

Rhode Island Defense Industry Skill Gap Study

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Prepared by



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Industry Partnership Program

About the Defense Sector Partnership

The Defense Industry Partnership came together in 2010 to cooperatively address the workforce needs of the sector. Despite current economic challenges, the Defense Sector has been an area of economic growth in Rhode Island. Working together to enhance the capabilities of Rhode Island's defense workforce is a way to accelerate an economic recovery for the state and provide good paying, high skilled job opportunities to Rhode Islanders.

The Partnership is funded by a grant from the Rhode Island Governor's Workforce Board. The Southeastern New England Defense Sector Alliance (SENEDIA) is the lead organization working closely with the Newport County Chamber of Commerce, the Middletown Economic Development Advisory Committee, the Rhode Island STEM Center at Rhode Island College, and the Rhode Island Economic Development Corporation.

<http://www.senedia.org/defense-industry-partnership.html>

Acknowledgements

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Defense Industry Skill Gap Study

Defense Industry Partnership

EXECUTIVE SUMMARY

The deep technical and domain knowledge of the defense workforce in Rhode Island is a competitive advantage that the Defense Industry Partnership intends to enhance through identifying and addressing critical skill gaps. In addition to investing in professional development for their own workforce, a significant number of employers in Rhode Island’s Defense Sector are supporting the workforce development pipeline at the college, high-school, and sometimes middle school level. This leadership in STEM education outreach is an important resource for Rhode Island to engage to support the growth of the knowledge and innovation economy. In the face of tightening national defense budgets, collaborative workforce development initiatives are particularly vital to the small and medium size companies in the cluster.

Despite Rhode Island’s historic strength in engineering, the local defense sector is constrained by the engineering and technician education pipeline and the absence of a world-class education program dedicated to developing the manufacturing expertise to support the innovation economy. The occupation most in demand in the coming year in Rhode Island’s defense sector are engineers. Engineers are also the category in which defense employers most frequently have difficulty hiring qualified candidates. Through interviews and a survey we find that the top skill gaps for Rhode Island’s defense sector are 1) technical writing, 2) experience with shipboard environments and unique defense systems, and 3) developing the skills to communicate and collaborate with customers.

Top Five “Critical Skill Gaps” in four Occupational Categories

	Engineering	Technician	Production	Business Administration
1.	Technical writing	Technical writing	Teamwork and ability to communicate with co-workers	Relevant government financial and contracts knowledge
2.	Knowledge of shipboard environments	Knowledge of shipboard environments	Knowledge of relevant government procedures and vocabulary	Critical thinking; problem solving; innovation
3.	Ability to communicate with customers	Ability to communicate with customers	Critical thinking; problem solving; innovation	Ability to work independently; be a self-starter
4.	Critical thinking; problem solving; innovation	Teamwork and ability to communicate with co-workers	Ability to work independently; be a self-starter	Technical writing
5.	Ability to work independently; be a self-starter	Ability to work independently; be a self-starter	Ability to communicate with customers	Leadership; ability to lead team efforts in a multi-task environment

Rhode Island Defense Industry Partnership Workforce Survey. Oct-Nov 2011

The findings of this study point to six high impact areas for collaborative action:

1. Professional Development for Current Employees

The skill gap analysis points to several areas where the Defense Industry Partnership could collaborate to offer professional development opportunities. These findings should serve as the basis for applying for federal and state worker training funds.

2. Supporting College Engineering Programs

Partner with Colleges of Engineering at URI and UMASS Dartmouth and technician degree programs at New England Institute of Technology, MTTI, CCRI, and other relevant institutions to support engineering pipeline programs and recruitment of students into undergraduate and graduate studies in engineering, engineering technology, computer science, and information technology.

Champion the realization of the University of Rhode Island College of Engineering's Master Plan and partner with the College of Engineering in building collaborative research areas and student learning opportunities of high relevance to the industry.

3. Internships

Develop an organized Defense Industry Partnership Internship program that increases the number, quality, and visibility of defense internships in the region. Develop a marketing strategy to use the

Defense Industry Partnership Internship program to attract more top quality students into associated degree programs at local colleges and universities.

4. Manufacturing Expertise to Support the Innovation Economy

Build a community college Manufacturing Education Program in Rhode Island so that Rhode Island can attract and prepare more people for advanced manufacturing careers. The Manufacturing Technology Center at Asnuntuck Community College in Enfield, Connecticut is a potential program model.

5. Veterans

Work with colleges, universities, workforce development partners, and services for transitioning military to support the transition of veterans into defense careers in Rhode Island.

6. Organizing to Support STEM Education

Facilitate an industry-academia forum to improve STEM and Innovation education K-16. The forum will work to increase the number of students that participate in recognized high quality STEM programs such as FIRST and SMILE inside and outside of the school day. It will also work to coordinate industry resources to maximize their impact on the number of Rhode Islanders who are motivated and prepared to succeed in college level engineering, engineering technology, computer science, and information technology degree programs.

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INTRODUCTION

The Defense Industry Partnership has undertaken this Skill Gap Study to provide information to support workforce strategy development work for the cluster. Even in a down economy and a period of tightening federal budgets the Defense Sector presents opportunities for growth by Rhode Island companies. In addition to addressing Department of Defense (DoD) needs for advanced capabilities, there is demand for practical ways to confront new security threats, and to do more for less money by stretching the useful life of systems and equipment and finding lower cost means of manufacturing high quality equipment. There are growth opportunities in identifying markets for defense related services and products needed by Homeland Security; the U.S. Department of Energy; state and local police, fire, and emergency management agencies; and related international markets. In addition, growth opportunities are found in capabilities that have defense and non-defense markets.

This study has a particularly broad occupational scope because Defense is a cross-industry cluster comprised of diverse companies that sell products and services to support national security and defense. This study includes all defense activities except construction. In addition to the analysis of published data, Ninigret Partners conducted 12 key informant interviews and conducted a widely distributed company survey to learn about workforce issues and critical skill gaps. The Defense Industry Partnership Workforce Survey asked about hiring, workforce training, and the importance of skill sets for various occupations. Part two of the survey asked about science, technology, engineering, and math (STEM) education outreach activities and tested interest in certain types of collaborative workforce development and outreach activities.

The Defense Sector is reliant on deep technical skills, problem solving, communication, and teamwork. In the knowledge economy, it is employee skills that drive growth. We found that at all levels there is demand for technicians and degreed engineers. The survey found some respondents who reported difficulty in finding and hiring the right talent for entry level to mid level positions in all categories of work. We have found that there are a number of professional skills that are needed across all occupations that could be aided by worker professional development and efforts in the K-16 education system. Survey respondents pointed to a number of skill gaps including technical writing, ability to communicate with customers, critical thinking, problem solving, and innovation skills.

Top Workforce Challenges

The top skill gaps for Rhode Island's defense sector are 1) technical writing, 2) experience with shipboard environments and unique defense systems, and 3) developing the skills to communicate and collaborate with customers. Beyond these specific skill gaps, the defense sector is limited by the engineering and technician education pipeline and the absence of a world-class education program dedicated to developing the manufacturing expertise to support the innovation economy. In order to unlock the economic potential of Rhode Island's Defense Sector, there are six inter-related things the

Defense Industry Partnership can champion.

Professional Development for Current Employees

> Collaborate to offer professional development opportunities through the Defense Industry Partnership. Apply for federal and state worker training funds to support training that supports the career advancement of incumbent workers.

Supporting college engineering programs

> Partner with Colleges of Engineering at URI and UMASS Dartmouth and technician degree programs at New England Institute of Technology, MTTI, CCRI, and other relevant institutions to support engineering pipeline programs and recruitment of students into undergraduate and graduate studies in engineering, engineering technology, computer science, and information technology.

Champion the realization of the University of Rhode Island College of Engineering's Master Plan and partner with the College of Engineering in building collaborative research areas and student learning opportunities of high relevance to the industry.

Internships

> Develop an organized Defense Industry Partnership Internship program that increases the number, raises the quality, and increases the visibility of defense internships in the region. Develop a marketing strategy to use the Defense Industry Partnership Internship program to attract more top quality students into associated degree programs at local colleges and universities.

Manufacturing Expertise to Support the Innovation Economy

> Build an industry-oriented community college Manufacturing Education Program so that Rhode Island can attract and prepare more people for advanced manufacturing careers.

Veterans

> Work with colleges, universities, workforce development partners, and services for transitioning military to support the transition of veterans into defense careers in Rhode Island.

Organizing to support STEM education

> Facilitate an industry-academia forum to improve STEM and Innovation education K-16. The forum will work to increase the number of students that participate in recognized high quality STEM programs such as FIRST and SMILE inside and outside of the school day. It will also work to coordinate industry resources to maximize their impact on the number of Rhode Islanders who are motivated and prepared to succeed in college level engineering, engineering technology, computer science, and information technology degree programs.

THE DEFENSE SECTOR IN RHODE ISLAND

Defense may be a cross-industry cluster rather than an “industry”, however there are many attributes that make the workforce skill needs of this sector unique. The U.S. Department of Defense (DoD) is a huge and unique customer with its own laws, conventions, and systems. As such, employers place a high value on work experience within the defense sector and certain categories of military service. While it is common in all industries to use professional networks for recruiting new employees, the defense sector appears to rely on these defense-specific professional networks to a very high degree. The security clearance required for many positions requires U.S. citizenship and evidence of good judgment as demonstrated through credit records and other personal information. Workers need to be willing to choose a career that will require a high degree of personal disclosure to the federal government, especially if they have family connections and travel to sensitive parts of the globe. A final attribute that is characteristic of the Rhode Island Defense Sector is the high value it places on legacy knowledge, and as a result employers have shown great flexibility in arrangements to enable older workers to continue to work past retirement age.

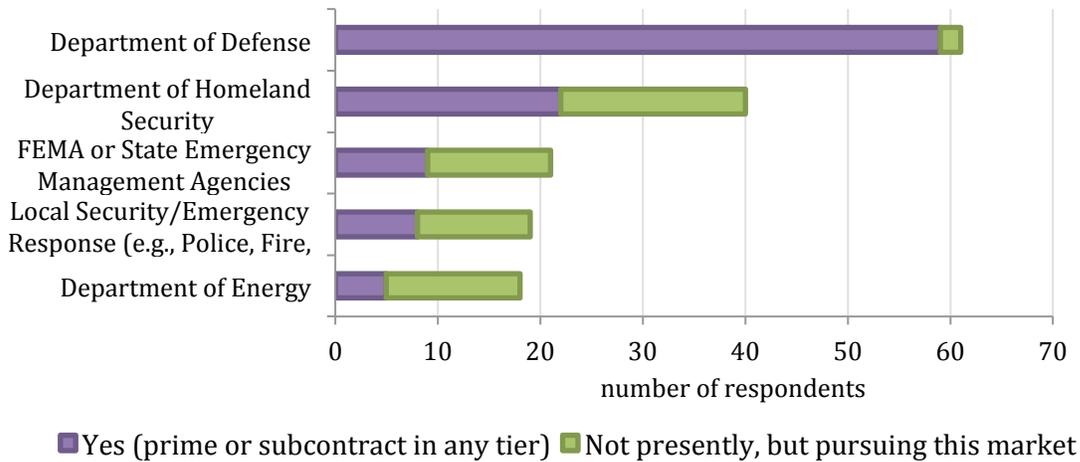
Rhode Island’s Defense Cluster encompasses a range of technical service, manufacturing, and support companies that do defense work. The DoD is the largest customer, but a substantial minority of companies also do contract work for the Department of Homeland Security. Figure 1 illustrates the range of defense and security customers of respondents to the Defense Industry Partnership Workforce Survey. In doing survey outreach for this study, the Defense Industry Partnership strove to include not only companies who are entirely oriented around the defense market, but also companies with a product or division oriented around defense customers. The Defense Industry Partnership was successful in gaining survey participation from a number of companies that are not SENEDIA members; 22 percent of survey respondents were non-members.

Rhode Island Defense Sector Segments

- Research, Development, Testing and Engineering professional services
- Computer systems and software development
- Program management and outsourced services
- Navigation equipment
- War game development
- Sonar and acoustics
- Submarine fabrication and outfitting
- Command and control systems development and integration
- Precision tooling
- High performance parts for aerospace applications
- Materials testing services
- Computer aided engineering software
- Language translation tools
- Military woolen blankets
- Insoles for footwear
- Dyeing services for camouflage
- Special purpose textiles
- Medals and insignia
- Security services
- Laminated pouches
- Ship repairs

Figure 1. Major Defense and Security Customers

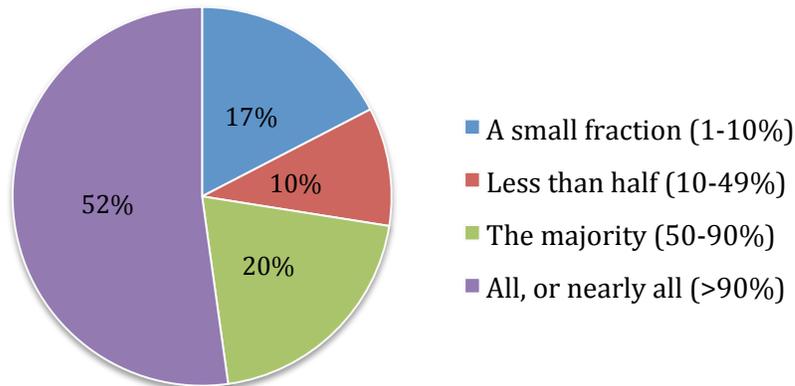
Are you doing contract work to support any of the following customers?



Rhode Island Defense Industry Partnership Workforce Survey. Oct-Nov 2011

Figure 2. Survey Respondents by Percent of Business that is Defense Related

What percent of your business is defense related?



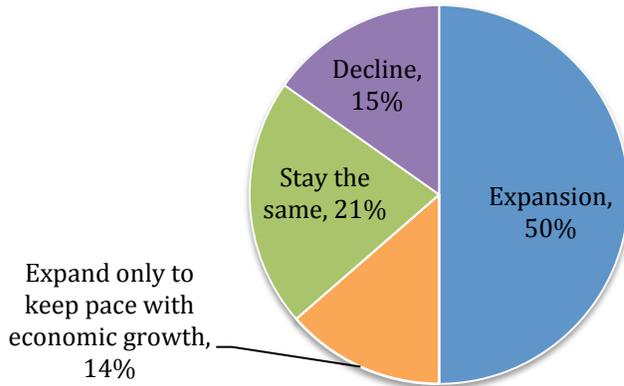
Rhode Island Defense Industry Partnership Workforce Survey. Oct-Nov 2011.

Hiring Outlook

Defense budgets will surely shift with the draw down of operations in the Middle East and tightening constraints on federal spending. There will be a continued emphasis on smart security and lean maintenance and manufacturing. In that context, half of the Rhode Island defense businesses in our survey see growth for their defense market, another 35% see no growth or growth not exceeding inflation. Fifteen percent are facing a probable decline in their defense sales and are seeking new markets.

Figure 3. Five-Year Outlook for Defense Business

What is the anticipated outlook for the defense portion of your business in Rhode Island in the next five years?



Rhode Island Defense Industry Partnership Workforce Survey. Oct-Nov 2011

In this report we present two data sources for the hiring outlook for the Rhode Island defense sector: the hiring projections reported by our survey respondents and the statewide RI Occupational Outlook¹ for the top Defense occupations. Identifying the top occupations in Rhode Island’s Defense Sector required the combination of data sources because employment and wage data is published by industry, and Defense includes a fraction of many industries. Ninigret Partners created an estimate of defense employment by occupation inclusive of all of all components of Rhode Island’s Defense Sector except construction. Table 1 shows the top Defense Sector occupations. Along side the top defense occupations Table 1 shows actual 2010 Rhode Island earnings data and BLS projected job openings that or each of these occupations (for all industries not just defense), and the statewide projected annual job openings (for all industries not just defense) created by the RI Labor Market Information.

Defense Industry Partnership survey respondents together projected 338 entry-level, 188 mid-level, and 110 senior-level hires in the next year (see Figures 4,5 and 6). The entry-level hires can be interpreted as new workers to the industry, while many of the projected mid and senior level openings may be filled by internal promotions or hiring experienced professionals from other local defense companies.

At the entry-level, skilled production workers and technicians are most in demand. Less than half a dozen companies indicated they would be hiring production workers in the coming year, but those companies project over 100 openings. Across all levels the demand for degreed engineers and technicians is very strong.

¹ DLT Rhode Island Labor Market Information / Bureau of Labor Statistics

Table 1. Top Occupations in the RI Defense Sector*with statewide Rhode Island annual earnings and projected annual openings through 2018*

Occupational Title	Annual Earnings by Occupation			Projected Annual Openings
	25th Percentile	Median	75th Percentile	
Business				
General and Operations Managers	83,160	107,710	152,500	133
Sales Representatives, Technical and Scientific Products	55,240	80,590	101,050	30
Management Analysts	53,830	72,380	92,840	107
Business Operations Specialists, All Other*	51,870	64,880	82,330	46
Financial Analysts	51,400	64,570	78,260	28
Accountants and Auditors	52,880	63,870	78,140	153
Purchasing Agents	47,830	57,120	70,550	21
Budget Analysts	37,870	55,900	71,680	7
Production, Planning, and Expediting Clerks	36,040	47,200	59,240	24
Bookkeeping, Accounting, and Auditing Clerks	30,890	36,400	43,750	192
Secretaries and Administrative Assistants, Except Executive*	30,570	35,750	41,710	108
Office Clerks, General	22,950	28,720	35,890	239
Electrical Engineering and Computer Specialties				
Computer and Information Systems Managers	94,240	111,760	134,400	37
Electronics Engineers, Except Computer	95,020	111,450	116,290	26
Software Developers, Systems Software	70,010	93,530	115,570	55
Software Developers, Applications	76,260	92,000	110,790	59
Electrical Engineers	69,460	88,690	111,160	15
Information Security Analysts, Web Developers, Network Architects	61,050	73,800	92,620	NA
Network and Computer Systems Administrators	58,380	72,980	89,600	45
Computer Programmers	53,680	67,110	84,180	31
Electrical and Electronics Engineering Technicians	41,850	55,200	67,760	10
Computer Aided Designers and Drafters ¹	30,000	54,060	80,000	NA
Computer Support Specialists	37,450	46,490	57,310	72
Electrical and Electronic Equipment Assemblers *	22,790	27,990	36,450	11
Other Engineering, Technical and Production Occupations				
Architectural and Engineering Managers	96,080	113,500	145,290	15
Engineers, All Other	74,240	95,040	123,250	10
Mechanical Engineers	69,480	89,390	109,420	25
Industrial Engineers	65,850	80,120	95,230	19
Technical Writers	50,160	60,720	77,720	7
Machinists *	36,000	43,790	50,640	21
Inspectors, Testers, Sorters, Samplers, and Weighers *	21,230	28,030	36,700	21
Team Assemblers *	17,900	21,310	28,050	91
Logistics/Safety				
Logisticians	54,780	65,940	84,580	10

Analysis by Ninigret Partners. Sources: 2010 USA Spending DoD Procurement by state of performance (RI); BLS 2010 National Occupations by Industry; BLS 2010 Cross Industry Occupational Employment and Wage Estimates. RI DLT Labor Market Information Occupational Projections 2008-2018.

1This title is not directly from the BLS.

** Indicates a declining occupation in Rhode Island designated by the RI DLT/LMI. See table in appendix.*

Figure 4. Entry Level Hiring Projections for the Next Year

What Entry Level positions do you anticipate hiring for in the next year?

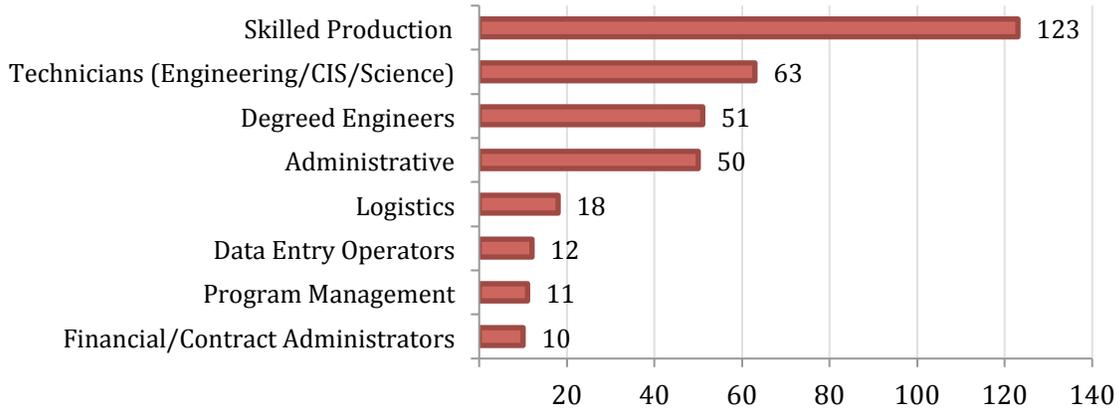


Figure 5. Mid Level Hiring Projections for the Next Year

What Mid Level positions do you anticipate hiring for in the next year?

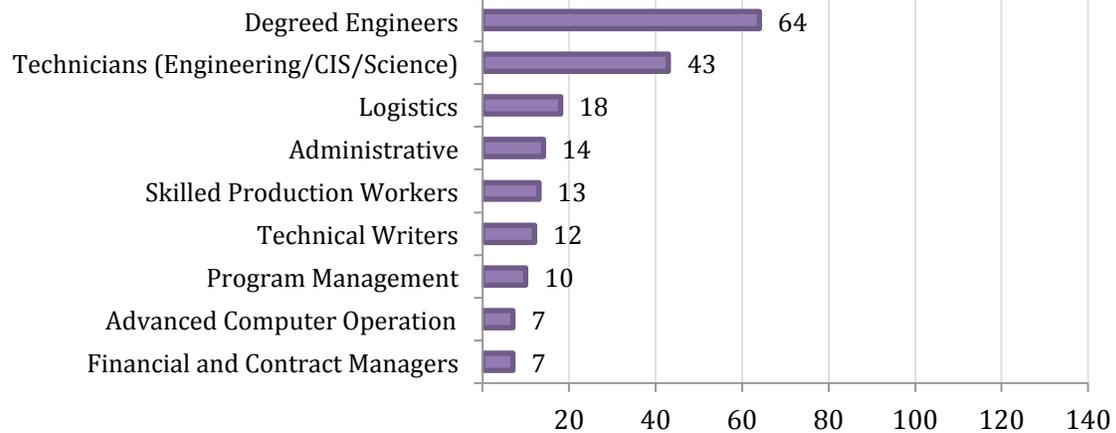
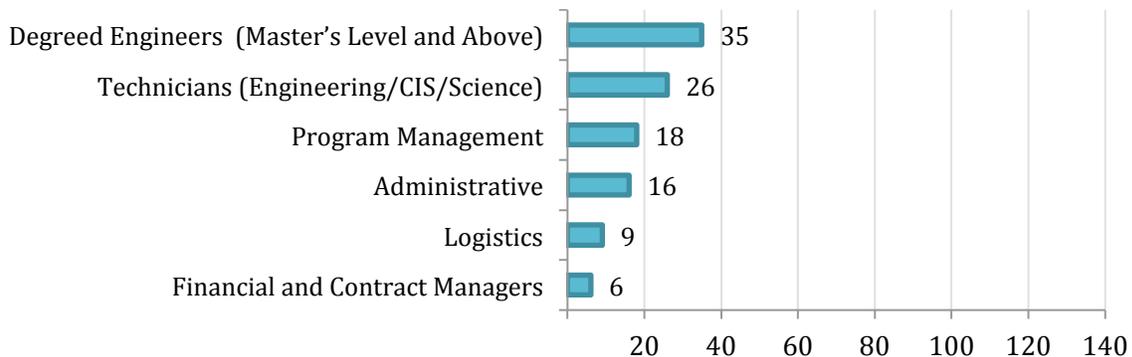


Figure 6. Senior Level Hiring Projections for the Next Year

What Senior Level positions do you anticipate hiring for in the next year?



Source for three figures above: Defense Industry Partnership Workforce Survey. Oct-Nov 2011. Only one response per company or IP address is summed in these figures.

Table 2. Highest Growth Occupations in the RI Defense Sector

Total annual vacancies as a percent of workers

1	Software Developers, Applications	5.7%
2	Technical Writers	5.4%
3	Information Security Analysts, Web Developers, & Computer Network Architects	5.0%
4	Network and Computer Systems Administrators*	4.6%
5	Software Developers, Systems Software	4.4%
6	Management Analysts	4.3%
7	Computer Support Specialists	4.2%
8	Logisticians	4.0%
9	Industrial Engineers	4.0%
10	Sales Representatives, Wholesale, Manufacturing, Technical & Scientific Products	3.4%
11	Accountants and Auditors	3.3%
12	Electrical and Electronics Drafters	3.3%
13	Computer and Information Systems Managers	3.3%
14	Electrical Engineers	3.2%
15	Architectural and Engineering Managers	3.2%

Source: RI LMI 2018 Occupation Projections. Top Defense Occupations identified by Ninigret Partners.

Figure 7. Occupational Career Ladders in Rhode Island’s Defense Sector

Salary Range	Business Administration	Computer Professions and Electrical Engineering	Other Engineering/ Science	Logistics / Safety
1-5 years experience \$30,000-\$50,000	Sales Managers, Technical & Scientific Senior Project Lead Management Analysts	Computer & Information Systems Managers Electronics Engineers System Software Developers Software Developers, Applications Electrical Engineers	Engineering Managers Engineers, All Other Mechanical Engineers Civil Engineers Industrial Engineers	
5 to 10 years experience \$50,00-\$80,000	Budget Analysts Financial Analysts Accountants, Auditors Purchasing Agents Business Operations Specialists	Computer Systems Analysts Information Security Analysts Web Developers Computer Network Architects Network & Computer Systems Administrators* Computer Programmers Electrical/Electronics Engineering Technicians Electrica/Electronics Drafters, CAD Computer Support Specialists Electrical/Electronic Equipment Assemblers	Technical Writers * Precision Tool Makers Test and Evaluation Engineer Environmental Biologist	Inventory Manager Logistician Material Handler Receptionist/Security Safety Specialist Warehouse Specialist Material Disposal Supervisor
10 or more years experience \$80,000-130,000	Production, Planning, & Expediting Clerks Bookkeeping, Accounting, Auditing Clerks Administrative Assistants, Except Legal, Executive Office Clerks, General	Computer Support Specialists Electrical/Electronic Equipment Assemblers	Civil Engineering Technicians Graphic Designers Machinists Mechanical Eng. Technicians Engineering Aid Inspectors, Testers, Sorters Team Assemblers	Maintenance and Repair Workers Warehouse Clerk

Career Ladders

Within any industry there are multiple career ladders that include pathways from entry-level to experienced positions. Each level requires a higher degree of industry, academic, workplace, and professional competencies. Advancement on the career ladder is possible through a combination of experience, professional development, and attainment of degrees and credentials. Figure 7 illustrates Defense Sector Career Ladders outlining occupations in low, middle, and high tiers across four broad occupational categories.

SKILL GAPS

Rhode Island Defense employers perceive skill gaps in applicant pools across all occupational categories in our survey: engineers, technicians, production workers, and business administration professionals. Searches for engineers and technicians are more likely to be difficult (many open positions unfilled) than searches for business administration. Fewer respondents have recently hired production workers or logisticians, but among those that did, 60% found it difficult or marginal to find candidates with the right skill sets in production and 76% for logisticians. We defined marginal as “longer job searches than ideal to fill open positions.”

Table 3. Difficulty of Finding the Right Talent in Rhode Island

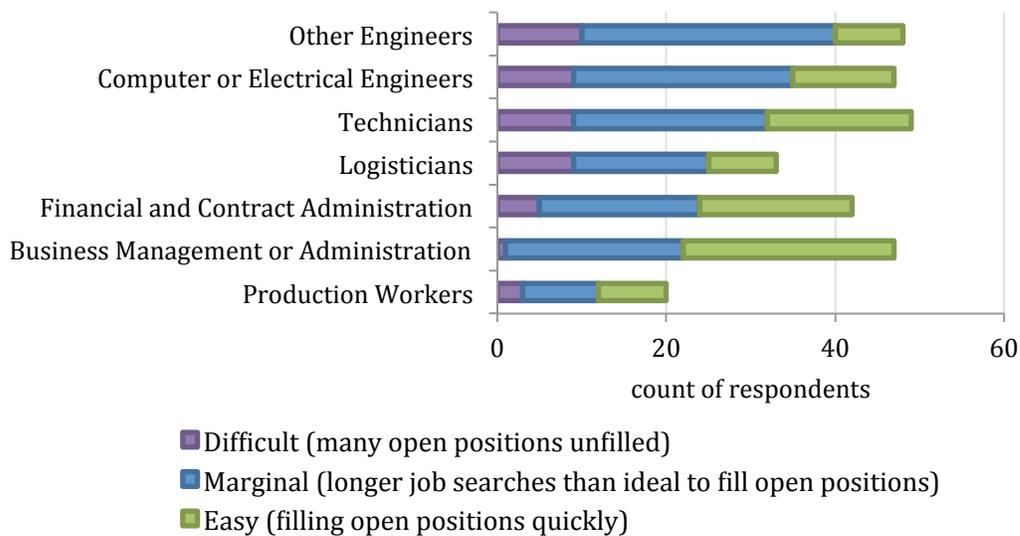
How would you describe your company’s ability to find and hire the right talent at your Rhode Island location?

Occupation category	Number of respondents experiencing difficult or marginal job searches	Total respondents with job searches in this category	Percent experiencing difficult or marginal job searches
Other Engineers	40	48	83%
Logisticians	25	33	76%
Computer or Electrical Engineers	35	47	74%
Technicians	32	49	65%
Production Workers	12	20	60%
Financial and Contract Administration	24	42	57%
Business Management or Administration	22	47	47%

Rhode Island Defense Industry Partnership Workforce Survey. Oct-Nov 2011

Figure 8. Difficulty of Finding the Right Talent in Rhode Island

How would you describe your company’s ability to find and hire the right talent at your Rhode Island location?



Rhode Island Defense Industry Partnership Workforce Survey. Oct-Nov 2011

Figure 9 drills down to identify the critical skill gaps in the applicant pools for entry to mid-level positions for engineers, technicians, production workers, and business administration. There were a number of common themes that arose in multiple categories. Technical writing was rated as a critical skill gap by 60% of respondents for engineers, 59% for technicians, 28% for production workers, and 44% for business administration. Technical writing is an important skill across all disciplines. The ability to work independently was also one of the five most frequently cited critical skill gaps in each of the four career categories on our survey. The full responses to this skill gap question are included as figures in the Appendix.

Figure 9. Top Five “Critical Skill Gaps” in four Occupational Categories

	Engineering	Technician	Production	Business Administration
1.	Technical writing	Technical writing	Teamwork and ability to communicate with co-workers	Relevant government financial and contracts knowledge
2.	Knowledge of shipboard environments	Knowledge of shipboard environments	Knowledge of relevant government procedures and vocabulary	Critical thinking; problem solving; innovation
3.	Ability to communicate with customers	Ability to communicate with customers	Critical thinking; problem solving; innovation	Ability to work independently; be a self-starter
4.	Critical thinking; problem solving; innovation	Teamwork and ability to communicate with co-workers	Ability to work independently; be a self-starter	Technical writing
5.	Ability to work independently; be a self-starter	Ability to work independently; be a self-starter	Ability to communicate with customers	Leadership; ability to lead team efforts in a multi-task environment

Rhode Island Defense Industry Partnership Workforce Survey. Oct-Nov 2011

Engineering and Technician Positions

Engineering and Technician positions require a relevant academic degree and employers indicated in interviews that the degree programs in engineering at URI and UMASS Dartmouth as well as the engineering technology and technician degree programs at NEIT and MTTI are particular assets for the industry. These academic programs are essential to the defense cluster in Rhode Island and the skill gaps employers identified generally were not in technical knowledge but instead in writing, communication, defense-specific knowledge, and professional skills. For engineers and technicians, technical writing and knowledge of shipboard environments were identified as critical skill gaps by more than half of survey respondents. Engineers in particular need knowledge of how the product will

be used by the customer. For many of Rhode Island's Defense companies, this means experience with submarine and shipboard environments and systems. There are very few opportunities to acquire such knowledge outside the Navy.

A theme that emerged through employer interviews is that technical businesses need employees who can be a bridge between the business and technical worlds. For example, engineers need to be connected to the customers' needs, the techniques of the production process, and the economics of production to design for manufacturability and affordability. Engineers, technicians, and scientists can bring more value to their technical work if they have the communication skills to understand customer challenges and the ability to communicate solutions. Bridge skills help workers take a step beyond meeting customers' needs, to identify new applications and markets for existing company capabilities. Such combinations of skills can be combined in one worker or they can be brought together through a well functioning team.

Teamwork and ability to communicate with co-workers ranked as one of the most frequent critical skill gaps for employers hiring technicians (46%) and also for a large minority of employers hiring engineers (35%).

Through the interviews and survey we also heard very specific comments on what software engineers and programmers need to know. Knowledge of the DoD Architecture Framework (DODAF) is essential. Software engineers need experience with languages such as C++ that interact with computers and other devices at a basic level. Because the defense sector creates software as part of the design of custom devices it is often important for software developers to have knowledge of hardware components and how they perform. Other engineers, technicians, and some production employees need to have a solid working knowledge of computer aided design concepts (e.g. SolidWorks) and geometrical tolerance for manufacturing.

Some technical specialties that will play important roles in the industry growth and development include modeling, simulation, high-end (3D) gaming environments for simulation and training, human machine interfaces, artificial intelligence, visualization, IT security / information assurance, intrusion detection and prevention, credentialing, biometric identity verification / identity management (fingerprints, retinas), e-commerce environments, mobile platforms (IOS and Android), web-services, cloud computing, acoustics, digital signal processing, transducer design, environmental safety / security, pollution prevention and monitoring, marine science, and marine biology. Many of these areas benefit from academic partnerships with universities in the region.

Production

There are many types of production workers supporting the Defense Sector including electronics assembly, precision and custom tool manufacturing, chemical etching workers, and a variety of textile workers, each requiring different specific skills. Manufacturing has recently become a hot policy topic in innovation policy circles. People have come to understand that the United States cannot let all production move overseas while keeping high-end engineering design on shore. This conclusion is articulated in the Charter for Revitalizing American Manufacturing (2011), a set of principles and

policy steps to rebuild a competitive and vibrant manufacturing sector, created through a collaborative process by the Information Technology and Innovation Foundation in 2011. A significant amount of innovation and product improvement happens at the intersection of production and design. In a similar manner, Rhode Island companies indicated they place a high value on workers who bridge the interface between technical design and production. Unless the engineer who designed a component understands the practical aspects related to how the item will be made, it falls to the production specialist to adapt the new design for manufacturability. Both are valued in the Defense Sector where Rhode Island companies make prototypes and customized products. The ability of production workers to interpret CAD drawings and technical specifications is also extremely important to the interface between design and production. Like many other manufacturers, the Defense sector requires production workers to have skills in quality assurance, specifically Lean and Six Sigma.

Manufacturing is indispensable to the health of the U.S. economy, for four key reasons: 1) Without a robust manufacturing sector, the U.S. will have great difficulty balancing its foreign trade; 2) Manufacturing is a key source of above-average-paying jobs; 3) Manufacturing, R&D, and innovation go hand-in-hand. In fact, manufacturing is the principal source of innovation and R&D activity in the U.S. economy, and; 4) Manufacturing is vital to U.S. national security and defense.

- *Charter for Revitalizing American Manufacturing. 2011. Information Technology and Innovation Foundation*

During interviews Defense employers pointed only to out of state colleges and universities as examples of valuable educational resources for their production workforce. The state of advanced manufacturing education in Rhode Island is such that employers have difficulty hiring qualified machinists – which is ironic given that machinists have been a declining occupation for many years, with displaced workers in Rhode Island available for retooling.

Logistics

Current watchwords for logisticians are sustainment and stretching in a tightening budget environment. Logisticians and the material movers, handlers, warehouse staff, inventory control, safety, and disposal specialists that support logistics represent a small fraction of the overall defense workforce. Our survey did not ask for details on skill gaps for this occupational category. However, 25 out of the 33 survey respondents who have recently hired logisticians indicated that the job search was difficult or marginal. In the coming year, survey respondents anticipate hiring 18 entry-level, 18 mid-level and 9 senior-level logistics personnel. The armed services are one source of experienced logisticians for the industry. Relevant certifications include Certified Professional Logician, Certified Logistics Professional, and Certified Supply Chain Professional. Education for careers in logistics include business degrees in areas such as supply chain management, manufacturing, procurement management, and strategic planning.

Business Administration Positions

On the business administration side, there is continual high demand for contract professionals with military or federal acquisition experience and regulatory knowledge. Some of the specialized skills that have high value include leaders and administrative staff who can streamline administrative

processes to work with flatter organizational structures. Managers are being asked to execute a wider variety administrative and human resource functions because increased automation is flattening administrative staff.

Innovation at All Levels

One important theme that emerged from interviews with Defense Sector leaders is that innovation happens at all levels of the workforce and across all functions. In order to continue to stretch DoD budgets to do more and to meet the challenging criteria of future security needs, there will need to be innovation in business administration, market development, maintenance, logistics, and technology application. Sixty-six percent of survey respondents indicated that professional development opportunities to develop “innovation” skills would be valuable and 71% indicated programs for “leadership” would be valuable (*see Table 9*).

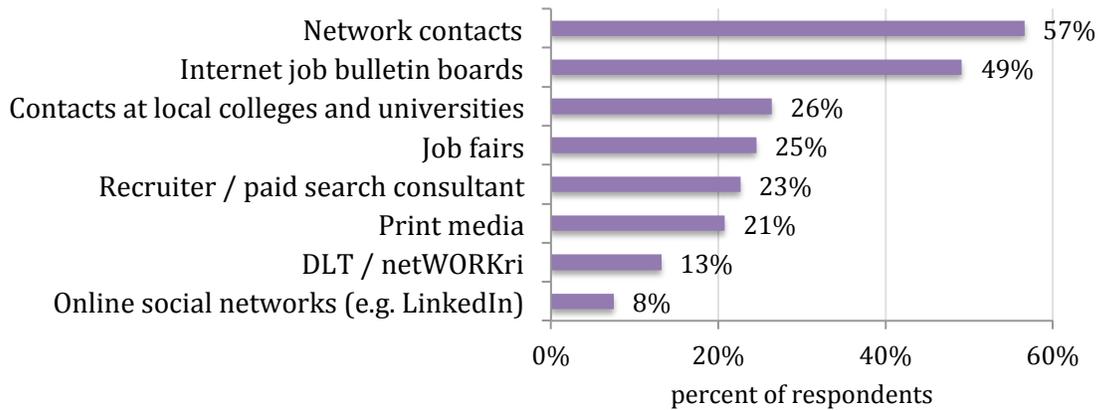
This industry lives by performing work to satisfy DoD requirements. However, technical sales leaders, or “capture specialists,” as they are also called, are working to diversify markets to include a greater range of other domestic and international security and defense customers. Knowledge of international markets and cultures is still a low priority most Rhode Island companies, but the potential for market expansion through international collaboration and international sales may support growth in the local Defense Sector. Companies seeking more international partnerships and customers value internationally literate business leaders with some knowledge of the culture and language of major markets.

RECRUITMENT CHANNELS

The Governor’s Workforce Board has asked the Defense Industry Partnership to identify ways state and local workforce agencies can be linked into the process of training and placement. As a baseline, the survey asked companies about the resources, they use for recruitment. Professional network contacts were the most frequently used recruitment resource, followed by internet job bulletin boards. Several respondents indicated that the company website is the basic recruitment resource and that job postings on the company website attract many applicants.

Figure 10. Frequently Used Recruitment Tools

Which type of resources do you use to recruit and hire new employees? Percent using the resource frequently or always.



Rhode Island Defense Industry Partnership Workforce Survey. Oct-Nov 2011

Half of the survey respondents indicated that they had used the DLT netWORKri centers as a recruitment tool and 13% indicated they use DLT or netWORKri frequently or always. The companies that use netWORKri as a resource include companies of all sizes and lines of business.

In an effort to identify areas where netWORKri might be able to assist companies with job applicants, key informants were asked about the most accessible positions within their firm during interviews. These occupations including clerical, production, and warehouse staff are captured in Figure 7 “Occupational Career Ladders in Rhode Island’s Defense Sector.”

Opportunities for Displaced Workers

The Department of Labor and Training has an interest in identifying opportunities for employment in the Defense Sector that build on the skills of workers displaced from declining industries and occupations. Broadly speaking, the top three major groups of declining occupations in Rhode Island are all related to occupations within the Defense Sector: Office and Administrative Support, Production, and Transportation and Material Moving (*see Table 5*). There could be opportunities for displaced workers from other industries within the Defense Sector, though many jobs in declining occupations had lower educational requirements than are currently demanded in the Defense Sector. Workers will also need to meet relevant citizenship and security criteria.

Table 4. Major Groups of Declining Occupations in Rhode Island

see detailed table of declining occupations in the appendix

SOC Code	major group	2008 Employment	Estimated Decline	Percent Decline
43-0000	Office and Administrative Support	26,667	-2133	-8%
51-0000	Production Occupations	22,879	-3198	-14%
53-0000	Transportation / Material Moving	10,172	-936	-9%

Source: Rhode Island DLT, Labor Market Information

The occupational category of “Secretaries and Administrative Assistants, Except Executive” is declining in Rhode Island, but is among the top occupations in the Defense Sector. However, like other industries, the Defense Sector is undergoing a “flattening” of administrative functions, and positions often carry multiple responsibilities. To be well-positioned for jobs in the Defense Sector, displaced administrative support personnel need a solid general education, a record of reliability, the ability to consistently work within company and industry procedures, and ability to learn to use management software. Key informants in the industry indicated that while experience in the Defense Sector is preferred, they hire new administrative support employees with general experience with the expectation that new hires will learn the specific company procedures, regulations, and software applications on-the-job.

Production occupations are probably the area where the Department of Labor and Training can provide the most value to individual companies in the Defense Sector through referrals of displaced workers with manufacturing experience. Highly relevant declining occupations include Machinists; Electrical and Electronic Equipment Assemblers; Team Assemblers; and Inspectors, Testers, Sorters, Samplers, and Weighers. The production workforce doing defense work must be American citizens even though security clearance is not generally required. As detailed in the Skill Gap section, specific companies in the Defense Sector need experienced production workers capable of working in an advanced manufacturing environment. Employers value workers who are cross-trained and flexible, to perform a variety of functions in a precision and often low-volume manufacturing environment. Upgrade training for production workers is also valuable in order to work from computer aided designs (CAD).

Textile manufacturing stands out among Rhode Island’s declining industries (see declining industry table in appendix), as an area of potential market growth in the Defense Sector. While commodity textile manufacturing is in profound decline in the United States, the Department of Defense purchases significant quantities of specialty textile products, garments, and insignia. U.S. manufacturers are not at the same disadvantage to low cost foreign competition in the defense market. Rhode Island companies perform a high proportion of DoD contracts in Fabric Mills, Textile and Fabric Finishing Mills, Other Textile Product Mills, and Cut and Sew Apparel Manufacturing². Economic development and workforce training assistance aimed at textile manufactures pursuing the defense market could help Rhode Island retain and even create new manufacturing jobs. Table 6 shows examples of textile and insignia manufacturers in urban communities throughout Rhode Island with DoD contracts.

² NAIC industry codes 3132, 3133, 3149, and 3152

Table 5. Selected Companies Performing Work Under DoD Textile and Apparel Contracts in Rhode Island

<i>Recipient name</i>	<i>DoD Obligated Amount</i>		<i>RI Location</i>
	<i>2010</i>	<i>Five Year: 2005-2010</i>	
IRA GREEN INC	\$1,785,118	\$14,210,256	Providence
HYMAN BRICKLE & SON INC	\$7,616,392	\$10,850,912	Woonsocket
URSCHEL TOOL CO	\$603,254	\$2,856,715	Cranston
INTERNATIONAL INSIGNIA CORP.	\$611,981	\$2,220,265	Providence
KENNEDY INCORPORATED	\$390,204	\$1,361,159	Quonset
MH STALLMAN COMPANY	\$138,780	\$1,247,369	Providence
NAIAD INFLATABLES OF NEWPORT		\$1,127,473	Portsmouth
MURDOCK WEBBING COMPANY INC	\$157,451	\$869,041	Central Falls
UNIVERSAL SPECIALTY AWARDS	\$243,632	\$736,939	Providence
EVANS T W CORDAGE COMPANY INC	\$183,744	\$720,286	Cranston
GLOBAL ENGINEERED MATERIALS CO	\$226,170	\$630,669	Pawtucket
BREN CORPORATION THE	\$154,715	\$319,138	Johnston
BRADFORD DYEING ASSOCIATION		\$234,202	Cranston
RHODE ISLAND TEXTILE COMPANY	\$44,640	\$132,660	Pawtucket
WILD THINGS LLC	\$92,894	\$92,894	Newport
PROPEL LLC	\$35,773	\$56,699	Providence

Source: USA Spending.

There may also be opportunities for displaced transportation and material moving workers in Defense Sector roles such as warehouse clerk, warehouse specialist, material handler, material disposal supervisor, and logistician. These positions are present in small numbers and are varied in their required skills and experience.

Geography Matters

Most Defense Sector employers have the ability to recruit nationally, but local connections are key to retention. During key informant interviews we learned that companies find they are able to recruit nationally, but that employee retention is higher for graduates of nearby colleges and universities with high local enrollment. For example retention is higher among URI computer science or engineering graduates (an institution with high enrollment from the region) compared to Brown University or MIT. For this reason the engineering and computer science programs at the University of Rhode Island and University of Massachusetts, Dartmouth and the technical degree graduates from the New England Institute of Technology and MTTI are key resources. Technical experts with experience with specific Navy systems and the associated security clearance are the most frequently cited targets for national recruitment. This includes Navy E6-E9 Electronic Technicians. Even here, companies find that retiring Naval personnel with previous connections to the region are easier to recruit and retain.

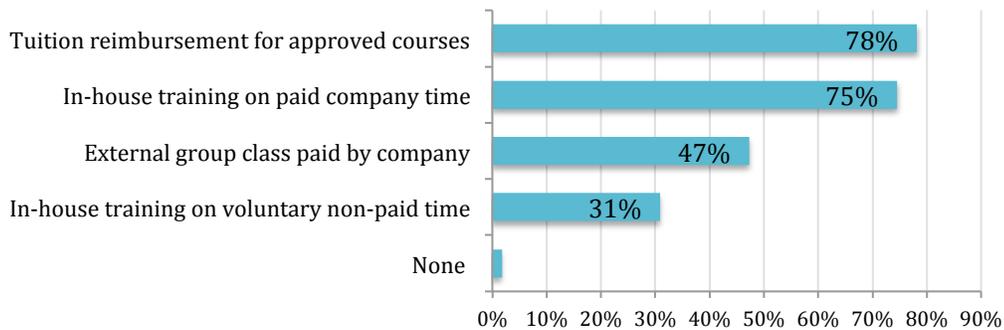
Employer Sponsored Training

Defense Sector companies generally have employees with high average educational attainment and they also invest in ongoing training and professional development. All but one respondent indicated

that their company or division provides some training or professional development. The majority of respondent companies offer tuition reimbursement for approved courses and also some in-house training on paid company time. Nearly half of respondents indicated that they at least sometimes bring in external trainers to teach classes. Some large companies have significant in-house resources. For example, a respondent company indicated they have an in-house online university with over 300 courses.

Figure 11. Company Employee Training

Does your company carry out employee training?



Rhode Island Defense Industry Partnership Workforce Survey. Oct-Nov 2011

Workforce Diversity

Three themes emerged when discussing workforce diversity with key informants in the industry. First, many employers in the Defense Sector felt they have been successful in recruiting women and advancing women into leadership positions including technical and engineering leadership positions. This success is attributed to early efforts to recruitment women in technology, computer science, and engineering – fields in which women are dramatically underrepresented nationally. There is a sense that women at the middle and upper levels within organizations serve as role models and support the career advancement of women in the industry.

Second, employers are aware that minorities are under-represented in the technical Defense Sector workforce. Employers indicated that the personal networks for recruitment and the degree programs at colleges and universities produce a pool of job candidates in which minorities are under-represented. There was a sense that increasing diversity in the technical workforce will happen if diversity is increased in the feeder education programs in engineering, information technology, computer science, technician training, and the Navy. The two success stories shared with Ninigret Partners from employers who had succeeded in efforts to increase minorities in technical positions involved relationships with universities outside of southern New England. These employers had technical leaders with personal relationships with faculty that assisted them in hiring a series of interns and permanent hires.

The third theme was the recognition that any employees who are not from southern New England are at risk of remaining “outsiders” in the sense that they may not come to feel part of local community and Defense Sector social networks. There is a sense that deliberate effort to connect newcomers to

the Rhode Island community could aid retention. Along the same vein, there was an acknowledgement by some employers that there is still a need for increased cultural awareness among all members of the team be supportive of a diverse workforce.

Veterans

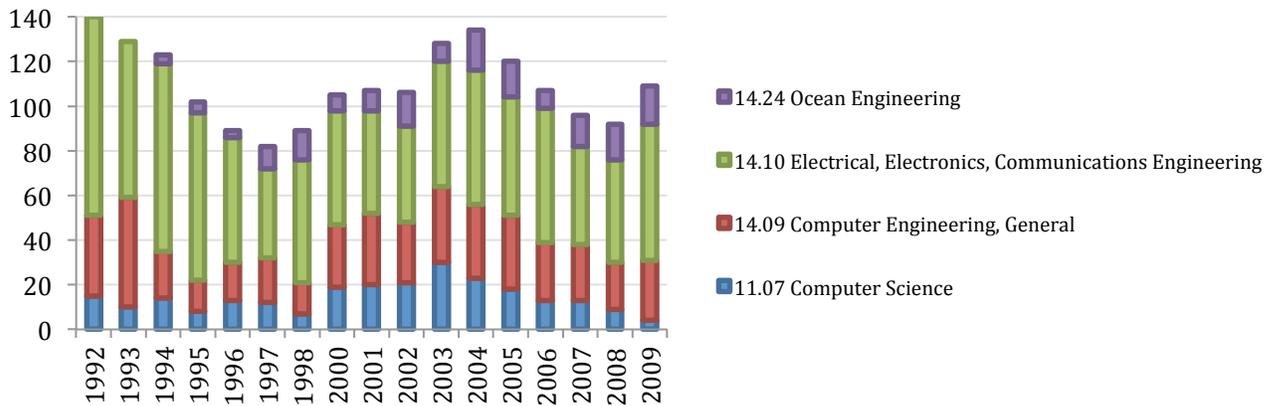
Military personnel leaving active service are a particularly good recruitment target as defense employers value military experience and also have a desire to support the wounded warrior program. GI education benefits enabling transitioning military to complete relevant technical degree programs that would qualify them for current jobs in the Defense Sector. Rhode Island’s Defense Sector, Department of Labor and Training, colleges, and universities could do more to reach out to transitioning Navy personnel to make it easy for them to find prospective employers and degrees that match their skills in Rhode Island.

REGIONAL EDUCATION TRENDS

Engineering and computer science graduates continue to be in high demand while the degree pipeline has not grown. The figure below illustrates the number of bachelor-level engineers and computer science graduates from Rhode Island institutions and the University of Massachusetts Dartmouth.

Figure 12. Engineering and Computer Science Bachelor’s Degrees

Rhode Island Schools and UMass Dartmouth, 1989-2009

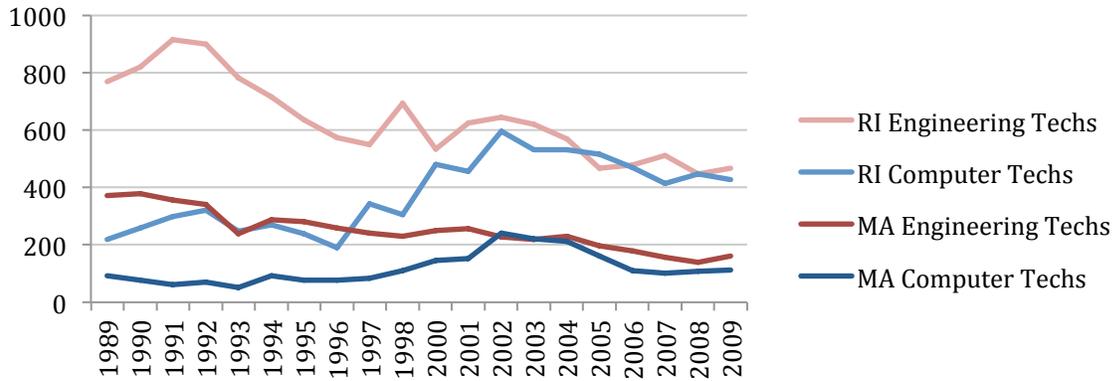


Source: IPEDS database in NSF webcaspar 1989-2009.

Several high growth occupations in the defense sector are accessible with an associate’s degree: network administrators, computer support specialists, and drafters with CAD skills. Relative to the size of the labor force, the Rhode Island region has been educating high numbers of graduates in engineering and computer technology degree programs. However, the numbers have declined over the last decade rather than grown. Engineering Technology degrees have declined since the early nineties. Computer Technology degree granting peaked in 2002 and has declined since.

Figure 13. Technical Associate's Degrees per Million in the Labor Force

All institutions by state, 1989-2009



Source: IPEDS database in NSF webcaspar 1989-2009.

New England Institute of Technology (NEIT) has maintained its number of degrees in Computer Technology, whereas other area schools have graduated declining numbers in this field. In the last five years, 80% percent of engineering technology degrees and 60% of Computer Technology degrees in Rhode Island were granted at NEIT.

Technical positions are filled by graduates with relevant degrees therefore workforce diversity for the Defense Sector depends on the students pipeline. Table 7 allows comparison of graduates by race, ethnicity, and gender compared to the Rhode Island population as a whole. Blacks are underrepresented among graduates of most tech degrees except Bachelors in CIS, and Hispanics are less than proportionally represented in tech degrees except Bachelors in computer engineering. The proportion of whites among engineering and engineering tech degrees granted in Rhode Island is lower than the white share of the state population because of the high numbers of Asian graduates.

Table 6. Tech Degree Pipeline by Race, Ethnicity, and Gender

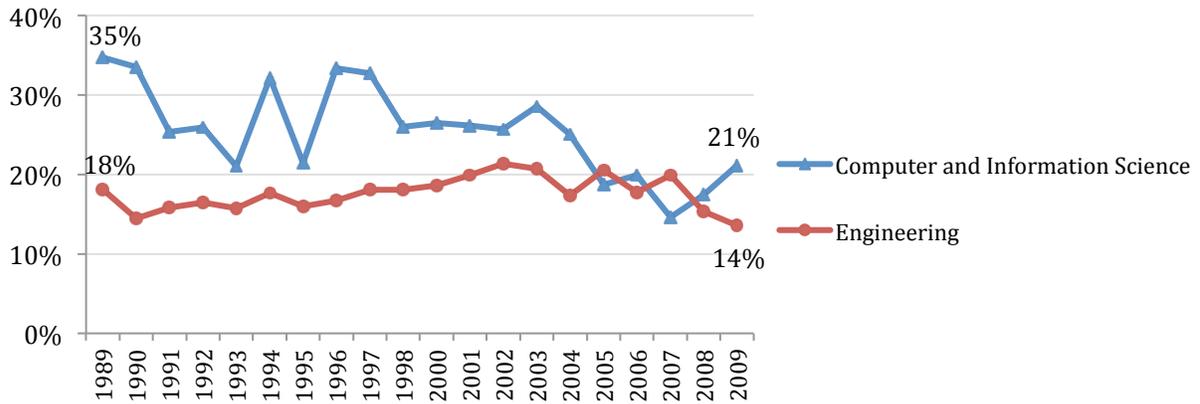
Degrees granted by Rhode Island institutions

	White Non-Hispanic	Black Non-Hispanic	Hispanic	Female
Associate's Degrees				
Computer Tech	70%	8%	6%	21%
Engineering Tech	69%	5%	5%	8%
Bachelor's Degrees				
Computer and Information Sciences & Support Services	71%	6%	4%	19%
Computer Engineering	63%	3%	14%	4%
Electrical, Electronics, Communications Engineering	70%	4%	5%	16%
Ocean Engineering	82%	0%	1%	18%
Total RI Population	83%	6%	11%	51%

Source: IPEDS database in NSF webcaspar. Most recent five years (2005-2009).

The gender imbalance in engineering education programs is dramatic. For many years women were better represented in computer and information science (CIS) than in engineering programs at the Bachelor's level, but this difference has diminished. The shift in gender balance has been even more dramatic at the Associate's degree level. Women earned 48% of Computer Technology degrees in 1989 and 13% in 2009. The shrinking J&W and CCRI programs have contributed to the decline in women graduates, as these programs had a higher proportion of women than NEIT.

Figure 14. Women as a Percent of Bachelor's Level Engineering and CIS Graduates
Rhode Island Schools and UMass Dartmouth, 1989-2009



Source: IPEDS database in NSF webcaspar.

Table 7. Women as a Percent of Bachelor's Level Engineering and CIS Graduates by Institution

Rhode Island Schools and UMass Dartmouth, 2005-2009

	Engineering	CIS
Brown University	30%	20%
Bryant University	-	18%
Johnson & Wales University	8%	31%
New England Institute of Tech	-	11%
Providence College	33%	26%
Rhode Island College	-	20%
Roger Williams University	16%	-
Salve Regina University	-	26%
UMASS Dartmouth	10%	8%
University of Rhode Island	17%	8%

Source: IPEDS database in NSF webcaspar. Most recent five years (2005-2009).

Figure 15. Women as a Percent of Associate’s Level Degrees in Engineering and Computer Technology

Rhode Island Schools and UMass Dartmouth, 1989-2009

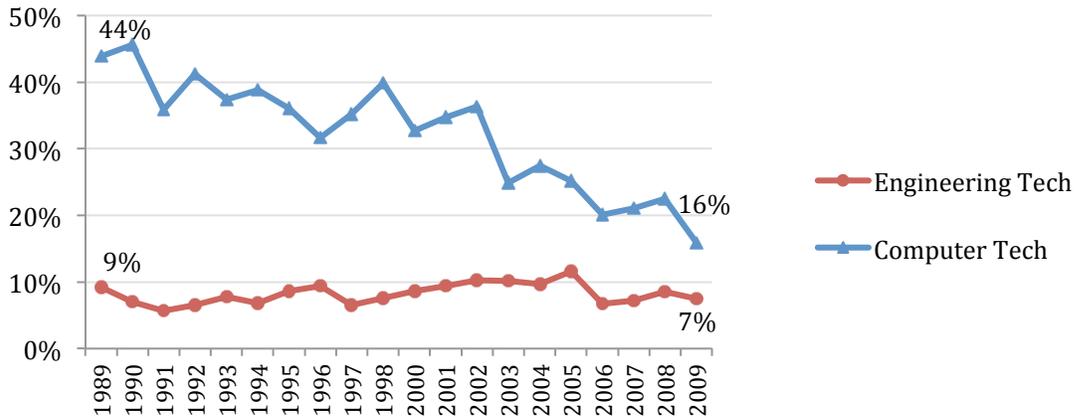


Table 8. Education Resources that are Important to the Industry

Resources mentioned by one or more company during key informant interviews

Local Post Secondary Education Resources

- Engineering (URI, U Mass Dartmouth, Northeastern, Wentworth, WPI)
- New England Tech 2 &4 year degrees (*Business Management Technology, Game Development & Simulation, Network Engineering, Software Engineering, Electronics Systems, Mechanical Engineering*)
- MTTI (*Computer Service Technician / Electronic Communications Technician*)
- Manufacturing Technology Center at Asnuntuck Community College in Enfield, Connecticut
- Business Schools (Bryant, URI)
- General Arts and Sciences (URI, UMASS, PC, RW, J&W, CCRI)

Other Important Training Resources / Certifications

- Navy C Schools for active duty military
- Federal Acquisition Regulation (FAR) Training
- Defense Acquisition University
- Defense Contract Audit Agency (DCAA) Accounting courses
- National Contract Managers Association (NCMA): Contract Manager Certification
- Certified Information Systems Security Professional
- National Association for Defense Manufacturing and Machining
- Vendor factory schools

MOVING FORWARD

The Defense Industry Partnership was formed because of the desire of Rhode Island's defense companies to become more collaborative and proactive in supporting workforce development for the industry. The capabilities of the local workforce are a source of competitive advantage that industry intends to enhance. In addition to investing in professional development for their own workforce, often through tuition reimbursement programs, a significant number of companies in Rhode Island's Defense Sector are supporting the workforce development pipeline at the college, high-school, and sometimes middle school level. This leadership in STEM education outreach is an important resource for Rhode Island to tap to support the growth of the knowledge economy. In the face of tightening national defense budgets, collaborative workforce development initiatives will be particularly vital to the smaller companies that cannot sustain training resources, internship programs, or education outreach efforts in-house.

Professional Development for Current Employees

- ★ **Collaborate to offer professional development opportunities through the Defense Industry Partnership. Apply for federal and state worker training funds to support training.**

A majority of respondents to our survey indicated that their company would benefit if the Defense Industry Partnership were to organize professional development programs for the industry. Based on the skill gap study, the three highest priorities are as follows:

1. Develop a course of study for practicing engineers and technicians to improve technical writing skills.
2. Create seminars or workshops designed to introduce technicians and engineers to topics in design for shipboard environments. Determine the feasibility of including shipboard experiences.
3. Create a workshop series and mentoring program to develop the ability of engineers, technicians, and production experts to communicate and collaborate effectively with customers.

The table below summarizes interest in a wider array of potential collaborative training opportunities that would benefit defense companies in the region. The Defense Industry Partnership could function as a forum through which members propose training courses, and if interest is sufficient, a trainer could be engaged jointly by participating companies. The Defense Industry Partnership would benefit by following the example of the Tech Collective to apply for federal and state incumbent worker training funds to provide matching funds to support collaborative training. These efforts could increase the number of workers completing valued certifications in the industry such as Federal Acquisition Regulation (FAR) training, DCAA accounting courses, NCMA Contract Manager Certification, and Certified Information Systems Security Professional.

Table 9. Areas in Which More than Half of Respondents Feel their Company Would Benefit from Collaboratively Organized Training

My company could benefit from an investment in Defense Industry Partnership organized training programs (with education partners) in the following areas.

<i>Percent of respondents who agreed or strongly agreed</i>	
Advanced courses for computer and electrical engineers	73%
Information assurance / cyber security	73%
Leadership programs	71%
Contract management	66%
Knowledge of shipboard environments	66%
Skills for using new technology	63%
Innovation skills	63%
Regulatory training	59%
Business, communication, and sales skills for technical staff	56%
Project management	54%

Rhode Island Defense Industry Partnership Workforce Survey. Oct-Nov 2011

Internships

Key informant interviews emphasized the value of internships in the transition from academic programs to technical careers in the Defense Sector. Current internship programs range from formalized programs to ad hoc acceptance of the occasional intern. The quality of internships ranges widely with the key determinant being the intern supervisor’s ability to integrate the intern and treat them like an engineering or technical professional.

- ★ **Develop an organized Defense Industry Partnership Internship program that increases the number, quality, and visibility of defense internships in the region. Develop a marketing strategy to use the Defense Industry Partnership Internship program to attract more top quality students into associated degree programs at local colleges and universities.**

There are many advantages to building an organizational infrastructure to support quality internships. The largest employers in the sector have established internship programs, but the number of internships available to students could be increased through a Defense Industry Partnership internship program created in close cooperation with academic institutions. “Building a Premier Internship Program: A Practical Guide for Employers” by the Association of Colleges and Employers outlines a number of best practices that would be attainable with an industry-wide program.

- Provide interns with real work assignments
- Hold orientations for all involved
- Pair scholarships with highly selective internships
- Offer flex-time and/or other unusual work arrangements.
- Hold new-hire panels (panelists who were hired as new grads within last 3 years)
- Bring in speakers from the company’s executive ranks
- Conduct focus groups/surveys to get feedback from student interns
- Showcase intern work through presentations or an expo
- Conduct exit interviews to support continuous improvement of the program

While the largest number of interns will be from engineering and technology programs, it would be beneficial to also reach out to business schools to establish a pathway to defense industry careers. Twenty-one respondents to our survey are interested in the Defense Industry Partnership brokering more defense relevant courses or events at area business schools to bring people into contract acquisition, contract management, and project management in the defense sector.

Table 10. Interest in Activities to Support Internship Programs

What types of cooperative activities would benefit your company with regard to internship programs?

<i>Percent of Respondents rating as beneficial or highly beneficial</i>	
Align curriculum with industry needs	83%
Improve internship preparation by local college programs to help students meet workplace expectations	78%
More interaction with faculty to help get appropriate intern referrals	73%
Mentoring skills sessions for employees who will work with interns	60%
Share best practices for successfully supporting interns	50%

Rhode Island Defense Industry Partnership Workforce Survey. Oct-Nov 2011

Supporting College Engineering Programs

Engineering education has been a historic strength that supported the growth of the Defense Cluster in Rhode Island, and a world-class College of Engineering is essential to maintain world-class capabilities in the Region’s defense sector. Of the potential collaborative activities of the Defense Industry Partnership that we asked about in the survey, the area with the widest interest was the Defense Industry Partnership organizing Defense Sector companies to support local college engineering programs.

★ Partner with Colleges of Engineering at URI and UMass Dartmouth, and technician degree programs at New England Institute of Technology, MTTI, CCRI, and other relevant institutions, to support engineering pipeline programs and recruitment of students into undergraduate and graduate studies in engineering and engineering technology.

The Defense Industry Partnership will champion the realization of the University of Rhode Island College of Engineering’s Master Plan and partner with the College of Engineering in building collaborative research areas and student learning opportunities of high relevance to the industry.

The URI College of Engineering has identified the need for new facilities to support faculty collaboration around cross-disciplinary topics and support outside partnerships. The College of Engineering was expanded through a building-boom in the 1960s, and many of those facilities are no longer adequate to recruit and retain world-class faculty, nor do they support College of Engineering’s vision of organizing around industry-relevant research topics that draw from multiple disciplines.

The College of Engineering at the University of Massachusetts Dartmouth was ranked in the top 50 among engineering programs focused on undergraduate education by the 2010 U.S. News and World Report. Of particular relevance to the skill gap study is the IMPULSE program (Integrated Math, Physics, Undergraduate Laboratory, Science and Engineering) because it integrates interdisciplinary team projects into the first year of undergraduate engineering. This studio-type class is team taught by engineering, math, and physics professors to help students learn to approach problems from multiple perspectives.

Manufacturing Expertise to Support the Innovation Economy

Defense Sector employers indicated that strong education programs exist in manufacturing outside Rhode Island, but companies would have better access to skilled workers if more students were in high quality programs within Rhode Island.

Rhode Island lacks the manufacturing technical education that is necessary to support the growth of advanced manufacturing in the region. Rhode Island's defense sector depends on the innovation that happens through the interaction of capabilities in engineering and production. Rhode Island may not be the place where mature designs are mass-produced, but many Rhode Island jobs depend on the design, prototyping, development, customization, and improvement of devices and systems.

In addition to the practical and technical knowledge of their trade which include computer skills, advanced manufacturing workers need

- Teamwork skills and the ability to communicate with co-workers;
- Critical thinking, problem solving, and innovation capabilities;
- Ability to work independently;
- Ability to communicate with customers;
- And in the defense sector, they need to know relevant government procedures and vocabulary.

★ Build a community college Manufacturing Education Program in Rhode Island so that Rhode Island can attract and prepare more people for advanced manufacturing careers. The Manufacturing Technology Center at Assunpink Community College is a potential model program.

Veterans

The experience of Navy veterans is highly valued by Rhode Island defense employers. This leads us to questions about what more can be done to support transitioning military, and whether local universities are visibly supporting transitioning Naval personnel through "credit for experience" policies.

- What are schools nationally are doing the best job reaching out to transitioning military personnel? What can we learn from them?
- What are the precedents at our biggest engineering and technical schools for giving credit for military training and experience?

- What are the channels of communication to get the word out to transitioning military personnel (not just Rhode Islanders) about education and employment opportunities in this region?

The Defense Sector could employ a broader range of transitioning military if employers would hire somewhat under-qualified veterans while they use their GI benefits to gain an employer approved credential or degree. In contrast to a regular internship where the student first starts a degree program and then seeks an internship, this proposal is for veterans to seek an employer first and train for a specific position in a company.

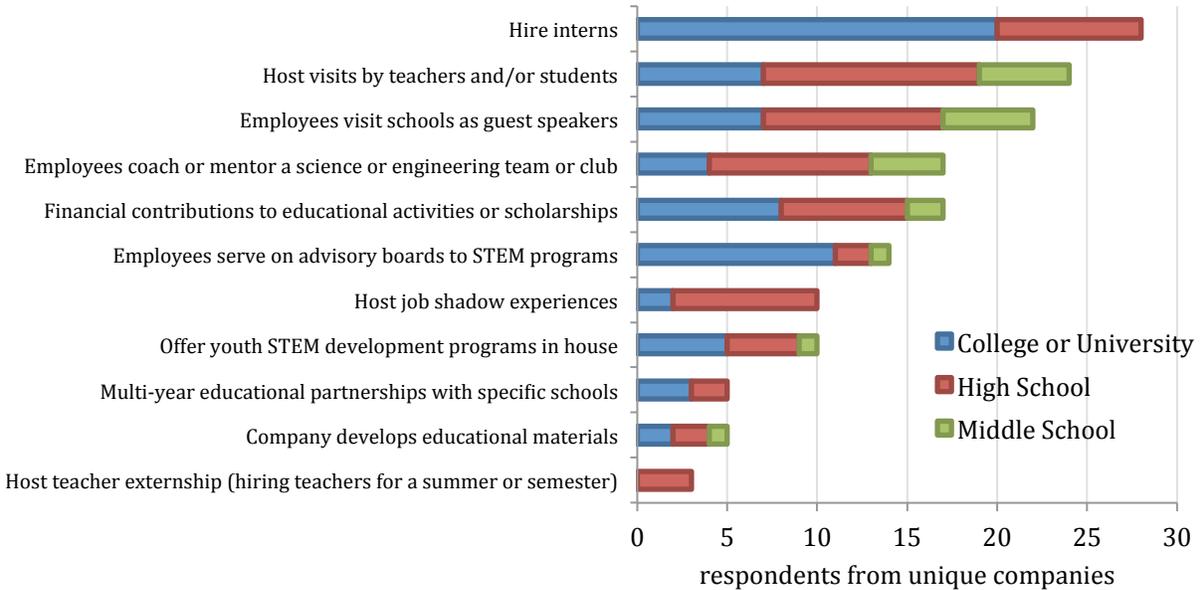
- ★ **Work with colleges, universities, and workforce development partners to support the transition of veterans into defense careers in Rhode Island.**

Organizing to Support STEM Education

The findings on skill gaps in Rhode Island's Defense Sector are highly congruent with national studies on the skill needs of the science and technology workforce. There is no substitute for a solid science K-16 education with role models and mentors. STEM education needs to develop the full spectrum of communication, collaboration, organization, and innovation skills. Defense companies are among Rhode Island's leading champions of engaging students in the fun and importance of science, technology, engineering, and math. Twenty-six companies indicated in our survey that they engage in K-16 STEM outreach efforts.

Figure 16. STEM Education Activities of Rhode Island Defense Companies

The STEM Center would like to know about existing relationships defense companies have supporting STEM (Science Technology Engineering or Math) education in area schools and colleges. Please check all that apply to your group/company.



Rhode Island Defense Industry Partnership Workforce Survey. Oct-Nov 2011

STEM education in Rhode Island could be moved forward by creating a forum for pulling together the expertise, passion, and resources for improving STEM education from industry and academia.

- ★ **Facilitate an industry-academia forum to improve STEM and Innovation education in K-16. The forum should work to increase the number of students that participate in recognized high quality STEM programs inside and outside of the school day. It will also work to coordinate industry resources to maximize their impact on the number of Rhode Islanders who are motivated and prepared to succeed in college level engineering, engineering technology, computer science, and information technology degree programs.**

APPENDIX

Survey Methodology

The Defense Industry Partnership Survey Workforce Survey was designed with input from the Defense Industry Partnership Executive Committee, Education Committee, and 12 key informant interviews with defense employers. Several questions from the Tech Collective's information technology skill gap survey were adapted for this survey. The survey asks about hiring, workforce training, and the importance of skill sets for various types of employees. Part two of the survey asked about STEM education outreach activities and tested interest in certain types of collaborative workforce development and outreach activities.

The request to complete the Defense Industry Partnership Workforce Survey was circulated to company lists from SENEDIA, the Rhode Island Economic Development Corporation, and the Newport County Chamber of Commerce. Respondents followed a web link to complete the survey online. The survey was open for responses from October 28 through November 10, 2011. This outreach was intended to engage companies with defense contracts beyond the current SENEDIA membership. Seventy-eight percent of respondents were SENEDIA members and 22 percent were not.

Our objective in targeting respondents was to reach people with direct knowledge of the company's hiring and recruitment success and a strategic sense of what skills contribute to company competitiveness and growth. Respondents were directors, human resources managers, and group leaders. All respondents indicated whether they were responding for a whole company (47% of respondents) or for a particular defense-related division of a larger company (53% of respondents).

Supplemental Tables and Figures

Table 11. Declining Industries in Rhode Island by Projected 10 Year Job Losses
Annual Average Employment

Industry Title	Actual 2008	Projected 2018	Numerical Change	Percent Change
Miscellaneous Manufacturing	8,507	5,300	-3,207	-38%
Fabricated Metal Product Manufacturing	6,605	5,700	-905	-14%
Textile Mills	2,591	2,000	-591	-23%
Plastics & Rubber Products Manufacturing	2,614	2,075	-539	-21%
Printing & Related Support Activities	1,849	1,365	-484	-26%
Machinery Manufacturing	2,034	1,585	-449	-22%
Federal Government (Excluding Post Office)	9,966	9,540	-426	-4%
Paper Manufacturing	1,613	1,210	-403	-25%
Telecommunications	3,361	3,100	-261	-8%
Merchant Wholesalers, Durable Goods	8,650	8,400	-250	-3%
Primary Metal Manufacturing	1,601	1,360	-241	-15%
Electrical Equipment, Appliance, & Component Mfg	1,586	1,370	-216	-14%
Local Government (Excluding Education & Hosp.)	12,780	12,600	-180	-1%
Textile Product Mills	599	445	-154	-26%
Rental & Leasing Services	1,883	1,750	-133	-7%
Nonmetallic Mineral Product Manufacturing	624	500	-124	-20%
Utilities	1,111	995	-116	-10%
Merchant Wholesalers, Nondurable Goods	4,990	4,895	-95	-2%
Broadcasting (except Internet)	781	700	-81	-10%
Publishing Industries	2,480	2,400	-80	-3%

Source: Rhode Island DLT, Labor Market Information

Table 12. Declining Occupations in Rhode Island

SOC		2008 Actual	2018 Estimate	Decline	Percent Decline
Code	Occupational Title	Employment			
41-9041	Telemarketers	569	436	-133	-23%
43-4071	File Clerks	618	350	-268	-43%
43-5053	Postal Service Mail Sorters, Processors, and Processing Machine Operators	763	648	-115	-15%
43-5071	Shipping, Receiving, and Traffic Clerks	2,766	2,634	-132	-5%
43-5081	Stock Clerks and Order Fillers	5,958	5,498	-460	-8%
43-6014	Secretaries, Except Legal, Medical, and Executive *	6,796	6,659	-137	-2%
43-9011	Computer Operators	503	372	-131	-26%
43-9022	Word Processors and Typists	823	715	-108	-13%
43-9199	Office & Administrative Support Workers, All Other	1,879	1,718	-161	-9%
51-1011	First-Line Supervisors/Managers of Production and Operating Workers	2,358	2,093	-265	-11%
51-2022	Electrical and Electronic Equipment Assemblers*	650	530	-120	-18%
51-2092	Team Assemblers*	4,356	4,173	-183	-4%
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	1,188	879	-309	-26%
51-4033	Grinding, Lapping, Polishing, Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic	790	564	-226	-29%
51-4041	Machinists*	1,379	1,271	-108	-8%
51-4072	Molding, Coremaking, Casting Machine Setters, Operators, and Tenders, Metal and Plastic	515	392	-123	-24%
51-5023	Printing Machine Operators	754	637	-117	-16%
51-9061	Inspectors, Testers, Sorters, Samplers, Weighers*	1,398	1,185	-213	-15%
51-9071	Jewelers and Precious Stone and Metal Workers	1,246	961	-285	-23%
51-9121	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	613	514	-99	-16%
51-9132	Photographic Processing Machine Operators	217	108	-109	-50%
51-9198	Helpers--Production Workers	2,183	1,974	-209	-10%
53-7062	Laborers & Freight/Material Movers, Handlers	5,324	5,180	-144	-3%
53-7063	Machine Feeders and Offbearers	346	243	-103	-30%
53-7064	Packers and Packagers, Hand	3,108	2,513	-595	-19%
major group subtotals					
43-0000	<i>Office and Administrative Support</i>	26,667	24,534	-2133	-8%
51-0000	<i>Production Occupations</i>	22,879	19,681	-3198	-14%
53-0000	<i>Transportation / Material Moving</i>	10,172	9,236	-936	-9%

* These declining occupations are among the top occupations in Rhode Island's Defense Sector.

Source: Rhode Island DLT, Labor Market Information

Figure 17. “Critical Skill Gaps” – Engineers

Please check areas that you perceive to be critical skill gaps in the applicant pool for entry to mid-level Engineering positions.

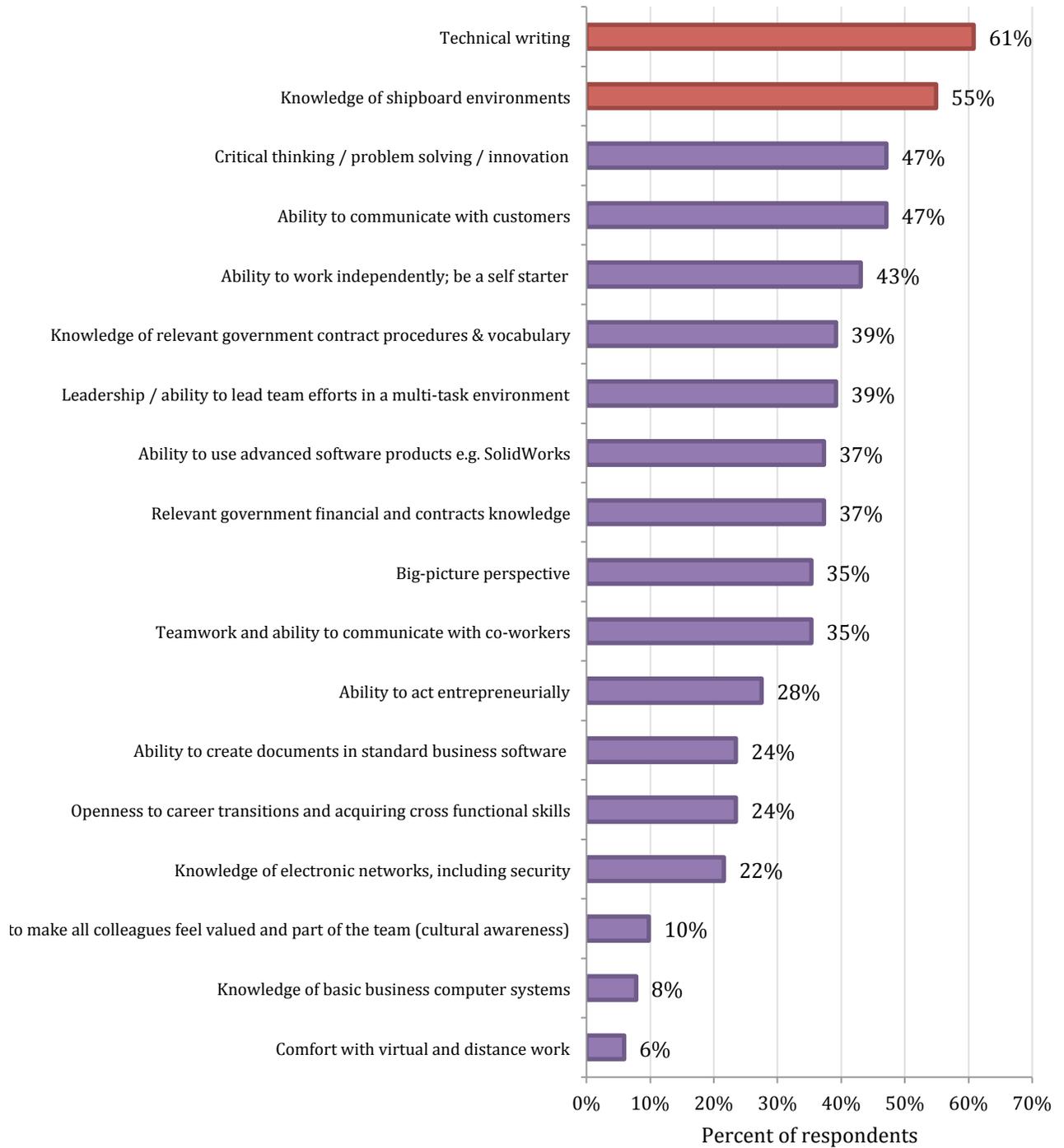


Figure 18. “Critical Skill Gaps” - Technicians

Please check areas that you perceive to be critical skill gaps in the applicant pool for entry to mid-level Technician positions.

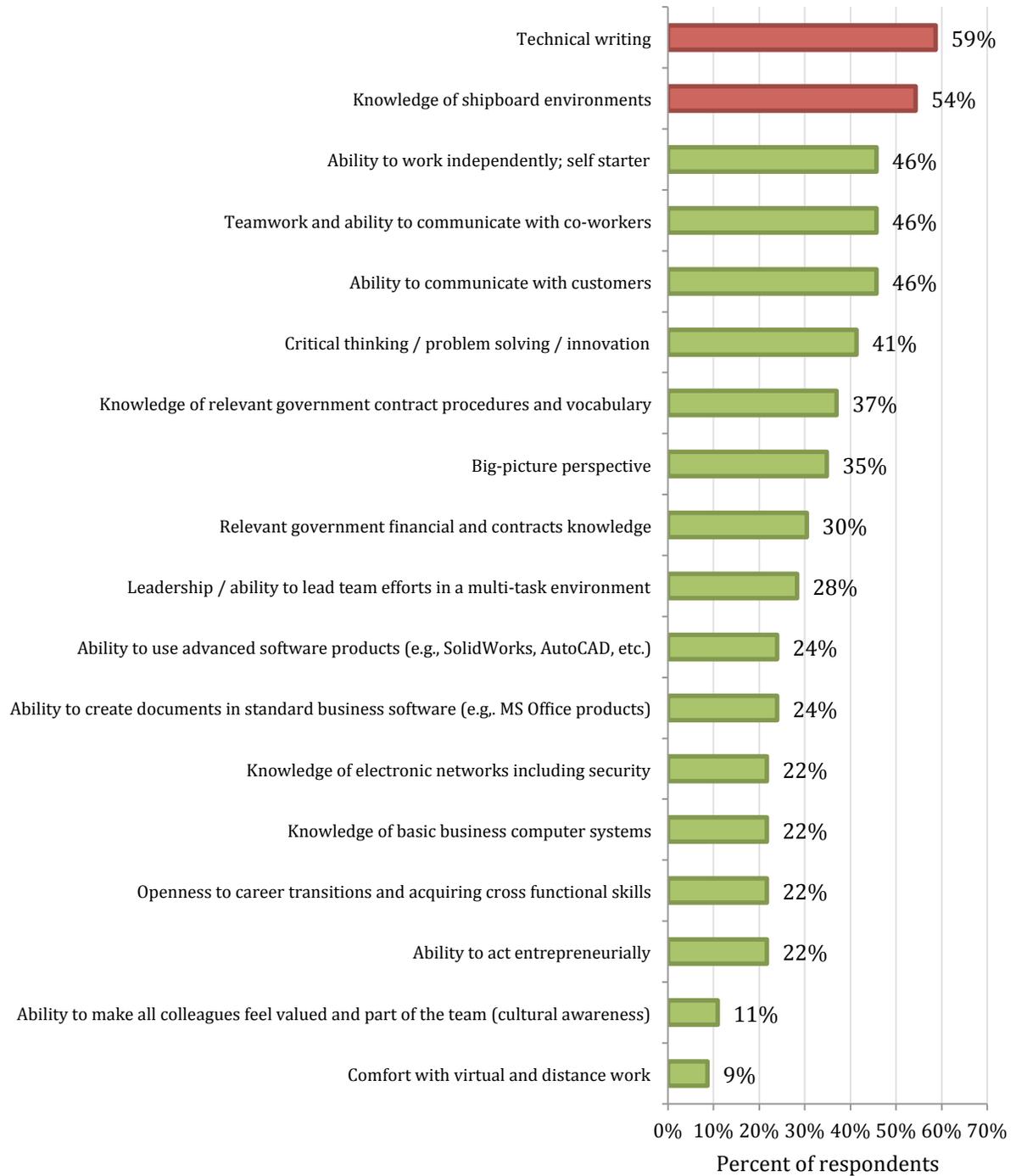


Figure 19. “Critical Skill Gaps” - Production Occupations

Please check areas that you perceive to be critical skill gaps in the applicant pool for entry to mid-level Production positions.

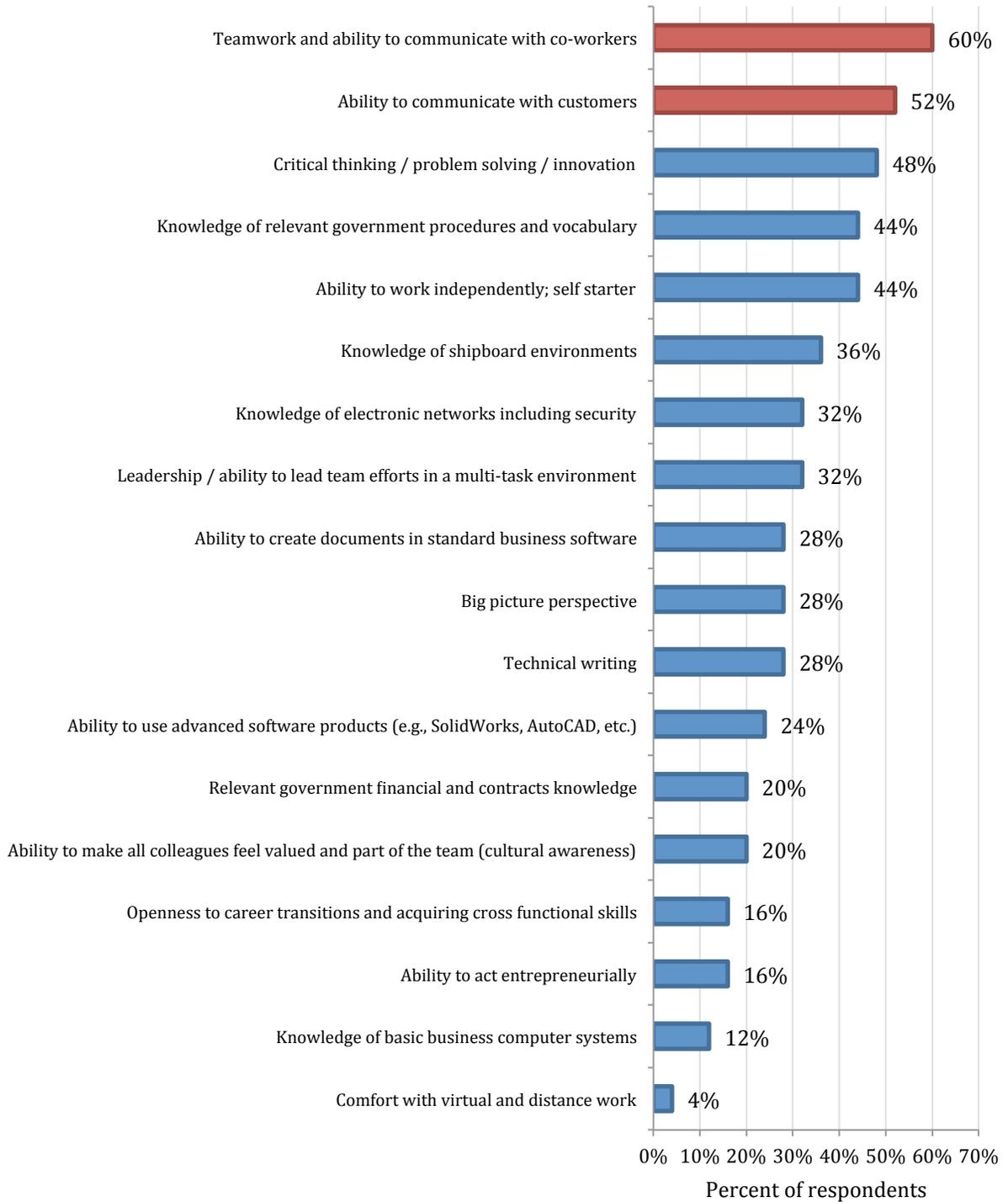


Figure 20. “Critical Skill Gaps” - Business Administration Occupations

Please check areas that you perceive to be critical skill gaps in the applicant pool for entry to mid-level Business Management or Administration positions.

