HAMPDEN COUNTY WORKFORCE BOARD
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FRANKLIN HAMPSHIRE WORKFORCE BOARD
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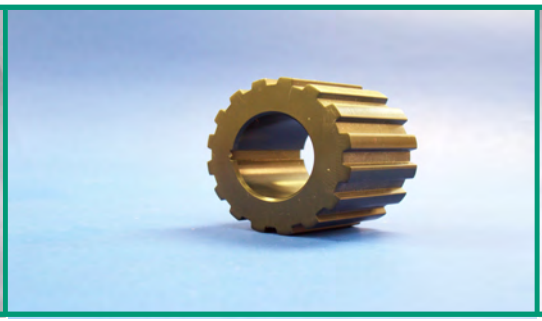
Workforce Development

And

Technology Adoption Report



Findings and Recommendations

The ***2020 Workforce Development and Technology Adoption Report*** is a part of the on-going implementation of the Regional Planning strategies and goals codified in the **Pioneer Valley Labor Market Blueprint- 2018-2022,** produced by the MassHire Workforce Boards of Hampden and Franklin Hampshire Counties.

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On the Cover

Cover photos courtesy of advanced manufacturing companies that are members of the Western Massachusetts Chapter of the National Tooling and Machining Association (WMNTMA).

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July 2020

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INTRODUCTION

Technology enabled advanced manufacturing is a priority industry sector in the Pioneer Valley Region of Massachusetts. The advanced manufacturing companies are primarily small and medium sized enterprises (SMEs) that are part of a supply chain that is primarily engaged in producing precision mechanical parts, components, and sub-assemblies utilizing high technology equipment, lean manufacturing, and world class technology development.

The broader regional advanced manufacturing sector is characterized economically as part of the "Knowledge Corridor" (Figure 1), a highly inter-dependent region that straddles the border between western Massachusetts and northern Connecticut.

Figure 1- Knowledge Corridor

New manufacturing process technologies, the demand for new and innovative products, and the growing need for manufacturers to utilize sustainable business practices require the adoption of new approaches to doing business and achieving operational excellence. In addition, in order to remain competitive, particularly in light of the COVID-19 pandemic and its global impact, the industry must have a technologically relevant incumbent workforce, and develop a workforce development plan that will implement training programs that will ensure a sustainable pipeline of new employees. The industry-led regional partnership comprised of advanced manufacturing companies, educational institutions, and state and regional entities continues to take a leadership role in positioning the companies to remain competitive in advanced design and manufacturing.

The availability of a well-educated and appropriately sized workforce is the companies' competitive advantage in today's global economy. Currently, however, the regional firms continue to experience a critical shortage of qualified employees, and prioritized the following occupations as most in demand. (Figure 2). This reality is constraining their future growth and expansion.

Figure 2

The companies require on-going support in identifying and adopting new technologies appropriate to their business, optimizing their manufacturing processes, and in particular, developing short-term solutions and long-term strategies to address to their workforce needs and requirements.

The Findings and Recommendations in the **2020 Workforce Development and Technology Adoption Report** will be used by the regional partnership to continue to implement programs and activities that will strengthen the industry's competitiveness, create opportunities for market expansion, accelerate job creation, and drive the continued economic development of the Region and the State.

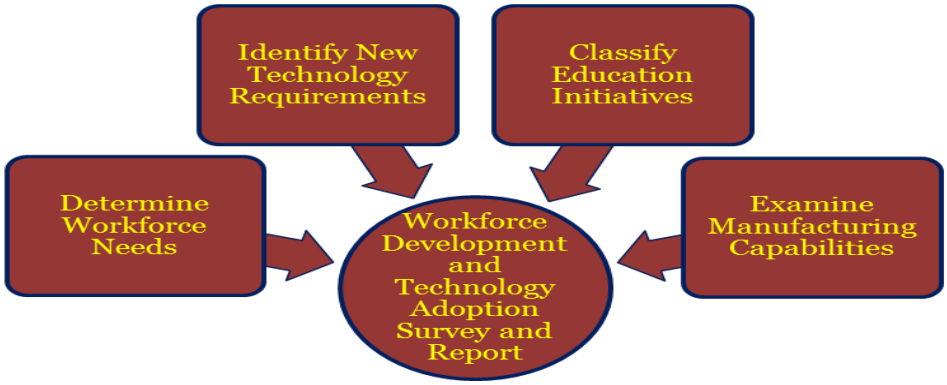
OVERVIEW

The ***2020 Workforce Development and Technology Adoption Report*** is part of the on-going implementation of the Regional Planning strategies and goals codified in the **Pioneer Valley Labor Market Blueprint- 2018-2022,** produced by the MassHire Workforce Boards of Hampden, Franklin Hampshire Counties. The Report presents data, findings, and recommendations based on responses from forty (40) targeted advanced manufacturing companies in greater Pioneer Valley (Appendix-1) that completed the 2020 Workforce Development and Technology Adoption Survey (Appendix-2). The Survey was sent to fifty-two (52) targeted companies with a response rate of 77%.

The Report is divided into the following five Sections:

1. **Market Segmentation and Business Trends**
2. **Workforce Needs**
3. **Manufacturing Operations**
4. **Technology/ Innovation Priorities**
5. **Education Initiatives**

The following Framework was used as a general guide to assess the current state of the broader regional advanced manufacturing sector.



The ***2020 Workforce Development and Technology Adoption Report*** provides a detailed analysis of the industry's needs, challenges, and opportunities. It offers a number of recommendations for addressing those needs and challenges which include:

- Securing an adequately skilled and trained workforce in the near-term.
- Adopting new innovative manufacturing processes and technologies.
- Creating a sustainable and predictable pipeline of new employees to respond to future workforce needs, and surges in demand.
- Increasing student, parent and educator awareness of careers in advanced manufacturing.

The ***2020 Workforce Development and Technology Adoption Report*** can be viewed on the web site of the MassHire Hampden County Workforce Board Inc. www.masshirehcwb.com/, MassHire Franklin Hampshire Workforce Board, at www.masshirefhwb.org and on the web site of the Western Massachusetts Chapter of the National Tooling and Machining Association at http://www.wmntma.org

EXECUTIVE SUMMARY

Advanced manufacturing is a priority industry in the Pioneer Valley Region of Massachusetts. The regional advanced manufacturing companies are primarily small and medium sized enterprises (SMEs) that are part of a supply chain engaged in producing precision mechanical parts, components, and sub-assemblies utilizing high technology equipment, lean manufacturing, and world class technology development. The companies are conducting business in multiple markets with Aerospace, Defense, and Commercial, being the strongest market segments for the regional companies**.**

In order to remain competitive and maintain strong customer-supplier relationships, the industry requires a technologically relevant incumbent workforce and a sustainable pipeline of qualified new employees. The availability of a well-educated workforce is the differentiator that gives the regional advanced manufacturing companies the competitive advantage to conduct business in today's global economy- an economy that has changed due to the COVID-19 pandemic. The highest priority need for both replacement and new production employees along the advanced manufacturing workforce pipeline is for CNC Machinists, Quality Control Inspectors, and CNC Operators.

Over the next three years, based on the demand numbers from the forty (40) companies responding to the 2020 survey, and using a conservative employee multiplier, the broader advanced manufacturing companies in the region will need **1,088** new production employees. The regional educational institutions and workforce training programs will graduate an estimated **519** students from their manufacturing programs during the same three-year time period-a **Supply Gap/Ratio** of **569 (.48)** employees. The regional partnership must develop a strategic workforce development plan that will implement training programs and creative program delivery models to respond to this critical Supply Gap.

The SMEs need help in identifying new technologies appropriate to their business, optimizing their manufacturing processes, and in particular developing short-term interventions and solutions, and long-term strategies to respond to their workforce needs.

Process innovation and new software technology adoption, in particular around Enterprise Resource Planning, is critical to the SMEs ability to conduct business and remain competitive within their existing supply chains. Identifying and adopting affordable and compatible software packages will allow the smaller companies to remain competitive and move to the next growth stage. Sensors, additive manufacturing, machine monitoring, and robotic technologies are major influencers in the manufacturing process, and will require companies to assess their manufacturing production techniques and operations going forward. New technology adoption is a business imperative and will strengthen the industry's competitiveness, create opportunities for market expansion, and accelerate the economic development of the Region and the State.

The regional partnership must work more closely with the region's educational institutions to provide support and assistance to ensure that curriculum content is aligned with industry needs, employability readiness skills are embedded into the curriculum, and career awareness initiatives that educate parents on the viability of advanced manufacturing as a personally and financially rewarding career pathway for their student are accelerated.

The Regional partnership, led by the MassHire Workforce Boards of Hampden, and Franklin Hampshire Counties, must continue to work with the regional sector companies to obtain appropriate federal, state, and private funding to conduct workforce training programs, develop and implement technology innovation initiatives, and increase the capacity of the regional education institutions to continue to be effective and valued partners in the work ahead.

Regional Advanced Manufacturing Industry
2020 Workforce Development and Technology Adoption Survey

N= 40 Companies

Section I- Market Segmentation and Business Trends

1. Which category best describes your business relationship to your customer?

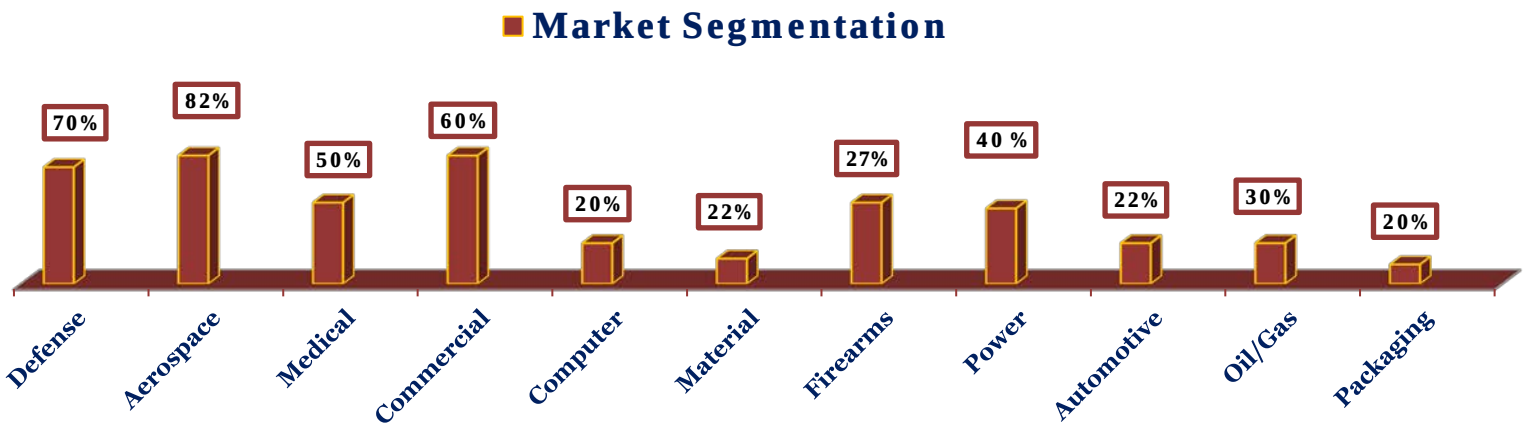
Customer Business Relationship	Number of Responses	
	2020	2018
Job Shop -Independent company-primarily short run and other non-repeatable jobs	22 (55%)	23 (56%)
Contract Shop- Independent company- primarily contracts for repeating part numbers	16 (40%)	13 (31%)
Captive Company-Part of a larger company	1 (2.5%)	5 (12%)
Equipment Distributor	1 (2.5%)	-

Findings

- The majority of the regional advanced manufacturing companies responding to the 2020 survey characterized their customer business relationship as either a **Job Shop (55%)** or a **Contract Shop (40%),** as defined above. A small number of companies indicated their customer business relationship was split between Job Shops and Contract Shops.
- Only one manufacturing company characterized their firm as a **Captive Company** with a different structure and business model.

2. **Please indicate the principal markets in which you conduct your manufacturing business.**

Markets	No. of Responses	Market Ranking					Markets	No. of Responses	Market Ranking				
		2020	2018	2016	2014	2012			2020	2018	2016	2014	2012
Defense	28	2	2	3	3	3	Firearms	11	7	6	4	5	10
Aerospace	33	1	1	1	1	1	Power Generation	16	5	5	5	6	5
Medical Device	20	4	4	6	4	4	Automotive	9	9	7	7	8	-
Commercial	24	3	3	2	1	2	Oil/Gas Field	12	6	8	8	9	-
Computer/Telecomm.	8	10	11	9	7	6	Packaging	8	11	8	5	11	7
Material Handling	9	8	10	11	10	9	Cosmetics NEW	1	12				



Findings

- The regional advanced manufacturing companies are conducting business in multiple market segments with **Aerospace (82%)** and **Defense (70%)** the two most active market segments for the regional companies**.** Aerospace continues to be the principal market for the regional company's book of business, with more companies indicating they are engaged in manufacturing operations in that industry segment.

- The presence of **(60%)** of the regional companies in **Commercial** related markets is consistent with the percentage of companies that indicated a presence in that market segmentation in 2018.

- The presence of twenty (20) companies **(50%)** in the **Medical Device** market consistent with the percentage of companies that indicated a presence in that market segmentation in 2018.

- The **Power Generation** market is attracting **(40%)** of the regional company's business, and continues to be an important market for selected regional manufacturers. This percentage is a slight increase from the 37% in the 2018 survey.

- The percentage of regional companies engaged in the **Firearms (27%)** market continues to decline and reflects national trends in this market segment.

Recommendations
- The regional partnership must continue to collaborate with state agencies to develop a closer working relationship between the state's OEMs and the regions Job Shops and Contract Shops to ensure greater presence in existing supply chains. - Forces surrounding the COVID-19 pandemic will have significant bearing on the strategic priorities of the regional manufacturing companies, and must be monitored carefully by the partnership throughout 2020 and 2021.

3. Do you have plans for growing or expanding your company over the next three (3) years? If so, please indicate (√) if the growth plan involves any of the following actions:

Actions	Number of Responses				
	2020	2018	2016	2014	2012
Introducing New Products	15	20	16	15	15
Introducing or Integrating New Technologies	19	26	22	21	22
Building Relocation/Expansion	11	16	15	9	17
Achieving Greater Cost Efficiencies	21	34	26	16	21
Accessing New Markets	25	25	20	23	26
(OTHER)	1	3	3	6	-

Findings

- Implementing methods and processes to **Achieve Greater Cost Efficiencies** continues to be a critical part of their strategic plan of the regional companies going forward.

- There was a significant increase in the percentage **(71%< 61%)** and number of companies indicating their interest in **Accessing New Markets.**

- **54%** of the companies indicated that they are focused on **Introducing or Integrating New Technologies** into their manufacturing operations.

- The number of regional companies **(11)** that indicated that their growth strategy moving forward includes **Building Relocation/Expansion** was down from the 2018 survey but still indicative of regional companies' confidence in future business trends and economic activity.

Recommendations
The partnership should continue to encourage the regional companies to work closely with regional and State-wide economic development entities and industry associations to develop opportunities for the companies to engage in coordinated networking and matchmaking events that will position them to access business in new and emerging markets.
The regional partnership should continue to coordinate activities to develop resources that will support SME's participation at national trade shows that will position them to access business in new market segments.

4. If you are planning to purchase a new machine tool in 2018/2019, please indicate your reason for considering this capital equipment. Please list Top Two Priorities:

Reason	Priority		
	2020	2018	2016
Increase Machine/Equipment Capacity	1	1	1
Machine/ Process Flexibility	2	2	
New Machines to Reduce Costs			2
Tighter Quality Standards			

Findings

- The companies continued to view **Increasing Machine/Equipment Capacity** as their major reason for considering the purchase of new machine tools in 2020/2021.

- Achieving **Machine/Process Flexibility** was clearly the second priority for the companies, and indicates their continued need to remain agile and positioned to respond to a myriad of job orders that require process control and reliability throughout the manufacturing cycle.

4. Please compare the general TRENDS that you are seeing in your manufacturing operations in January 2020 compared to January 2019 AND July 2019

Indicator	January 2020 Compared to January 2019				January 2020 Compared to July 2019			
New Orders	☐ Growing	**22**	☐Contracting	**8**	☐ Growing	**20**	☐Contracting	**9**
Production	☐ Growing	**19**	☐ Contracting	**7**	☐ Growing	**20**	☐Contracting	**7**
Backlog	☐ Growing	**19**	☐ Contracting	**8**	☐ Growing	**22**	☐Contracting	**7**
Material Prices	☐Increasing	**19**	☐Decreasing	**3**	☐Increasing	**16**	☐Decreasing	**3**
Supplier Deliveries	☐ Lengthening	**15**	☐ Shortening	**11**	☐ Lengthening	**14**	☐ Shortening	**11**
Future Business Expectations	☐ Improving	**22**	☐ Declining	**5**	☐ Improving	**23**	☐ Declining	**4**

+

Findings

- On a year to year basis, the regional companies manufacturing operation **Indicators** Were **Trending Positively.** For a number of companies, **Supplier Deliveries Shortened** during CY 2019. Shorter delivery times indicate that suppliers have capacity and can meet the on time demands of their customers.

- January 2020 manufacturing operations **Indicators** in comparison to July 2019 continue strong and suggest positive trends throughout the balance of 2020. The current COVID-19 pandemic and international actions focused on tariffs will need to be monitored carefully, and may impact selected Indicators moving into the second half of CY 2020.

- **Future Business Expectations** remain positive and were the most consistent Indicator across the two time periods.

Section II- Workforce Needs

6. Total number of employees in your company_____. Total number of production employees in your company.

Findings

- There are **2,302 TOTAL** employees in the Forty (40) advanced manufacturing companies that responded to the 2020 Workforce Development and Technology Adaption Survey. This employment level is significant, and indicates the continued importance of the advanced manufacturing sector to the economic vitality of the region.

Year	2020	2018	2016	2014
Total Companies	**40**	**41**	**40**	**38**
Total Employees	**2,302**	**2,353**	**2,291**	**2,006**

- The advanced manufacturing companies responding to the 2020 survey are primarily small and medium size enterprises (SME), are categorized in the following table and their current business relationship is defined in **No.1** above. This

employment level is significant, and indicates the continued importance of the advanced manufacturing sector to the economic vitality of the region.

Customer Business Relationship	Number of Companies	
	2020	2018
Job Shop	22	23
Contract Shop	16	13
Captive Company	1	5
Equipment Distributor	1	-

- Of the **2,302 Total Employees,** there are **1,649 Production Employees (72%)** directly involved in the manufacturing process on the plant floor. This compares to a Production Employee level of **1,577 (67%)** in the 2018 survey. The **percentage** of production workers continues to grow incrementally and is a positive sign of business trends within the regional companies.

Year	2020	2018	2016	2014
Total Companies	40	41	40	38
Total Employees	2,302	2,353	2,291	2,006
Total Production Employees	1,649	1,577	1,486	1,095
% of Production Employees to Total Employees	72%	67%	65%	55%

7. Number of Production employees retiring in the next three (3) years whose positions will need to be replaced.

Year	2020	2018	2016	2014
Total Companies	40	41	40	38
Total Production Employees	1,649	1,577	1,486	1,095
Total Production Employees Retiring/Replaced	136	142	92	110
% of Production Employees Retiring	8.2%	9.0%	6.2%	10.0%

Findings

- A total of **136 Production Employees, whose positions will need to be replaced,** will be retiring in the next three (3) years- an average of **45** retirements a year. This is a **decrease of 6** production employee retirements from the 2018 survey projection of 142 with one (1) fewer company reporting.

- The 136 planned production employee retirements represent **8.2%** of the total production employees currently working in the 40 companies. This is a slight percentage decrease from the **9.0%** planned retirements from the 2018 survey, although from one less company.

Recommendation
Production employee retirement projections in the advanced manufacturing industry during the next three years will require companies to utilize all available networking and recruitment resources and strategies in order to identify the appropriate talent to replace these veteran craftspeople.

8. Number of NEW Production employees you project hiring over the next three (3) years.

Year	2020	2018	2016	2014
Total Companies	40	41	40	38
Total Current Production Employees	1,649	1,577	1,486	1,095
Total NEW Production Employees to be Hired	261	370	320	212
% of NEW Production Employees to Current Production Employees	15.8%	23.5%	21.5%	19.4%

Findings

- The regional companies reported that **261 New Production Employees** will be needed through December 31, 2022. This projected hiring level represents **15.9%** of the total current production employee level of 1,649. This is a **decrease** from the 370 new production employees (23.5%) reported in the 2018 survey, with one (1) less company reporting.

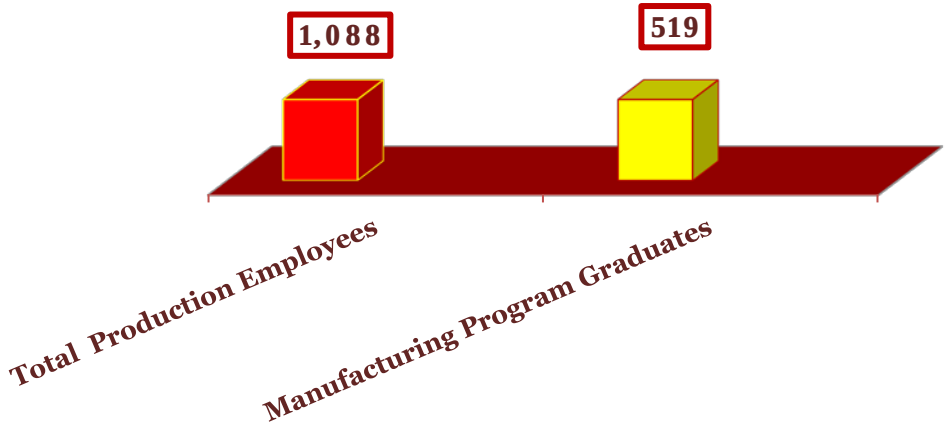
- The percentage of total new production employee compared to the current total production employees suggests that the regions projected workforce needs continue to grow but may be slowing from the previous year's rates. Despite the reduction, there continues to be pressure on the supply side to respond to this controlled, yet unabated growth.

- The following table summarizes the **Workforce Indicators** combining the impact of planned Retirements of Production employees whose positions must be replaced, with the projected NEW Production Employee hiring demands indicated by the 38 companies.

Workforce Indicators	TOTAL			
	2020	2018	2016	2014
Total Employees	2,302	2,353	2,291	2,006
Production Employees	1,649	1,577	1,486	1,095
Production Retirement Replacements	136	142	92	110
New Production Hires	261	370	320	212
TOTAL	397	512	412	322

- Combining the projected 136 Replacement Production employee positions and the need for 261 NEW Productions employees creates a regional industry need for **397 new** production employees over the next three years the 40 manufacturing companies responding to the 2020 survey. This projected demand is **29%** less than the 512 projection in the 2018 survey.
- Projecting this to the broader advanced manufacturing industry in the Pioneer Valley Region, and using a conservative employee multiplier of 2.74, the demand side for production employees will exceed **1,088 employees** during the three-year period.
- The Advanced Manufacturing Technology Program in the eight vocational technical/comprehensive/collaborative high schools (262) in the Pioneer Valley Region, the Associate Degree and Certificate programs in the Mechanical Engineering Technology program at Springfield Technical Community College (105), and the Manufacturing Training programs being sponsored by the MassHire Workforce Boards (152), based on current enrollment data, will graduate **519** students/individuals during the same three-year time period-a **Supply Gap/Ratio** of **569 (.48) employees**.

TOTAL REGIONAL Hiring- Replacement and New Employees



Recommendations
The regional partnership must continue to engage the WMNTMA and its member companies, and other regional advanced manufacturing companies, education/training institutions, and other interested partners in the development of a **long range** strategic plan that addresses regional workforce development needs. **The regional advanced manufacturing partnership must continue to identify new funding streams that will scale-up existing workforce development programs, including Registered Apprenticeship programs, to respond to this persistent Supply Gap issue**.

9. Based on your responses to No. 8, please PRIORITIZE the number of REPLACEMENT and NEW employees in each of the Job Classifications in which you anticipate hiring in the next three (3) years.

Job Classifications	Replacement Priority						NEW Priority				
	2020	2018	2016	2014	2012		2020	2018	2016	2014	2012
Machinist	2	2	2	2	3		3	3	4	4	3
Tool Maker	4	5	6	5	6		9	6	9	8	6
General Machine Operator	9	8	7	7	4		6	7	3	7	4
CNC Machinist	1	1	1	1	1		1	1	2	1	1
CNC Operator	10	6	3	6	5		4	4	1	3	2
Process Engineer	5	7	5	3	7		7	8	5	6	8
CNC Programmer	7	4	9	8	10		5	5	7	5	7
QC Inspector	3	3	4	4	2		2	2	8	2	5
CAD/CAM Technician	12	10	10	9	8		11	9	10	10	10
Engineer	6	9	8	10	9		8	10	6	9	9
Software Technician	11	11	11	11	11		10	11	11	11	11
Other: Supervisor	8	-	-	-	-		-	-	-	-	-

- The highest priority need for both replacement and new production workers continues to be for **CNC Machinists**. This demand has not changed from the previous surveys, and indicates that identifying qualified applicants with the requisite skills for this priority job classification will continue to be a high priority.

- The need for all purpose **Machinists** remains a consistent and high priority especially in the Replacement category and is directly tied to the retirement of several senior level experienced machinists. Similar to CNC Machinists, identifying qualified applicants with the requisite skills and experience to fill this job classification is be high priority, but a difficult challenge.

- Finding qualified **Quality Control Inspectors** for both Replacement **and** New Production employees remains a constant need for the regional companies, and reflects the value-added work that SMEs in particular are being required to perform by their customers.

- The need for **CNC Operators** remains a consistent and high priority both for replacement and particularly for companies hiring **New Production** employees. Identifying qualified applicants with the requisite skills to fill this job classification will require on-going collaborative efforts by the partnership to conduct training programs focused in this occupational classification.

Recommendations

- As experienced production operators approach retirement, companies must maintain a commitment to implementing comprehensive continuous improvement programs for their incumbent workers at all levels along the employment continuum.
- The regional partnership must accelerate efforts to identify flexible and sustainable funding to develop workforce development and training interventions, particularly the Registered Apprenticeship job creation model, which will prepare unemployed/underemployed individuals with the competencies required to fill critical, hard to fill positions.

10. Using the Wage Scale below, please indicate the average Hourly Wage Range for the following positions by entering the Wage Code next to each position for both Experienced and NEW employees.

Wage Code	Hourly Wage Range
A	Under $13.00
B	$13.01-$15.00
C	$15.01-$20.00
D	$20.01-$25.00
E	$25.01- ↑

Job Category	Experienced Wage Code					NEW Pipeline Wage Code			
	2020	2018	2016	2014		2020	2018	2016	2014
Machinist	E	D	D	D		C	C	C	C
Tool Maker	E	D	D	D		C	D	C	C
General Machine Operator	C	C	C	C		B	B	B	B
CNC Machinist	E	D	D	D		C	C	C	C
CNC Operator	C	C	C	C		C	C	C	C

Electro-Mechanical Technician *NEW*	**D**	**-**	**-**	**-**		**C**	**-**	**-**	**--**
Process Engineer	**E**	**E**	**E**	**E**		**D**	**D**	**D**	**D**
CNC Programmer	**E**	**E**	**E**	**E**		**D**	**D**	**D**	**D**
QC Inspector	**D**	**D**	**D**	**D**		**C**	**C**	**C**	**C**
CAD/CAM Technician	**E**	**D**	**E**	**D**		**D**	**C**	**D**	**C**
Software Technician	**E**	**E**	**D**	**E**		**D**	**C**	**C**	**B**
Engineer	**E**	**E**	**E**	**E**		**D**	**D**	**D**	**D**

Findings

- **Experienced** production employees working in the high demand job classifications referenced above were compensated in the **$20.01-$25.00** ↑ per hour wage range. The 2018 hourly **wage ranges** in almost all Job Categories are unchanged from 2018.
- New production **CNC Operators** were compensated in the lower range $**15.01-$20.00** hourly wage range. This is in line with findings from previous years' surveys.

- The wages and fringe benefits in the regional advanced manufacturing industry are significantly higher than those found in other regional priority industries. The wage scale, benefit package, together with the continuous improvement/training opportunities available to employees, should be attracting more individuals to the profession.

11. Please indicate which of the following employment benefits, practices, and programs you offer to your full time employees.

Benefits, Practices, Programs	Number of Responses				
	2020	2018	2016	2014	2012
Paid Medical Benefits	31	35	38	29	39
Profit/Revenue Sharing Plan	17	13	19	15	17
Bonus Plan	22	24	28	20	22
Annual Review and Raise Program	25	31	37	30	33
Formal Employee Training Program	16	26	23	17	23
Education/Training Reimbursement	20	24	28	18	29
Leadership Development	13	13	8	14	19
Apprenticeship Program	1	13	-	-	-
401-K	30	32	5	-	-
Employee Ownership Option	1	2	-	-	-

Findings

- **89%** of the companies offer **Paid Medical Benefits** to their employees. This percentage is an increase from the **86%** in the 2018 survey.

- **86%** of the companies offer **a 401-K Plan** to their employees. This percentage is an increase from the **78%** in the 2018 survey.

- A significant number of the regional companies have institutionalized an **Annual Review and Raise** program to reward and retain their incumbent workforce.

- **63%** of the companies offer their employees a **Bonus Plans** as a way to reward employee performance, retain talent, and incentivize their employees to continue to implement a company-wide culture of quality and operational excellence.

- The regional companies are committed to continuous improvement with **57%** of the companies offering **Education/Training Reimbursement** for their incumbent workers. This is consistent with the percentage of companies who offered this benefit in 2018.

- A commitment to company-specific **Employee Training Programs** to ensure that their employees have the technical competencies to respond to new technologies declined significantly from the previous two surveys. A company-wide commitment to training and continuous improvement is one of the key differentiators that will sustain their growth trajectory in a changing business climate.

- **Profit/Revenue Sharing Plans** is a consistent trend among several regional SMEs as a way to share company growth with their employees, and retain top talent. This benefit however is more commonly used by the larger companies within the region, and is not a common practice at the smaller SMEs.

- **Leadership Development** was the same as in the 2018 survey, but is not an established practice among the majority of regional companies. Leadership development requires a top-down management commitment and failure to develop strategies on this issue could have future long-term implications at the management levels of the regional companies.

12. Approximately how many hours of formal training did your Production Employees receive in 2019? NO. OF HOURS.

Number of Responses		Average Training Hours	
2020	2018	2020	2018
23	12	50	160

Findings

- A significantly higher number of companies indicated that they provide formal training to their production employees with an **Average of 50 Training Hours** during 2019**.** Several companies had formal training that exceeded the average of 50 hours. This is an encouraging sign of the company's commitment to continuous improvement of their incumbent workforce.

13. Please identify the factors/characteristics that you consider in hiring Production employees. Please list in Priority Order 1-8.

Hiring Factors/Characteristics	Experienced Priority					NEW Pipeline Priority				
	2020	2018	2016	2014	2012	2020	2018	2016	2014	2012
Technical Skills and Competencies	2	2	2	1	1	3	3	3	3	3
Interest in Learning and Self-Improvement	3	4	3	3	3	2	2	2	2	2
Attitude and Motivation	1	1	1	2	2	1	1	1	1	1
Related Experience in Manufacturing	4	3	4	4	4	4	4	4	4	4
Education/Training Beyond High School	5	6	6	6	7	6	5	5	5	7
Associates Degree in Manufacturing Related Field	7	7	7	7	-	7	7	7	7	-
Nationally Recognized Credential	8	8	8	8	-	8	8	8	8	-
Work Shift Flexibility	6	5	5	5	5	5	6	6	6	6

Findings

Experienced Production Employees

- **Attitude and Motivation** continues to be the leading factor/characteristic that influences the hiring process for both Experienced and New Pipeline employees as companies aggressively compete for talent in today's tight labor market.
- The regional companies continue to value an applicant's current **Technical Skills and Competencies** as a determining factor in hiring experienced applicants for production positions.
- **Interest in Learning and Self-Improvement** has moved into the top three as priorities for the regional companies in particularly in the hiring of experienced employees.
- **Related Experience in Manufacturing** and familiarity with the business and culture of manufacturing eases employee on-boarding and initial start-up training, and is important to company owners and production supervisors.
- **Formal Post-High School Education**, including attaining an **Associate's Degree in a Manufacturing Related Field,** and/or attaining a **Nationally Recognized Credential**, have remained unchanged from survey to survey, and are still not major factors in companies hiring decisions.

New Pipeline

- **Attitude and Motivation** and **Interest in Learning and Self-Improvement** continue to be the most significant factors in hiring new pipeline employees.

- The **Technical Skills and Competencies** of new applicants for production positions continues to be highly valued by the companies and indicates, in a shrinking pool of applicants, the continuing value of applicants who have either some prior work experience in a general manufacturing setting, or have been involved in industry-related manufacturing training programs.

- **Formal post-high school education** continues as a minor factor in the hiring decision for new production employees. Going forward however, innovation and new technology may cause companies to reassess the factor of post-high school education in hiring new employees.

14. Which of the following competencies/attributes would you like New Production Employees to possess? Please list Top 3 Competencies/Attributes in Priority Order.

Competencies/Attributes	Priority				
	2020	2018	2016	2014	2012
Basic Employability/Job Readiness Skills	1	1	2	1	1
Mechanical Aptitude	2	2	1	2	2
Hands-On Machining Skills	3	3	3	3	3
Reading/Writing/ Verbal Communication					
Mathematics Skills					
Read and Interpret Blueprints					

- **Basic Employability/Job Readiness Skills** continues to be the most significant attribute that companies would like new production employees to possess. Good attendance and punctuality patterns, the ability to self-start, accept constructive suggestions in a positive manner, and maintain a positive attitude are important traits that employers are seeking in new employees.

- **Mechanical Aptitude**, although at times difficult to ascertain during the interview and selection process, is a consistent attribute that the regional companies would like new production employees to possess.

- **Hands-On Machining Skills** continues to remain an important factor in the hiring process for new employees. Companies understand the need to provide technical support to new employees and are committed to providing new workers with opportunities for continuous improvement and skills enhancement.

Recommendations
▪ Basic Employability/Job Readiness Skills should be embedded into the curriculum in all manufacturing training programs at the vocational technical high schools and community colleges. ▪ Programs/courses in manufacturing technology must continue to emphasize basic skills development with a strong emphasis on hands-on instruction in the operation of computerized numerically controlled (CNC) machine tools. ▪ The State approved Advanced Manufacturing Technology Framework must continue to guide technical instruction to ensure consistency in teaching the basic technical competencies; however, instruction in new technologies aligned with industry standards and requirements must be incorporated within the existing Framework.

15. Please identify the sources that have been most successful for your company in the recruitment and hiring of both Experienced and New pipeline production employees. Please Prioritize the Top 3 Sources.

Source	Experienced						New Pipeline				
	Priority						Priority				
	2020	2018	2016	2014	2012		2020	2018	2016	2014	2012
Private Employment or Recruiting Agencies	3	3									
Vocational High Schools/High Schools							3	2	1	1	2
MassHire One Stop Career Centers											
Internet/Social Media	1	2	2	2	3		1	3	3		
Community Colleges											
Newspaper Advertisements			3	3	2					3	3
Career and Technology Fairs											
Employee Referrals	2	1	1	1	1		2	1	2	2	1
Industry Networking Events											
County House of Corrections-Re-Entry Programs *NEW*											
AE/English Language Literacy Programs *NEW*											

Findings

- The **Internet/Social Media** have become the primary recruiting source for **BOTH Experienced and New Pipeline** employees.

- **Employee Referrals** continue to be a highly successful source for recruiting and hiring both experienced employees and identifying new production applicants.

- **Private Employment or Recruiting Agencies** have continued to be an important recruitment source for experienced employees.
- **Newspaper Advertisements**, a consistent recruitment source for experienced employees in the previous surveys, appears to be a less than successful recruitment source for experienced applicants as well as new applicants.

- Companies that have developed working relationships with the **Vocational Technical High Schools** continue to find success in using the schools as a source to recruit **new production** employees. Several survey companies serve as cooperative education sites for students and retain many of the students following graduation.

- The Regions **One Stop Career Centers** continue to be underutilized by the regional advanced manufacturing companies for recruiting either experienced or new production workers.

Recommendations
The regional partnership must continue to facilitate connectivity between the regional advanced manufacturing companies and the MassHire One Stop Career Centers to discuss ways to include the Centers as a more integral partner in the outreach and recruitment process.
Regional companies must accelerate their involvement in Cooperative Education and Internship programs that have demonstrated value as a recruitment method for attracting new talent.

16. Does your company use the following social media?

Social Media	Number of Responses	
	2020	2018
Facebook	21	16
Twitter	4	8
LinkedIn	21	24
Instagram	6	7
Do Not Presently Use Social Media	4	7

Findings

- **LinkedIn and Facebook** are used by **60%** of the regional companies and are important parts of their business strategy going forward.

- **Twitter and Instagram** usage both declined from the 2028 survey and are not used for professional use by many of the companies.

- Survey responses indicate that the regional companies continue to use Social Media to support their business operations.

Section III. Manufacturing Operations

17. Please indicate which of the following Improvement Methodologies you regularly use in your manufacturing operations.

Improvement Methodologies	Number of Responses				
	2020	2018	2016	2014	2012
Continuous Improvement Program	26	29	32	31	33
Quality Certifications (ISO etc.)	24	29	32	29	32
Cellular Manufacturing	10	14	14	12	9
5S Workplace Organization	18	19	25	22	17
Kaizen Events	8	9	-	-	-
Just-in-Time Material Flow	11	12	18	11	20
Value Stream Mapping	9	11	18	12	10
Total Quality Management	10	13	-	-	-
Kanban and Pull Systems	7	11	14	13	-

Findings

- The regional cluster companies are using a myriad of improvement methodologies in their manufacturing operations. Close to **70%** of the companies indicated that they have the appropriate **Quality Certifications** and have a **Continuous Improvement Program** in place at their company.

- The number of companies using **Kaizen Events** and **TQM** as improvement methodologies declined from the 2018 survey, but remain important improvement methodologies for selected companies.

- The number of companies using **Value Stream Mapping** and **Just-in Time Material Flow** as improvement methodologies declined from the 2018 survey, but remain important improvement methodologies for selected companies.

18. Please indicate which of the following Machining Strategies you regularly use in your manufacturing operations.

Machining Strategies	Number of Responses			
	2020	2018	2016	2014
Five Axis Machining (Full Contouring)	16	12	21	18
Four Axis Machining (Full Contouring)	20	20	-	-
High Speed Machining	21	20	27	22
Lights-Out Machining	12	12	23	13
Composite Machining	7	9	6	N/A
Hard Turning	17	16	19	14
Hard Milling	18	14	16	15
Prototyping	17	19	22	17
Other: Grinding	1			
Other: Swiss Turning	1			

Findings

- **High Speed Machining** continues to be a machining strategy that is regularly used by a significant number of companies in their production process.
- The number of companies using **Lights Out Machining** as a machining strategy is constant from both the 2018 and 2014 surveys. The high number in the 2016 survey appears to be an aberration without a plausible explanation.
- The number of companies indicating that **Four and Five Axis Machining (Full Contouring)** was one of the machining strategies they use used as a normal part of their manufacturing operations is consistent with a slight increase in the number of companies using **Four Axis Machining.**
- **Hard Milling and Turning** are consistently used by the regional companies, with the incidence of company use holding steady throughout the four survey cycles.
- The regional companies (**48%**) continue to include **Prototyping** as both a service and a strategy in their relationship with their customers and believe that the service is an important strategy for generating new work moving forward.

19. Please indicate which of the following Supply Chain Practices are part of your manufacturing operations.

Supply Chain Practices	Number of Responses			
	2020	2018	2016	2014
Collaboration Design with Customers (DFM)	14	20	23	20
Just-In-Time Deliveries	17	17	25	21
Access to Customers Forecasts	18	21	18	18

Customer Satisfaction Surveys	21	29	29	27
Certification of Major Suppliers	20	22	23	25
None of These	-	2	5	2

Findings

- **Customer Satisfaction Surveys** continue to be the most acknowledged supply chain practice that is imbedded in the manufacturing operations of the regional companies.
- **Certification of Major Suppliers** continues to be a significant supply chain practice of the companies, and is widely used by both small and medium sized advanced manufacturing companies.
- Fewer companies appear to be using **Collaboration Design with Customers (DFM)** as a standard practice.

20. Do you use **Robots** to perform part loading/unloading for any of your machine tools?

Robots	Number of Responses	
	2020	2018
YES	6	6
NO	26	29
Total	32	35

Finding

- **81%** of the company's responding to the question indicated that they do **NOT** use Robots to perform part loading/unloading for their machine tools. The **19%** who do utilize this technology were some of the larger companies within the SME cohort.

21. Please indicate if your company has 3D additive manufacturing/ part printing capability?

3D Additive Manufacturing	Number of Responses	
	2020	2018
YES	9	7
NO	23	26
Total	32	33

Finding

- **72%** of the companies responding to the question indicating that they do **NOT** presently have 3D additive manufacturing/part printing capability. The **28%** of the companies that do utilize this technology were some of the larger companies within the SME cohort.

22. If you answered **YES**, please indicate what you use your **3D** additive manufacturing/ part printing capability to produce. (Please check ALL that apply)

3D Additive Manufacturing	Use	
	2020	2018
Protyping to validate designs	5	4
Protyping to test parts before production	6	2
Tooling and Fixturing	5	5
Short-run initial production	1	2
Full production of end-use parts	3	2

Finding

- The regional companies indicating they have **3D** additive manufacturing/ part printing capability are using the technology primarily for Protyping to Test Parts Before Production and Tooling and Fixturing.

22. If you do not presently have 3D additive manufacturing/part printing capability, would your company make use of prototyping facilities, including 3D printing and other tools, if they were available in the region?

3D Additive Manufacturing	Number of Responses			
	2020	2018	2016	2014
YES	12	9	18	24
NO	14	16	12	9
Total	26	25	30	33

Findings

- The number of companies indicating that they would **NOT** make use of Prototyping Facilities, including 3D printing and other tools, if they were available in the region continued to exceed the number of companies expressing an interest in accessing potential opportunity. The responses from the 2020 and 2018 surveys are very different from those in the earlier years' surveys.

- The positive future adoption from **46%** of the companies responding to the question indicates the need to continue to engage the companies in discussion moving forward.

23. Please identify the following emerging manufacturing technologies that might be relevant to your company or that you want to learn more about:

Interest in Emerging Manufacturing Technologies	Yes				No				Need More Information			
	2020	2018	2016	2014	2020	2018	2016	2014	2020	2018	2016	2014
Sensing, measurement and process control	17	15	22	16	5	2	5	1		2	3	6
MT Connect	6	7	6	4	10	4	7	1	1	5	4	8
New materials design, synthesis and processing	3	3	10	6	13	8	8	6	1	2	1	5
Digital manufacturing technologies and Product Lifecycle Management (PLM)	6	4	9	5	10	4	5	5	1	5	5	7
Sustainable manufacturing	7	8	10	13	9	2	6	2	1	6	3	4
Metal additive manufacturing	9	16	14	14	9	4	5	1		1	4	3
Industrial robotics	13	13	20	13	4	1	5	3		3	4	2
Advanced forming and joining technologies	3	3	5	5	9	6	6	6		3	5	1

Findings

- There was a significant decline **(16 → 9)** in the number of manufacturing companies indicating **Metal Additive Manufacturing** was relevant to their manufacturing operations.

- **Sensing, Measurement and Process Control** continues to be a technology that is relevant to the companies**. 49%** of the firms believe this technology is important for their manufacturing operations moving forward.

- In comparison to responses from the 2018 survey, a significant number of companies, indicated that many of the technologies are NOT relevant to their current manufacturing operations.

24. Do you currently have a Machine Monitoring System in place for some or all of your machine tools?

Machine Monitoring System	Number of Responses	
	2020	2018
YES	12	10
NO	17	17
Total	29	27

Findings

- Of the 29 companies that responded to this survey question, **41%** indicated they have a **Machine Monitoring System** in place for some or all of their machine tools. **59%** are presently not using a Machine Monitoring System as part of their manufacturing operations. This is only slightly different from the comparable usage data from the 2018 survey.

- This slight increase is encouraging, and will be watched closely in future surveys to gauge the level of adoption among the regional companies.

Section IV. Technology/Innovation Priorities

25. Please indicate the Enterprise Resource Planning (ERP) software that is presently being used by your company.

ERP Software Use	No. of Companies	Product Name
1. ERP integrated software package	17	Sightline, Infor Visual, Keyed In, SAP, E-2, Net Suite, Shop Tech, QMS, Job Boss, Epicor, Global Shop, M1
2. Job Shop Operation -planning and execution package	15	Job Boss, Vista, M-1, Epicor
3. Financial software adaptation	10	QuickBooks
4. Manual and general purpose software	10	Excel
5. Internally Developed/Proprietary System	2	N/A

a. If you use an integrated Enterprise Resource Planning software package, please provide the following assessment:

ERP Software Assessment	2020		2018		2016		2014	
	YES	NO	YES	NO	Yes	No	Yes	No
Are you satisfied with the ERP software product you are using?	20	1	25	2	25	11	19	6
Does the implementation and use of the S/W require new skills/training for employees?	24	-	22	4	24	6	17	4
Is the investment in the ERP software (including the implementation) justifiable?	25	-	21	3	24	7	23	1
Does this ERP software tool make your company more competitive?	24	-	20	3	22	11	22	3

Findings

- The companies are using a wide range of **ERP Software** packages as part of their manufacturing operations, and there is clearly no one ERP Software package that is the standard among the regional SMEs.
- The SMEs are in a **50/50 ratio** of those using an integrated software package versus those companies using compartmentalized software to manage specific areas of their business.
- The companies are using a wide variety of **Job Shop Operation-Planning and Execution** software packages as part of their manufacturing processes. **Job Boss** is the software most referenced.
- **QuickBooks** continues to be the preferred **Financial Software Adaptation** package used by the companies. The companies have a comfort level with QuickBooks and continue to use it as their preferred software.
- **Excel** continues to be the leading **Manual** and **General Purpose Software** being used by the regional companies.
- A significant percentage of the regional companies believe the **investment** in their respective ERP software (including the implementation) **is justifiable**, and a significantly number of the companies indicated that their chosen ERP software tool was **making their company more competitive.**
- The companies are **generally satisfied** with the ERP software products they are using and continue to identify software packages that are affordable, flexible, and easily adapted to their manufacturing processes.

27. Please indicate the CAD/CAM and Simulation Software that is presently being used by your company.

CAD/CAM/Simulation Software	No. of Companies	Product Name
1. Integrated CAD/CAM package	16	Solidworks Edge CAM Mastercam Esprit Tek Soft
2. Product Lifecycle Management (PLM) (integrated with customers)	4	Global Shop, Autodesk
3. 3D CAD vendor supported system	10	Solidworks, Fusion
4. 3D CAD free system	6	Solidworks, Mastercam, Key Creator
5. Modeling, simulation/verification software	6	Vericut Siemens NX Solidworks Autodesk
6. Programmable Automation Software	5	Esprit, Arsys, Mastercam

a. If you use an integrated CAD/CAM or PLM software package, please provide the following assessment:

CAD/CAM or PLM Software Assessment	2020		2018		2016		2014	
	Yes	No	Yes	No	Yes	No	Yes	No
Implemented CAD/CAM or PLM to satisfy customer requirements	15	10	15	7	16	11	12	11
Are you satisfied with the product you are using?	22	3	20	5	27	3	27	2
Does your software vendor provide appropriate and effective support?	21	1	19	4	28	2	25	3
Does the software implementation require new skills/training for employees?	12	12	13	11	25	5	25	2
Is the investment (including the implementation) justifiable?	21	3	17	7	26	3	24	2
Do you believe that this tool makes your company more competitive?	19	6	17	8	28	1	27	1

Findings

- **Mastercam** is clearly the preferred Integrated CAD/CAM and Simulation Software that companies are using in their manufacturing operations.
- The regional companies indicated that **Solidworks** is the 3D CAD Vendor Supported System they use and its users have increase incrementally form 2014.

- The regional firms indicated that they using a variety of Modeling, Simulation/Verification Software packages in their manufacturing processes and operations.

Recommendations
- The partnership should reinstitute regional **Innovation Information Forums** to share current practices, examine the company's future software needs, and identify resources that can provide guidance and support to the companies moving forward. - Integrated CAD/CAM and Simulation Software are increasing in importance to the regions SME's and is an area where companies need support and technical assistance.

Section V. Education Initiatives

30. Which of the following initiatives should the partnership focus on to assist the educational system in preparing students for careers in the advanced manufacturing industry? Please list Top 3 Initiatives in Priority Order.

Initiatives	Priority				
	2020	2018	2016	2014	2012
Align Technical Curriculum with Industry Needs	1	1	1	1	1
Strengthen Employability Readiness Instruction for Students	2	2	2	2	2
Develop Paid/Unpaid Summer Employment Opportunities for Students at Manufacturing Companies					
Develop Paid Summer Professional Development for Vocational Teachers at Manufacturing Companies					
Increase Informational Programs/Activities for Counselors and Teachers					
Increase Career Awareness Programs /Events for Parents	3	3	3	3	3

Findings

- The regional partnership must continue to work with the educational institutions to provide supports and assistance to ensure that the program/course technical curriculum is **Aligned with Industry Needs.** This continued to be the top priority of the companies to ensure the availability of qualified new talent pipeline going forward.

- Strengthening the **Employability Readiness** of students was critical to the successful employment assimilation, retention, and career advancement of new employees. Instruction in this area must be embedded into the technical curriculum and be consistently reinforced with the students.

- Developing and implementing a comprehensive and coordinated plan to **Increase Career Awareness** programs/events for parents to educate them on the viability of advanced manufacturing as a personally and financially rewarding career pathway for their students must continue to be a top priority of the work of the regional partnership.

Recommendations
- The partnership must continue to implement its strategic initiatives to assist the vocational technical high schools in preparing program graduates for careers in advanced manufacturing. - School budgets and staff allocation formulas should be weighted in support of technical program's that graduate and place students in related employment positions that meet documented regional labor market demand.

31. Please indicate which of the following workforce development initiatives your company is interested in becoming involved in to strengthen the regional advanced manufacturing industry.

Initiatives	Number of Responses				
	2020	2018	2016	2014	2012
Speaking to Parent / Student Groups Regarding Careers in Advanced Manufacturing	19	20	21	23	21
Exhibiting at Education Career and Technology Fairs	17	14	16	15	16
Contributing Tooling/Material to Schools	21	18	21	19	20
Working with Instructors to Incorporate Industry Standards into Curriculum	20	19	18	15	16
Serving as Mentors/Advisors at Selected Schools	16	19	19	13	14
Instituting Company Sponsored Educational Scholarships	8	12	6	4	5
Hiring Vocational/Community College Teachers for Paid Summer Work	14	11	13	11	8
Encouraging Employees to Serve as Instructor's in Manufacturing Training Programs for Adults NEW	5	-	-	-	-
Develop and Conduct Project-Based Learning Activities to Increase Awareness and Interest in Advanced Manufacturing Careers NEW	5	-	-	-	-

Findings

- Fewer companies indicated an interest in serving as **Mentors/Advisors** to the students in the manufacturing programs at selected schools in the Region. Mentoring is a powerful support for ensuring successful school to career transition, and developing supportive mentoring relationships and activities needs to be aggressively pursued.

- Companies continued to express their interest in **Working with Instructors** to ensure that the curriculum reflects current and future competencies that will facilitate new employee assimilation onto the factory floor.

- The regional companies continued to partner with selected schools to **Speak to Parent Organizations/Student Groups** regarding careers in advanced manufacturing. This initiative continued to be of significant interest to the regional companies.

Recommendations
- The regional partnership must continue to provide technical support, mentoring support, work-based learning opportunities, and financial incentives to assist the regions educational institutions in preparing program graduates for careers in advanced manufacturing. - Program Advisory Committees at the regions technical high schools must continue to identify creative ways to educate parents on the financial viability of a career pathway in advanced manufacturing. - Guidance counselors must continue to emphasize to female students the educational and career employment pathways that are available for women in advanced manufacturing.

32. Please indicate if your company would be interested in providing the following career related activities/supports to students in the Advanced Manufacturing Technology Program at the technical high schools in the Pioneer Valley region.

Activities/Supports	Number of Responses				
	2020	2018	2016	2014	2012
Job Shadowing	18	18	22	19	21
Cooperative Education Program	19	20	22	20	23
Unpaid School Year Internships	16	17	20	17	22
Paid Summer Employment	23	23	21	23	23
Part Time After- School/Saturday Employment	20	17	19	14	21

Findings

- The regional companies continued to support **Paid Sumer Employment** and **Part Time After-School/Saturday Employment** as good ways to build their future workforce, and continue to engage with the educational institutions to provide students with these learning opportunities.

- **Cooperative Education** is widely used by the regional companies to attract a pipeline of new entrants into their companies, and have maintained their long-standing relationships with the regional technical schools to ensure the viability of this educational option.

Recommendation
The partnership must continue to work with regional companies and the educational institutions to develop a coordinated process and set of protocols to develop student internship opportunities, identify paid summer employment and part-time after-school positions, and increase cooperative education placement agreements as a way of improving and accelerating the process of transitioning students to career employment positions in the industry following graduation.

33. Which of the following broad-based initiatives should be considered to strengthen advanced manufacturing as a critical industry sector in the Pioneer Valley Region and in the Commonwealth? Please list Top 3 Initiatives in Priority Order.

Initiatives	Priority				
	2020	2018	2016	2014	2012
State-Wide Marketing Campaign to Promote the Advanced Manufacturing Industry	2	3	2	3	1
Development of a Coordinated Applicant Referral System					
Alignment of Educational/Training Infrastructure and Programs with Industry Needs	1	2	3	1	3
Expanded Continuous Improvement Programs for Incumbent Employees					
Programs to Increase School, Student, and Parent Awareness of Careers in Advanced Manufacturing	3	1	1	2	2
Continued Access to Job Creation/Training Programs Including Registered Apprenticeships, Work Based Learning programs NEW					

Findings

- Alignment of **Programs with Industry Needs and Requirements** emerged as the key priority for the companies moving forward, and attainment of this priority will require continued coordination and communication between the regional companies and the educational institutions both at the secondary and community college level.

- Implementing a **State-Wide Marketing Campaign** to promote advanced manufacturing as a priority industry in the Region continued to be a priority of the regional companies. The companies acknowledge the significant commitment of resources and time that the State has invested in promoting the industry across the commonwealth.

- Continuing programing and activities to increase **School, Student, and Parent Awareness** of careers in advanced manufacturing in order to change the perception of manufacturing, increase student enrollment and graduation rates, and strengthen the regional industry-education partnership continued to be one of the top three priority initiatives identified by the companies.

Recommendations
The Massachusetts Advanced Manufacturing Collaborative (AMC) should complete its strategic planning work and become the state-wide point-of-contact to promote advanced manufacturing in the State, coordinate existing regional manufacturing initiatives, and develop a long-term, comprehensive state-wide strategic plan for the sector. The regional partnership, working with the Program Advisory Committees in each technical high school, must implement comprehensive and sustainable actions to increase school, student, and parent awareness of careers in advanced manufacturing.

34. Please indicate which of the following organizations/sources has your company successfully used for the education/training of your production employees?

Organizations/Sources	Number of Responses				
	2020	2018	2016	2014	2012
Internal Staff	26	30	22	29	35
External Consultants	16	19	10	16	16
Industry Associations/Organizations	13	16	12	17	18
MassHire Workforce Boards	12	23	20	23	14
Technical /Vocational High Schools	17	15	18	20	22
Community Colleges/Universities	14	16	15	14	15
MA Workforce Training Fund (WTF)	17	21	16	13	-
Online Training	9	8	7	7	9

Findings

- The regional companies have varied approaches to providing education/training to their production employees and see value in using a variety of education/training providers and delivery models contingent upon their specific business need.
- Using **Internal Staff to** provide education/training to their incumbent production employees continued to be the most widely used source for continuous improvement programming. This trend has remained constant from the findings in the previous surveys.

- Fewer companies viewed the **MassHire Workforce Boards/Career Centers** as a source for the up-skilling of the regional company's incumbent production employees.

- Regional companies continued to use the State's **Workforce Training Fund** as a practical and cost-effective way of professionally developing their incumbent employees to respond to innovation and new manufacturing processes that drive company growth and ultimately new job creation.

- The **technical/vocational high schools** and **community colleges** continue to be critical partners for providing technical skills enhancement and college credit courses for the region's incumbent manufacturing employees.

Recommendation
The regional MassHire Workforce Boards must continue its role as intermediary and market sector manager to work with the broad regional advanced manufacturing industry to obtain appropriate federal, state, and private funding to conduct training programs and initiatives for incumbent production employees, front line managers and supervisors, and persons interested in starting a career in advanced manufacturing.

35. Which of the following technology areas should be more fully integrated into the curriculum in the Advanced Manufacturing Technology Programs at the vocational technical high schools? Please list Top 3 Areas in Priority Order.

Technology Areas	Priority					Technology Areas	Priority				
	2020	2018	2016	2014	2012		2020	2018	2016	2014	2012
CNC Set-Up and Operation	1	1	2	2	1	CAD Fundamentals					
Quality Inspection Techniques	3	2	3	3	3	3D Printing Basics					
Reading/Interpreting Operations Sheets/Blueprints	2	3	1	1	2	Basic Rapid Prototyping					
Basic CNC Programming						Solid Modeling					

Findings

- **CNC Set-Up and Operation** is the top technology area that the companies would like to see more fully integrated into the curriculum in the Advanced Manufacturing Technology Programs at the technical high schools. There was an extremely strong focus by the smaller sized companies to accelerate this section of the MTT curriculum.

- **Quality Inspection Techniques** was viewed by **66%** of the companies as essential to preparing students to perform basic quality inspection of parts and sub-assemblies of increasing complex geometry.

- **Reading/Interpreting Operation Sheets/Blueprints** continued to be a priority technology area within the Advanced Manufacturing Technology curriculum with **72%** of the companies indicating the need to prepare program graduates with this basic competency.

36. Which of the following technology areas should be more fully integrated into the curriculum in the manufacturing/engineering technology programs/courses at the community college level? Please list Top 3 Areas in Priority Order.

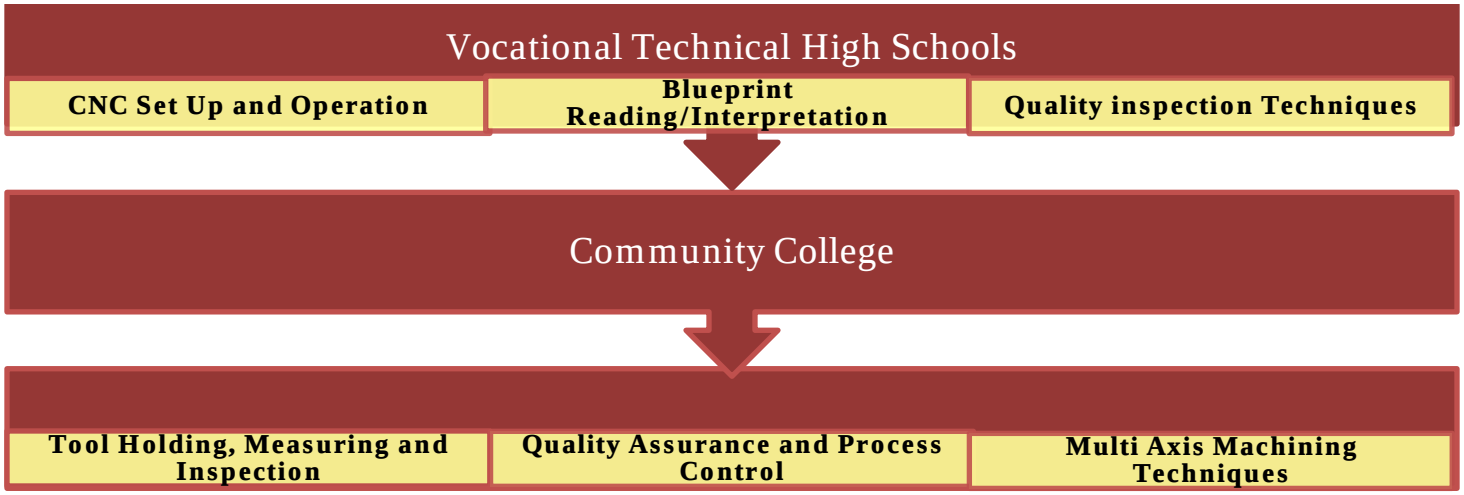
Technology Areas	Priority					Technology Areas	Priority				
	2020	2018	2016	2014	2012		2020	2018	2016	2014	2012
Multi-Axis Machining Techniques	3	3	2	2		Rapid Prototyping					
Tool Holding, Measuring and Inspection	1	1	1	3	3	CNC Programming and Verification				1	1
Using Solid Models in CAM Programs						Lean Manufacturing Theory and Implementation					
Quality Assurance and Process Control	2	2	3		2	Supply Chain Management Principles					
CAD Fundamentals						3D Printing					

Findings

- **Tool Holding, Measuring and Inspection Techniques** continued as the priority technology area that regional companies would like to see fully integrated into the manufacturing curriculum at the community college level.

- Similar to findings at the secondary level**,** strengthening the **Quality Assurance and Process Control** component of the community college's curriculum was of significant importance to the regional companies.

- **Multi-Axis Machining Techniques** continued to be a specific competency that companies would like to see community college manufacturing program graduates possess. Curriculum needs to be reviewed to make certain that this skill continues to be prioritized.



Recommendations
▪ The regional partnership must continue to provide on-going technical guidance and support to the educational institutions to ensure quality program development and implementation. Increasing student enrollment, providing internships and summer work opportunities, and increasing the graduation rate are critical to ensuring a workforce pipeline moving forward. ▪ The partnership working through the WMNTMA, and other regional manufacturing partnerships, must continue to seek out appropriate federal, state, and private funding to increase training programs and initiatives for unemployed/underemployed individuals to increase the supply of new employees.

July 2020

Appendix

Regional Advanced Manufacturing Companies

Advance Manufacturing

Advance Welding

Associated Electro-Mechanical

B&E Group

Ben Franklin Design & Manufacturing

BETE Fog Nozzle

Boulevard Machine & Gear

C&G Machine Tool Co.

D & S Manufacturing

Decker Machine Works

Duval Precision Grinding

Easthampton Quality Machine

Electro Term, Inc.

GenSwiss

Hoppe Technologies

Industrial Precision Inc.

Interstate Manufacturing

Jarvis Surgical

J&E Precision

Knight Machine

Mechanical Drive Components

Meridian Industrial Group

Mitchell Machine

Robert E. Morris

Nortek, Inc.

Peerless Precision

Pilot Precision

Phoenix Manufacturing

Poplar Hill Machine

Precise Turning & Mfg.

Rock Valley Tool

Sanderson MacLeod

Sisson Engineering

Troy Industries

Universal Plastics

Volo Aero MRO

Van Pelt Precision

WGI

Whalley Precision

Whip City Tool & Die

HAMPDEN COUNTY WORKFORCE BOARD
MASSHIRE

FRANKLIN HAMPSHIRE WORKFORCE BOARD
MASSHIRE

Regional Advanced Manufacturing Industry
2020 Workforce Development and Technology Adoption Survey

Company: _____ **Contact Person:** _____ **E-Mail:** _____

Market Segmentation and Business Trends

1. Which category best describes your business relationship to your customer?

Customer Business Relationship	√
Job Shop (Independent company-primarily short run and other non-repeatable jobs)	
Contract Shop (Independent company- primarily contracts for repeating part numbers)	
Captive Company-(Part of a larger company)	

2. Please indicate the principal markets in which you conduct your manufacturing business. **Please check all that apply.**

Markets	√	Markets	√
Defense/Military		Firearms	
Aerospace		Power Generation	
Medical		Automotive	
Commercial		Oil/Gas Field	
Computer/Telecommunications		Packaging	
Material Handling			
Other: (Please Specify)			

3. Do you have plans for growing or expanding your company over the next three (3) years? If so, please indicate (√) if the growth plans involve any of the following actions:

Actions	√
Introducing New Products	
Introducing or Integrating New Technologies	
Building Relocation/Expansion	
Achieving Greater Cost Efficiencies	
Accessing New Markets	
(OTHER)	
(OTHER)	

4. If you are planning to purchase a new machine tool in **2020/2021**, please indicate your reason for considering this capital equipment investment. **Please list Top Two Priorities:**

Reason	Priority	Reason	Priority
Increase Machine/Equipment Capacity		New Machine to Reduce Costs	
Machine/ Process Flexibility		Tighter Quality Standards	

5. Please compare the general **TRENDS** that you are **seeing** in your manufacturing operations in **January 2020** compared to **January 2019 AND July 2019**

Indicator	January 2020 Compared to January 2019		January 2020 Compared to July 2019	
New Orders	☐ Growing	☐Contracting	☐ Growing	☐Contracting
Production	☐ Growing	☐ Contracting	☐ Growing	☐Contracting
Backlog	☐ Growing	☐ Contracting	☐ Growing	☐Contracting
Material Prices	☐Increasing	☐Decreasing	☐Increasing	☐Decreasing
Supplier Deliveries	☐ Lengthening	☐ Shortening	☐ Lengthening	☐ Shortening
Future Business Expectations	☐ Improving	☐ Declining	☐ Improving	☐ Declining

Workforce Needs

6. Total number of employees in your company ____. Total number of **PRODUCTION** employees in your company _____.

7. Number of **Production** employees **retiring** in the next three (3) years **whose positions will need to be replaced** _____.

8. Number of **NEW Production** employees you project hiring over the next three (3) years _____.

9. Based on your responses to No. 7 and 8 above, please **estimate** the number of **Replacement** and **NEW** employees in each of the Job Classifications in which you anticipate hiring in the next three (3) years.

Job Classification	Replacement		NEW
Machinist			
Tool Maker			
General Machine Operator			
CNC Machinist			
CNC Operator			
Process Engineer			
CNC Programmer			
QC Inspector			
CAD/CAM Technician			
Engineer			
Software Technician			
Other:(Please Specify)			

10. Using the Wage Scale below, please indicate your average Hourly Wage Range for the following positions by entering the **Wage Code** next to each position for both **Experienced** and **New** employees.

Wage Code	Hourly Wage Range
A	Under $15.00
B	$15.01-$17.00
C	$17.01-$20.00
D	$20.01-$25.00
E	$25.01- ↑

Job Classification	Experienced	Wage Code		NEW Hire	Wage Code
Machinist					
Tool Maker					
General Machine Operator					
CNC Machinist					
CNC Operator					
Electro-Mechanical Technician					
Process Engineer					
CNC Programmer					
QC Inspector					
CAD/CAM Technician					
Software Technician					
Mechanical Engineer					
Other: (Please Specify)					

11. Please indicate which of the following employment benefits, practices, and programs you offer to your full time employees.

Benefits, Practices, Programs	√
Paid Medical Benefits	
Profit/Revenue Sharing Plan	
Bonus Plan	
Annual Review and Raise Program	
Formal Employee Training Program	
Education/Training Reimbursement	
Leadership Development	
State Registered Apprenticeship Program	
401(k) Plan	
Employee Ownership Options	
Other: (Please Specify)	

12. Approximately how many hours of formal training did your **Production Employees** receive in 2019? **NO. OF HOURS** _____

13. Please identify the most important factors/characteristics that you consider in hiring production employees. **Please list in Priority Order: 1-8.**

Hiring Factors/Characteristics	EXPERIENCED EMPLOYEES	Priority		NEW HIRES	Priority
Technical Skills and Competencies					
Interest in Learning and Self-Improvement					
Attitude and Motivation					
Related Experience in Manufacturing					
Education/Training Beyond High School					
Associates Degree in Manufacturing Related Field					
Nationally Recognized Credential (Ex. NIMS, MSSC)					
Work Shift Flexibility					

14. Which of the following competencies/attributes would you like **new production employees** to possess? **Please list Top 3 Competencies/Attributes in Priority Order.**

Competencies/Attributes	Priority
Basic Employability/Job Readiness Skills	
Mechanical Aptitude	
Hands-On Machining Skills	
Reading/Writing/ Verbal Communication	
Mathematics Skills	
Read and Interpret Blueprints	
Other: (Please Specify)	

15. Please identify the sources that have been most successful for your company in recruiting and hiring of both **Experienced** and **New** production employees. **Please Prioritize the Top 3 Sources.**

Source	Experienced Priority		New Hires Priority
Private Employment or Recruiting Agencies			
Vocational High Schools/High Schools			
MassHire One Stop Career Centers			
Internet/Social Media			
Community Colleges			
Newspaper Advertisements			
Career and Technology Fairs			
Employee Referrals			
Industry Networking Events			
County Houses of Corrections -(Re-Entry Programs)			
ABE/English Language Literacy Programs			
Other: (Please Specify)			

16. Does your company use the following social media?

Social Media	√
Facebook	
Twitter	
LinkedIn	
Instagram	
Do not presently use Social Media	
Other: (Please Specify)	

Manufacturing Operations

17. Please indicate which of the following **Improvement Methodologies** you regularly use in your manufacturing operations.

Improvement Methodologies	√
Continuous Improvement Program	
Quality Certifications (ISO etc.)	
Cellular Manufacturing	
5S Workplace Organization	
Kaizen Events	
Just-in-Time Material Flow	
Value Stream Mapping	
Total Quality Management	

Kanban and Pull Systems	
Other: (Please Specify)	

18. Please indicate which of the following **Machining Strategies** you regularly use in your manufacturing operations.

Machining Strategies	√
Five Axis Machining (Full Contouring)	
Four Axis Machining (Full Contouring)	
High Speed Machining	
Lights-Out Machining	
Composite Machining	
Hard Turning	
Hard Milling	
Prototyping	
Other: (Please Specify)	

19. Please indicate which of the following **Supply Chain Practices** are part of your manufacturing operations.

Supply Chain Practices	√
Collaboration Design with Customers (DFM)	
Just-In-Time Deliveries	
Access to Customers Forecasts	
Customer Satisfaction Surveys	
Certification of Major Suppliers	
None of These	
Other: (Please Specify)	

20. Do you use **Robots** to perform part loading/unloading for any of your machine tools? ☐ YES ☐ NO.

21. Please indicate if your company has **3D** additive manufacturing/part printing capability? ☐ YES ☐ NO.

22. If you answered **YES**, please indicate what you use your **3D** additive manufacturing/ part printing capability to produce. (Please check ALL that apply)

3D Printing	**Use**
Protyping to validate designs	
Protyping to test parts before production	
Tooling and Fixturing	
Short-run initial production	
Full production of end-use parts	

23. If you do not presently have 3D additive manufacturing/ part printing capability would your company make use of protyping facilities, including 3D printing and other tools, if they were available in the region? ☐ YES ☐ NO

24. Please identify the following emerging manufacturing technologies that might be relevant to your company or that you want to learn more about:

Interest in Emerging Manufacturing Technologies	Yes	No	Need More Information
Sensing, measurement and process control			
MT Connect			
New materials design, synthesis and processing			
Digital manufacturing technologies and Product Lifecycle Management (PLM)			
Sustainable manufacturing			
Metal additive manufacturing			
Industrial robotics			
Advanced forming and joining technologies			
Other (Please Specify):			

25. Do you currently have a **Machine Monitoring System** in place for some or all of your machine tools? ☐ YES ☐ NO.

Technology/Innovation Priorities

26. Please indicate the **Enterprise Resource Planning (ERP)** software that is presently being used by your company.

ERP Software Use	Product Name
1. ERP/MRP integrated software package (e.g. Global Shop Solutions)	
2. Job Shop Operation -planning and execution package (e.g. Job BOSS)	
3. Financial software adaptation (e.g. QuickBooks)	
4. Manual and general purpose software packages (e.g. Excel)	
5. Internally Developed/Proprietary System	
6. None of the above- Other (Please Specify)	

a. If you use an integrated Enterprise Resource Planning software package, please provide the following assessment:

ERP Software Assessment	Reason
Are you satisfied with the ERP software product you are using?	
Does the implementation and use of the software require new skills/training for employees?	
Is the investment in the ERP software including the implementation and maintenance justifiable?	
Does the ERP software make your company more competitive?	

27. Please indicate the **CAD/CAM and Simulation Software** that is presently being used by your company.

CAD/CAM/Simulation Software	Product Name
1. Integrated CAD/CAM package	
2. Product Lifecycle Management (PLM) (integrated with customers)	
3. 3D CAD vendor supported system	
4. 3D CAD free system	
5. Modeling, simulation/verification software	
6. Programmable Automation Software	
7. None of these	
8. Other (Please Specify)	

a. If you use an integrated CAD/CAM or PLM software package, please provide the following assessment:

CAD/CAM or PLM Software Assessment	Yes	No
Implemented CAD/CAM or PLM to satisfy customer requirements		
Are you satisfied with the product you are using?		
Does your software vendor provide appropriate and effective support?		
Does the implementation and use of software require new skills/training for employees?		
Is the investment (including the implementation) justifiable?		
Do you believe that this tool makes your company more competitive?		

Education Initiatives

28. Which of the following initiatives should the partnership focus on to assist the regional educational institutions in preparing students for careers in the advanced manufacturing industry? **Please list Top 3 Initiatives in Priority Order.**

Initiatives	Priority
Align Technical Curriculum with Industry Needs	
Strengthen Employability Readiness Instruction for Students	
Develop Paid/Unpaid Summer Employment Opportunities for Students at Manufacturing Companies	
Develop Paid Summer Professional Development Opportunities for Vocational Teachers at Manufacturing Companies	
Increase Informational Programs/Activities for Counselors and Teachers	
Increase Career Awareness Programs /Events for Parents	
Other: (Please Specify)	

29. Please indicate which of the following workforce development initiatives your company is interested in becoming involved in to strengthen the regional advanced manufacturing industry.

Initiatives	√
Speaking to Parent Organizations/ Student Groups Regarding Careers in Advanced Manufacturing	
Exhibiting at Education Career and Technology Fairs	
Contributing Tooling/Material to Schools	

Working with Instructors to Incorporate Industry Standards into Curriculum	
Serving as Mentors/Advisors at Selected Schools	
Instituting Company Sponsored Educational Scholarships	
Hiring Vocational/Community College Teachers for Paid Summer Work	
Encouraging Employees to Serve as Instructors in Manufacturing Training Programs for Adults	
Develop and Conduct Project-Based Learning Activities to Increase Awareness and Interest in Manufacturing Careers	
Other: (Please Specify)	

30. Please indicate if your company would be interested in providing the following career related activities/supports to students in the Machine Tool Technology Program at the technical high schools in the Pioneer Valley region.

Activities/Supports	√
Job Shadowing	
Cooperative Education Program	
Unpaid School Year Internships	
Paid Summer Employment	
Part Time After- School/Saturday Employment	

31. Which of the following broad-based initiatives should be considered to strengthen advanced manufacturing as a critical industry sector in the Pioneer Valley Region and in the Commonwealth? **Please list Top 3 Initiatives in Priority Order.**

Initiatives	**Priority**
State-Wide Marketing Campaign to Promote Advanced Manufacturing Industry	
Development of a Coordinated Applicant Referral System	
Continued Alignment of the Educational/Training Infrastructure and Programs with Industry Needs	
Expanded Professional Development/Continuous Improvement Programs for Incumbent Employees	
Programs to Increase School, Student, and Parent Awareness of Careers in Advanced Manufacturing	
Continued Access to Job Creation/Training Programs Including Registered Apprenticeships, Work-Based Learning Programs	
Other: (Please Specify)	

32. Please indicate which of the following organizations/sources your company has successfully used for the education/training of your production employees?

Organizations/Sources	√
Internal Staff	
External Consultants	
Industry Associations/Organizations	
MassHire Workforce Boards	

Technical /Vocational High Schools	
Community Colleges/Universities	
MA Workforce Training Fund (WTF)	
Online Training	
Other: (Please Specify)	

33. Which of the following technology areas should be more fully integrated into the curriculum in the Machine Tool Technology Programs at the **vocational technical high schools**? **Please list Top 3 Areas in Priority Order.**

Technology Areas	Priority	Areas	Priority
CNC Set-Up and Operation		CAD Fundamentals	
Quality Inspection Techniques		3D Printing Basics	
Reading/Interpreting Operations Sheets/Blueprints		Basic Rapid Prototyping	
Basic CNC Programming		Solid Modeling	
(OTHER)		(OTHER)	

34. Which of the following technology areas should be more fully integrated into the curriculum in the manufacturing/ engineering technology programs/courses at the **community college level**? **Please list Top 3 Areas in Priority Order.**

Technology Areas	Priority	Areas	Priority
Multi-Axis Machining Techniques		Rapid Prototyping	
Tool Holding, Measuring and Inspection		CNC Programming and Verification	
Using Solid Models in CAM Programs		Lean Manufacturing Theory and Implementation	
Quality Assurance and Process Control		Supply Chain Management Principles	
CAD Fundamentals		3D Printing	
(OTHER)		(OTHER)	

Please add any comments that will assist the team in its workforce development and technology adoption work.

Thank you for completing the *2020 Workforce Development and Technology Adoption Survey*.

January 2020

CONTACT INFORMATION

For information on the **2020 Workforce Development and Technology Adoption Report,** please contact David M. Cruise at 413-755-1362 or dcruise@masshirehcwb.com .

For information on the Massachusetts Executive Office of Housing and Economic Development, please visit their web site at http://www.mass.gov/hed/ Information on the Massachusetts Executive Office of Labor and Workforce Development can be found at http://www.mass.gov/lwd/ .

Information on the Western Massachusetts Chapter of the National Tooling and Machining Association can be found on their web site at http://www.wmntma.org/

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