources at multiple levels of education should be viewed as a strength. The variety of programming available provides ample opportunity to a broad spectrum of learners, whether they are a high school student, a recent graduate, or an adult learner. That allows us to reach multiple generations of our population as pipeline candidates.

Proximity to larger metros with higher cost of living

It should come as no surprise that the region has a low cost of living as compared to larger, neighboring metro areas New York City and Boston. The Albany-Schenectady-Troy metro area's cost of living index (COLI) was 112.7 in 2015, according to the Council for Community and Economic research. That was significantly lower than Brooklyn's COLI of 173.2 and Boston's 144.3. Our southern-most county, Columbia, is only 131 miles away from NYC and 150 miles from Boston. The heart of our region, Albany, is only 169 miles from Boston and 152 miles from NYC. This proximity and attractive cost of living as compared to these metro areas provides us with an excellent opportunity to leverage this benefit to potential pipeline candidates in those densely populated areas.

Free SUNY Education

Governor Cuomo announced the Excelsior Scholarship program in 2017, making college tuition free for full-time students matriculating through SUNY institutions whose family income is \$125,000 or lessⁱⁱⁱ. Although this asset is offered statewide, we feel that the density of SUNY institutions in the Capital Region makes it an ideal location for individuals in the manufacturing industry who are interested in eventually pursuing their 2-year or 4-year degree. This is also strengthened by the vast opportunity of educational programs at our SUNY institutions that are strategic to the manufacturing industry.

Growing population

According to Census Bureau estimates from March 2017, the Capital Region is one of a handful of regions in NYS that is growing. This puts at an advantage as compared to our neighboring regions to grow our workforce.^{iv}

General appeal of non-exempt, manufacturing positions

As observed in our focus groups, there is a tremendous perception issue amongst our community (both regional and nationwide) regarding non-exempt manufacturing positions^v. One of the commonly used words by our focus groups was “low-paying.” However, we have heard from many of our participants that pay and benefits were viewed as a positive, especially when considering the pay and benefits available from competing industries, such as retail and service. The Capital Region’s traditional manufacturing industries, less high tech industries, pay more than the retail trade sector, which in 2015 had an average annual wages of \$28,926. In contrast, the annual average wages was \$39,092 for the wood products manufacturing industry, \$42,786 for food manufacturing, \$58,056 for fabricated metal products manufacturing and \$66,668 for paper manufacturing, according to New York State Department of Labor data.

Additionally, we observed in the focus groups that some of the perceived “challenges” of non-exempt, manufacturing-focused positions are often seen as positives and/or strengths by younger generations. There was some reflection that the shift/swing work cycle was actually a benefit for them because it allowed for longer weekends which they could utilize to their liking. Also, the fact that these positions are not “desk jobs” was also viewed as a positive by some of our participants. These individuals reflected an inability to sit still and enjoyed the fact that their job required them to be actively on their feet and working with their hands.

Overall, we found this sample generally enjoys that they are able to directly apply their knowledge in a way that is tangible in some form. In regards to being qualified as non-exempt, a number of focus group participants reflected that being overtime-eligible presented them with a welcomed opportunity to make more money if they so choose. Finally, a number of participants expressed the development of their mechanical aptitude as a personal gain for them because it has given them a know-how that benefits them in their home lives. We frequently heard that this population enjoys and takes advantage of the fact that they are able to fix their own automobiles and provide various home improvement services to themselves instead of hiring others to do it.

Capital Region manufacturing employment is trending upward

Capital Region manufacturing employment has increased by 10% in the past 5 years, according to data from the US Bureau of Labor Statistics. During that period, the nation’s manufacturing sector has grown by only 3.3% and New York State’s declined by 2.1%. Clearly, the Capital Region is growing its manufacturing employment opportunities at a rapid speed^{vi}. By leveraging these strengths, we could better position the region to attract individuals from other areas of the country and state whose manufacturing employment trends are decreasing. The Pittsfield, Massachusetts metropolitan area, which abuts the Capital Region’s western border, last year sustained its largest annual manufacturing sector employment loss since 2010 (-2.2%). The Bennington County, Vermont metro area’s annual manufacturing sector employment sector decline was even steeper (-7.9%) and the highest since 2009. That means between these two New England metros, which are both within an hour’s drive of Albany, there were 303 displaced manufacturing workers in 2016 who could have been targeted for the Capital Region’s workforce pipeline.

SWOT - Weaknesses

Despite the region's strengths, there are weaknesses that continue to present themselves as impediments to growing our manufacturing workforce pipeline.

Declining population of ages 0-24

According to the URI report, the population of individuals from 0-24 is predicted to decrease over from 2015-2020^{vii}. This implies that we have an aging population and are lacking a steady stream of younger individuals who are capable of filling the roles that older generations will soon vacate. We have heard from several employers that succession is the biggest problem their organizations' workforces are facing.

General misunderstanding of manufacturing

Based on our focus groups, we believe there is a tremendous perception issue in regards to manufacturing in the Capital Region. When we asked focus group participants what were the most common perception of manufacturing was, they said people genuinely struggle to understand what they do. Additionally, we observed that there is also a perception issue within the manufacturing community itself. When asked if they would recommend a manufacturing career to a child, it was nearly split 50-50. Individuals struggled to believe that a career in manufacturing could result in "doing better." However, many did not struggle to name the successes with which manufacturing afforded them.

So long as this poor perception remains unchallenged, Capital Region manufacturers will have difficulty convincing people to pursue this career path. We must continue to tell positive stories about the opportunities that a career in manufacturing affords workers and their families.

Circumstances/nature of job

Contrary to our observations about the appeal of non-exempt manufacturing work noted in the "strengths" section, we noted that some individuals were hesitant to recommend this career path to a child/youth because of the challenges of the nature of the job. A number of focus group participants reflected on the strain a 24-hour work cycle can put on relationships, particularly if that individual has a family. Additionally, the physical demands of the job can make for a difficult transition for individuals who are not accustomed to such.

Average hourly earnings in NYS has remained flat

Stagnant wage growth could also be stunting the manufacturing sector's growth. In 2016, New York State's average hourly earnings for manufacturing employees was \$25.72 – down one penny from five years earlier.^{viii} One way to make manufacturing more attractive would be to increase the average hourly earnings. For example, between 2012 and 2016, the Raleigh metro area experienced a 28.1% growth in manufacturing employment, totaling 34,383 in 2016. During that period, its average hourly earnings for manufacturing employees increased by 6 percent to \$25.67 – more than New York State's rate. Notably, the Raleigh metro area in 2016 had 496 more manufacturing jobs than the Capital Region, whereas it had 3,973 fewer such jobs in 2012, according to U.S. Bureau of Labor Statistics data.

Rural transportation

We have observed from interviews with our rural manufacturers that access to public transportation is an impediment to growing their workforce. This is particularly challenging for our manufacturers in

Warren, Washington, Columbia, Greene, and rural parts of Saratoga and Rensselaer counties, who have extremely limited- or no- access to the CDTA system.^{ix}

Majority small companies = limited resources

Almost nine out of 10 Capital Region manufacturers (86.7%) had fewer than 50 employees in 2015. Seventy percent had less than 20, according to U.S. Census Bureau data. The size of the manufacturers limits their access to resources (e.g., financial and human capital) to promote opportunities, implement on-the-job training programs, and fund outside education programs. Employer size also limits access to the private capital that could help fund awareness campaigns to combat the poor perception issue the industry faces in the region.

SWOT - Opportunities

Based on the outlined strengths and weaknesses, we believe that the region is well-positioned to capitalize on the following opportunities to grow the manufacturing workforce pipeline.

Underemployment

According to the Capital 20.20 plan, the region's underemployment rate is estimated to be around 10.6%. We feel that there could be opportunity to encourage individuals within that 10.6% to consider a career change (and career improvement) by moving into the manufacturing space. A related focus group anecdote that comes to mind is an 18-24 year old male who had his associate's degree in music, was working in the service industry as a chef, and decided to move into the manufacturing space for stability and pay reasons. Although he is still not utilizing his degreed skillset, he is now tapping into a previously unrealized skillset as a machinist and has improved his pay from his previous job. We feel that it is likely there are many others out there that are similar to him, and that they may be worthwhile candidates for this workforce. Additionally, we feel as though our "customer profile" data could help us identify those individuals.

Referral programs

Just under half of our focus group interviewees shared that they were referred to their current employer by someone they knew. Based on this information, we feel that there is a substantial opportunity for our local manufacturing employers to increase these instances by implementing incentivized referral programs to help bring more outside individuals into the manufacturing workforce pipeline.

Declining retail establishments

This year and last have been described as a "disastrous two years"^{xi} for brick and mortar retail, and there is reason to believe that this downward progression will continue. Based on CEG's analysis of U.S. Bureau of Labor Statistics data for the Capital Region's manufacturing and retail trade sectors, manufacturing employment has increased 10% over the past 5 years and establishments have increased by 1.8%, as compared to a 1% increase in retail employment over the past 5 years and a 1.8% decline in establishments.

In fact, the performance of the Capital Region's retail sector is worse than the nation's, which over the year experienced a 1.2% increase in employment and a 0.2% increase in establishments. Schenectady County, in particular, has suffered annual retail sector declines for several years. In 2016, five of the region's eight counties sustained annual retail employment losses. All of them, with the exemption of Rensselaer County, averaged fewer retail establishments in 2016 than a year earlier. Looking back five years, Albany County is alone in gaining retail establishments, but only by 0.7%.

Consequently, we feel that the changing climate provides opportunities manufacturers can capitalize on, and, based on national reports, it is reasonable to assume this negative trend will continue. We should encourage manufacturers to engage this population of individuals in need of employment.

Automotive industry

Based on our interviews, we have learned that over 1/3rd of participants identified as having an interest in automobiles and have either worked on them personally or professionally. Based on this information, we feel that there is a potential opportunity to recruit individuals from the automotive industry who are

looking for a career change. Additionally, we should consider deploying generic recruiting surrounding the various automobile events (e.g. car shows and car races) held within the Capital Region.

Engage 25-44 population

According to the URI report,^{xii} the 25-44 population is projected to grow by .8% by 2020. We feel that this is an excellent population to tap into, especially considering that over half our sample fit into this population. Additionally, a number of our focus group participants shared that they made a career change to manufacturing while in this age range. Based on information gleaned from our interviews, we feel that individuals in this age range may have explored other industries that provide less stability (e.g. service and retail) and are able to finally realize the opportunities that a career in manufacturing can afford them.

Engage rural population

Based on the interviewees that we collected this data from, 61% identified as growing up in rural populations. We believe this rural upbringing may have helped these workers nurture the self-sufficiency that lends itself to the development of a mechanical aptitude. Therefore, we believe there are opportunities to continue to engage individuals hailing from rural populations as potential candidates for the manufacturing workforce pipeline.

Additionally, data indicates many manufacturing workers who live in rural areas are willing to travel to out-of-county worksites. In 2015, there were 3,013 people who lived in Columbia and Greene counties who worked in manufacturing^{xiii}, however, there were only 2,362 manufacturing jobs in those counties^{xiv}. Even if all the manufacturing jobs were filled by people living in the same counties as their employers, that leaves 651 residents were traveling to manufacturing jobs outside of their home counties.

Engage immigrant population

According to the latest census bureau data, international migrants are the driving force of the Capital Region's population growth. Between 2010 and 2016, the Capital Region experienced a -15,570 net migration of domestic residents and 16,479 of international residents. We know based on conversation with some of our employers that there has been generally positive experiences engaging immigrant populations in Schenectady and Columbia County. If we can expand necessary resources such as ESL services, we may be able to tap into some of this population growth to help improve the manufacturing workforce pipeline.

Communicate with potential pipeline candidates on YouTube and Facebook

Our focus group participants expressed overwhelming interest in both YouTube and Facebook. We feel as though the Facebook observation is potentially less compelling, as it's the most commonly used social media platform, but we are particularly intrigued by the sample's presence on YouTube. Most of the study participants who expressed using YouTube used it specifically for tutorial purposes – be it learning how to do electrical work to learning how to change the brakes on their car. Individuals utilizing YouTube to learn about manufacturing/electrical/technical processes and procedures may be good candidates for manufacturing jobs, and we therefore feel that this is a worthwhile avenue to explore for strategic marketing.

SWOT- Threats

Rural population is declining

According to recent Census Bureau data, our rural populations, which we identified as an opportunity group, are declining^{xv}. Although this is not necessarily a tremendous threat, it could potentially mean that we are losing access to a population of people that have a strong, self-developed mechanical aptitude.

Immigration reform

Similar to the above point, the uncertainty surrounding immigration policy in the United States could impede our ability to capitalize on the opportunity with which the increasing population of international migrants could afford.

General dialogue surrounding automation

One does not have to look far to understand that there are nationwide anxieties surrounding automation. There are countless examples, but one recent illustration of this anxiety is a television ad from the University of Phoenix about a young mother who works in a factory, who is left to re-build her life after a robot steals her job^{xvi}. Even though we know that increase automation does not necessarily mean job loss^{xvii}, we have heard in a handful of focus group interviews that this fear has had a direct impact on current manufacturing employees' confidence in the industry. Furthermore, this exacerbates and adds another layer to the perception issue the industry is already facing.

Low unemployment rate

The Capital Region's unemployment rate is currently at 4.2% – lower than both the state and national averages.^{xviii} That has introduced considerable competition for potential candidates. Additionally, our labor force is decreasing, therefore exacerbating this issue. The Capital Region's labor force consisted of 545,900 workers in 2016 – 15,500 fewer than there were before the recession started in 2007, according to New York State Department of Labor data.

Enrollment in BOCES programs

As we learned from our previous Pathways meeting, some area BOCES programs are experiencing difficulty getting students to enroll in their Career and Technical Education programs. While we can't speak definitively as to what might be causing this, we feel it's a possibility that this is a by-product of the growing perception issue we mentioned in the weaknesses portion of our analysis.

Unique workforce development programs in other states

As we learned from the Deloitte report, the shrinking manufacturing workforce is not an issue exclusive to the Capital Region, or even New York State. We are aware of a handful of programs in other states that are already successfully executing a "manufacturing bootcamp" type program. The two specific programs that we looked at, the Basic Manufacturing Course at East Mississippi Community College, and the Manufacturing Advancement Center Workforce Innovation Collaborative out of the Mass MEP have matriculated thousands from their programs and have also managed to secure funding streams from their state governments and workforce partners to continue their work.

Key Recommendations

In summary, we have identified the following key recommendations as worthwhile considerations for our manufacturing, workforce and education community:

1. **Manufacturer's should consider implementing incentivized employee referral programs**
 - o Based on our research, implementing an incentivized employee referral program is a worthwhile policy that manufacturers should consider. We observed 18 instances where participants were working at their current employer based on referral, and additionally, over half of our participants identified as being influenced by a family member or friend in regards to their career choice. We feel that implementing a program like this could help increase these instances and create greater access to potential candidates.
2. **The workforce community should consider expanding availability of apprenticeship programs**
 - o Based on our interviews with CEO/HR representatives, we found that there was considerable interest in increasing and/or improving availability of relevant apprenticeship programs, both formal and informal. Models worthwhile pursuing are the Manufacturing Alliance of Central New York's model or the Massachusetts MACWIC program. Under the MACNY model, a relevant association/nonprofit would sponsor specific apprenticeships in occupational titles most desired in the Capital Region (see Appendix 7). The MACWIC model also leverages a relevant association and nonprofit in partnership with regional community colleges (See Appendix 4). CEG's Manufacturing Extension Partnership center would be a logical candidate. Through these types of partnerships, CEG MEP would provide a variety of unique program offerings and help expedite qualified candidates and provide coaching support for apprenticeship supervisors. The MACNY model also eases the NYSDOL process for participating companies by acting as the intermediary between.
3. **We should target potential pipeline candidates (archetypes) to job opportunities and workforce programs through:**
 - o YouTube and Facebook content
 - o Outreach at events where target audience spends time
4. **We should target the 25-45 age group as they are a growing population and many of them may be good candidates for this field**
5. **We should continue to grow the study sample size of non-exempt employee interviews and develop a quantifiable survey**
 - o We recognize that a sample size of 46, although technically sufficient enough to fall within a normal distribution curve, is not substantial enough to say with confidence that the observations we are making are statistically significant when applied to the sample's population. Ideally, this study could be expanded to include a broader spectrum of non-exempt manufacturing employees so that we can apply our knowledge with greater confidence. Additionally, this survey should ask questions that are easily quantifiable, rather than utilizing qualitative interview data and turning it into quantifiable answers.

6. We should continue to support programs that highlight and promote manufacturing, such as Manufacturing Day, company tours, etc.
 - We know that there is a significant perception issue, not only in our region, but nationwide, when it comes to manufacturing. We must continue working to combat this issue, at the k-12 level and beyond. We strongly encourage continuing to support events and programs such as Manufacturing Day and school tours of our manufacturing facilities. There is opportunity to pursue targeted public relations campaigns to also help combat/improve public knowledge surrounding manufacturing in the Capital Region. These efforts should seek to create awareness on the many opportunities that exist in manufacturing.
7. Implement stackable credential model that provides manufacturing boot camp (certificate) and opens additional pathways to credit earning degrees
 - Based on our analysis of transferable skills needed by our manufacturing community, an expedited, stackable credential education model could be a worthwhile endeavor. This manufacturing “bootcamp” should aligns training with workforce agencies and employers and implement universally recognized assessment and stackable credentials. The programs outlined in the transferable skills section are each viable approaches to fulfill this recommendation.
8. Continue working with Manufacturing Partnerships to further refine pathways
 - Similar to the non-exempt employee study, we feel that there is still more that could be done to improve our understanding of the appropriate career pathways. It is important that we continue to work with our manufacturing partners and continue to refine these pathways.
9. Identify new and alternate funding programs to support these efforts
 - Workforce development programs can be expensive to administer. The Partners should continue to identify new and alternate funding programs that can support the programs outlined in this set of recommendations.

ⁱ <http://www.themanufacturinginstitute.org/~media/827DBC76533942679A15EF7067A704CD.ashx>

ⁱⁱ <https://www.lifewire.com/top-social-networking-sites-people-are-using-3486554>

ⁱⁱⁱ <https://www.suny.edu/smarttrack/types-of-financial-aid/scholarships/excelsior/>

^{iv} <http://alloveralbany.com/archive/2017/03/24/albany-metro-new-york-state-counties-2016-populati>

^v “The Public Perception of Manufacturing series conducted over the past six years by The Manufacturing Institute and Deloitte consistently reveals that while Americans consider manufacturing among one of the most important domestic industries for maintaining a strong national economy, they rank it low as a career choice for themselves”

<https://www2.deloitte.com/us/en/pages/manufacturing/articles/boiling-point-the-skills-gap-in-us-manufacturing.html>

^{vi}

Capital Region Manufacturing Employment Trends							
County/Region	2012	2013	2014	2015	2016	1-YR Change	5-YR Change
Albany	7,162	7,681	7,512	7,495	7,796	4.0%	8.9%
Columbia	1,441	1,556	1,480	1,471	1,455	-1.1%	1.0%
Greene	869	852	844	891	886	-0.6%	2.0%
Rensselaer	2,915	3,183	3,416	3,732	4,179	12.0%	43.4%
Saratoga	6,452	6,942	6,972	7,842	7,846	0.1%	21.6%
Schenectady	5,736	5,797	5,833	5,856	5,932	1.3%	3.4%
Warren	3,541	2,912	3,189	3,183	3,149	-1.1%	-11.1%
Washington	2,696	2,969	2,797	2,794	2,644	-5.4%	-1.9%
Capital Region	30,812	31,892	32,043	33,264	33,887	1.9%	10.0%
NYS	456,734	454,027	450,222	452,550	447,174	-1.2%	-2.1%
US	11,904,945	11,994,922	12,156,537	12,291,676	12,295,670	0.0%	3.3%

Source: US BLS

^{vii} https://www.ny.gov/sites/ny.gov/files/atoms/files/CRREDC_URI_FinalPlan.pdf

^{viii}

NYS Manufacturing Production Worker Hours & Earnings							
Category	2012	2013	2014	2015	2016	1-YR Change	5-YR Change
Average Weekly Hours of Production Employees	40.1	40.4	40.7	40.4	40.1	-0.7%	0.0%
Average Hourly Earnings of All Employees	\$25.73	\$25.53	\$25.87	\$25.67	\$25.72	0.2%	0.0%
Average Hourly Earnings of Production Employees	\$18.54	\$19.25	\$19.42	\$19.40	\$19.51	0.6%	5.2%
Average Weekly Earnings of All Employees	\$1,018.91	\$998.22	\$1,032.21	\$1,013.97	\$1,005.65	-0.8%	-1.3%
Average Weekly Earnings of Production Employees	\$743.45	\$777.70	\$790.39	\$783.76	\$782.35	-0.2%	5.2%

Source: US BLS

^{ix} <https://www.cdta.org/sites/default/files/pdfs/systemmap.pdf>

^x https://www.ny.gov/sites/ny.gov/files/atoms/files/CRREDC_URI_FinalPlan.pdf

^{xi} <https://www.theatlantic.com/business/archive/2017/04/retail-meltdown-of-2017/522384/>

^{xii} https://www.ny.gov/sites/ny.gov/files/atoms/files/CRREDC_URI_FinalPlan.pdf

^{xiii} according to U.S. Census Bureau data

^{xiv} according to Bureau of Labor Statistics data

^{xv} <http://alloveralbany.com/archive/2017/03/24/albany-metro-new-york-state-counties-2016-populati>

^{xvi} <http://www.adweek.com/brand-marketing/university-of-phoenix-taps-wwii-icon-rosie-the-riveter-to-inspire-working-moms/>

^{xvii} <https://www.recode.net/2017/5/26/15656120/manufacturing-jobs-automation-ai-us-increase-robot-sales-reshoring-offshoring>

^{xviii}

Capital Region Unemployment Rate Trends							
County/Region	2012	2013	2014	2015	2016	1-YR Change (PPT)	5-YR Change (PPT)
Albany	7.1%	6.0%	4.9%	4.3%	4.0%	-0.3%	-3.1%
Columbia	7.0%	6.0%	4.7%	4.0%	3.7%	-0.3%	-3.3%
Greene	9.9%	8.7%	6.7%	5.6%	5.0%	-0.6%	-4.9%
Rensselaer	7.7%	6.6%	5.3%	4.6%	4.3%	-0.3%	-3.4%
Saratoga	6.8%	5.8%	4.6%	4.1%	3.8%	-0.3%	-3.0%
Schenectady	7.7%	6.7%	5.3%	4.7%	4.3%	-0.4%	-3.4%
Warren	9.2%	8.1%	6.5%	5.5%	5.2%	-0.3%	-4.0%
Washington	8.3%	7.5%	6.1%	5.0%	4.6%	-0.4%	-3.7%
Capital Region	7.5%	6.5%	5.2%	4.5%	4.2%	-0.3%	-3.3%
NYS	8.5%	7.7%	6.3%	5.3%	4.8%	-0.5%	-3.7%
US	8.1%	7.4%	6.2%	5.3%	4.9%	-0.4%	-3.2%

Source: NY DOL