WORKFORCE DEVELOPMENT BOARD OF VENTURA COUNTY

MANUFACTURING COMMITTEE MEETING

Thursday, October 20, 2016
8:00 a.m. - 9:30 a.m.

NOTE CHANGE OF LOCATION

United Food and Commercial Workers International Union (UFCW)
816 Camarillo Springs Rd. (Suite A), Camarillo, CA

AGENDA

8:00 a.m.	**1.0 Call to Order and Agenda Review**	Alex Rivera
8:02 a.m.	**2.0 Public Comments** Procedure: The public is welcome to comment. All comments not related to items on the agenda may be made at the beginning of the meeting only.	Alex Rivera
8:05 a.m.	**3.0 Approval of Minutes:** June 8, 2016 August 5, 2016	Alex Rivera
8:08 a.m.	**4.0 Ventura County Regional Strategic Workforce Development Plan**	
.	• Regional Partnership: AMP SoCal	Jason Miller
8:20 a.m.	• MRVC: Planning Update – Manufacturing Day 2016 – Networking Events	Byron Lindros
8:35 a.m.	• WIOA Sector Planning – Joint Sector Meeting Outcomes – Industry-Recognized Credentials – Alignment with 2-Year Plan	Cheryl Moore
9:15 a.m.	**5.0 Metalworking Report**	Patrick Newburn
9:20 a.m.	**6.0 Committee Member Comments**	Committee
9:30 a.m.	**7.0 Adjournment**	Alex Rivera

Next Meeting
December 15, 2016 (8:00 a.m.-9:30 a.m.)
United Food and Commercial Workers International Union (UFCW)
816 Camarillo Springs Road (Suite A), Camarillo, CA

Individuals who require accommodations for their disabilities (including interpreters and alternate formats) are requested to contact the Workforce Development Board of Ventura County staff at (805) 477-5306 at least five days prior to the meeting. TTY line: 1-800-735-2922.

WDB Manufacturing Committee Meeting
June 8, 2016

MINUTES

Meeting Attendees

Committee Members	WDB Staff	Guests
Vic Anselmo* (Chair)	Talia Barrera	Jeffrey Albaugh (Ventura Adult and Continuing Education)
Mike Bastine	Cheryl Moore	
Patrick Grimes	Patrick Newburn	Heidi Hayes (The Agency)
Cindy Guenette*		
Marybeth Jacobsen		
Jason Miller		
Bill Pratt*		
Mary Anne Rooney		
Peter Zierhut*		

**WDB Members*

1.0 Call to Order and Agenda Review

Chair Vic Anselmo called the meeting to order at 8:07 a.m.

2.0 Public Comments

No public comments

3.0 Approval of Minutes: April 13, 2016

Motion to approve: Cindy Guenette
Second: Bill Pratt
Motion approved

4.0 Ventura County Regional Strategic Workforce Development Plan

- Regional Partnership: AMP SoCal

  Jason Miller suggested that the aligned needs and desires of Ventura County should be communicated to AMP SoCal. The committee discussed need to stay informed with the continued goals and outcomes of the AMP SoCal partnership. Peter Zierhut from Haas Automation shared their letter of in-kind support that was provided recently to AMP SoCal. Cheryl Moore provided a two year perspective and historical overview of the AMP SoCal partnership.

- MRVC: Planning Update

  Talia Barrera provided an update on the latest MRVC Leadership Group meetings Three projects are in focus: Manufacturing Week first week in October 2016, 12 business to date have agreed to host tours during Manufacturing Week; double from last year; Manufacturing Professional Network has 4 quarterly events and hosts schedules; WDB staff have agreed to work in concert with Haas Automation to take over the ongoing maintenance of *LinkedIn* website.

- Year-End Review 2015-2016

  Committee members had valuable discussion and listed new accomplishments and several insights to be added to final year-end report. A few of the highlights include:

- Use Manufacturing Week as a meaningful rudder for advancing manufacturing awareness in the region.
- Need to find an efficient, collaborative way to bridge business and education.
- Need to communicate with manufacturers about how they can participate in providing opportunities for teachers to gain business experience as well as student opportunities to gain awareness and appreciation in the value of manufacturing careers.

- Manufacturing Committee 2-Year Plan: Discussion

  Committee discussion identified a first-draft of top three manufacturing Workforce development priorities for Ventura County:

  - Develop definitions and descriptions of *Advanced Skills* needed for in-demand jobs within Ventura County. Advanced Skills are differentiated from manual labor skills previously identified by the committee.
  - Investigate and analyze the European *Guild Style* career pathway of "master/student" and explore on-ramps and providers for specialty training.
  - Data analysis for in-demand jobs and career pathways in advanced manufacturing.

5.0 2016-2017 Meeting Calendar

Committee members discussed potential calendar options for upcoming program year. Doodle Poll will be emailed to all committee members before final dates are selected.

6.0 Committee Member Comments

Mary Anne Rooney announced a California Workforce Development Board (CWDB) Accelerator 3.0 Grant to the Oxnard Chamber of Commerce for $100,000+ for a Linked Learning internship program at four Oxnard high schools. The principle funding is from a CWDB Workforce Accelerator Grant to the California Foundation of Commerce and Education ($500,000 total).

7.0 Adjournment

Vic Anselmo adjourned the meeting at 9:43 a.m.

Next Meeting
August 5, 2016 (8:00 a.m.–10:00 a.m.)
Regional Sectors Meeting
Ventura County Office of Education (Salon C)
5100 Adolfo Rd. Camarillo, CA

JOINT MEETING
WDB REGIONAL SECTOR COMMITTEES
August 5, 2016

WDB Business Services Committee
WDB Clean/Green Committee
WDB Healthcare Committee
WDB Manufacturing Committee

MINUTES

Meeting Attendees

Business Services
Jesus Torres* (Chair)
Tracy Perez*
Stephen Yeoh*

Manufacturing
Alex Rivera*(Chair)
Jim Avery
Michael Bastine
Patrick Grimes
Cindy Guenette*
Marybeth Jacobsen
Byron Lindros*
Jason Miller
Tiffany Morse
Bill Pratt*
Mary Anne Rooney
Bruce Stenslie*
Peter Zierhut*

**WDB Members*

Clean/Green
Anthony Mireles*(Chair)
John Brooks
Rebekah Evans
David Fleisch
Mary Anne Rooney

Healthcare
Greg Barnes* (Chair)
John Cordova
Martel Fraser*
Amy Mantell
Dawn Neuman
Irene Ornelas
Mary Anne Rooney
Richard Trogman*

WDB Members
Vic Anselmo* (Vice Chair)
Charles Harrington*
Victoria Jump*
Capt. Doug King*
Patty Schulz*

WDB Administration
Talia Barrera
Patricia Duffy
Tracy Johnson
Richard McNeal
Cheryl Moore
Patrick Newburn
Ma Odezza Robite
Theresa Salazar Vital

Guests
Sally Harrison (CEO's Office)
Heidi Hayes (theAgency)
Paula Hodge (SCCRC)
Payal Kamdar (VSolvit)
Vivian Pettit (CSD/WIOA)
Mairelise Robinson (Workforce Education Coalition)
Chris Schuckmann (Hi-Tech Corp.)
Michelle Schuckmann (Hi-Tech Corp.)

1.0 Call to Order and Agenda Review

WDB Vice Chair Vic Anselmo called the meeting to order at 8:06 a.m. No changes were made to the agenda.

2.0 Public Comments

No comments.

3.0 Welcome and Introductions

WDB Vice Chair Vic Anselmo welcomed committee members to the first joint meeting of the WDB Regional Sector Committees: Business Services, Clean/Green, Healthcare, and Manufacturing. WDB and sector committee members gave self-introductions.

4.0 WDB Sector Committees

Vic Anselmo commended the impressive amount of work undertaken by the WDB sector committees for more than six years to strengthen workforce development in Ventura County. He thanked the committee members for their exceptional commitment and collaboration.

Greg Barnes, Chair of the Healthcare Committee, Anthony Mireles, Chair of the Clean/Green Committee, Alex Rivera of the Manufacturing Committee, and Jesus Torres of the newly appointed Business Services Committee provided updates and perspectives on the work of their respective committees. A copy of the presentation may be found in each sector committee meeting packet posted on the WDB website: www.workforceventuracounty.org.

5.0 WIOA Regional Sector Requirements

Cheryl Moore provided an overview of the industry sector requirements for WDB regional and local planning under the Workforce Innovation and Opportunity Act (WIOA) and responded to questions. Discussion included a description of the WIOA workforce development system, regional planning units in California, regional strategy for building a competitive workforce pipeline in Ventura County, WIOA One-Stop system alignment, and performance components relating to programs, fiscal, providers, and the alignment of partners in the American Job Center of California (AJCC) delivery system. A copy of the presentation may be found in each sector committee meeting packet posted on the WDB website: www.workforceventuracounty.org.

6.0 Opportunities for Collaboration

WDB committee members worked in sector groups and cross-sector groups, reporting to the large group their responses to four questions. Reference materials available included updated workforce/occupational data by sector, workforce skills charts developed by sector committees, sector committee year-end reviews, and draft two-year sector committee plans. Below is a summary of the wall notes and committee member comments during the follow-up discussion. The input will be considered during sector committee planning and WDB/WIOA regional and local planning processes.

Business Services

1. What are the high-demand jobs in the next 3-5 years?

- Accounting (software, QuickBooks)
- Advanced Office I.T. (cloud, collaborative software)
- Cyber Security
- Gaming/Simulation Developers
- IoT Networking
- IT Manager
- Junior programmers / developers
- Marketing (digital) (social media)
- Mobile developers App-software
- Quality Information Manager (software)
- Technical Literacy
- Technology Office Manager (operational)

2. Which of those jobs are hard to fill? Why?

- Cyber Security
- IoT Networking
- Junior Programmers /Developers
- Mobile Developers App-Software

- *Lack of pipeline*
- *Growing: devices/data analysis/networking, cross functional skills*
- *Evolving: cyber security and technological challenges constantly evolving; therefore solutions and the skills required change as well, which outpaces training/education available*

Clean/Green

1. What are the high-demand jobs in the next 3-5 years?

- Alternative Fuel Mechanics
- Green Chemistry
- High Voltage Electrician
- Hospitality (all areas)
- Hospitality Workers
- Inspection Services for Government Services
- Inspectors
- Landscaping/Xeriscaping Installation
- Marketing
- Marketing/Outreach Coordinator Specialist
- Municipality
- Organic Agriculture
- Solar Installation
- Utility Workers
- Water/Wastewater Workers

2. Which of those jobs are hard to fill? Why?

- Hospitality Workers: *gap between training for green skills and employers desire to pay*
- Inspectors: *certification/training pipeline - not in data base-localized*
- Marketing: *understanding the value to the businesses*
- Utility Workers: *not enough workers and lack of training*

Healthcare

1. What are the high-demand jobs in the next 3-5 years?

- Bilingual
- Care Coordinators
- Caregivers (CHW, I.H.S.S.)
- Case Managers
- CNA (HHA)
- Geriatrician Specialty M.D.'s.
- Health Educators

- Health Faculty
- I.T. Clinical Technology/Biomedical Engineering
- I.T. Technology/Biomedical Engineering
- Mental Health Providers
- Physician Assistants
- Physical Therapy/OT
- R.N.'s (i.e. specialty LVNs, RNP)

2. Which of those jobs are hard to fill? Why?

- Bilingual: *lack of cultural awareness skills*
- Caregivers (CHW, I.H.S.S.): *low wages*
- Geriatrician Specialty M.D.'s.: *need extra training*
- Health Faculty: *wages*
- I.T. Clinical Technology/Biomedical Engineering: *lack of trained available workforce*
- Mental Health Providers: *education level*
- Physical Therapy/Occupational Therapy: *education requirements*
- R.N.'s (i.e. specialty LVNs, RNP): *shortage/training*

Manufacturing

1. What are the high-demand jobs in the next 3-5 years?

- Additive Manufacturing Technician
- Cyber Security
- Design Engineer
- Discrete Hyper Skills
- Engineers – Systems
- Equipment Maintenance
- Experienced Machinists
- Facilities Maintenance
- High Technology Assemblers
- I.T. integrate with manufacturing EQ
- Industry-specific interns
- Inspectors (Dimensional, Visual, Electrical)
- Inventory Control
- Machinists with 10 Years' Experience
- Maintenance Technicians
- Manufacturing Systems Technicians / Engineers
- Manufacturing Technician
- Mechanical Engineer
- Metal Finishers/Coating Experts
- Mid-level Managements Skills
- Plant Operator
- Programmer (CNC/Controls)
- Quality Assurance (ISO/AS 9100 + Physical Inspection)
- Skilled Assembly
- Software Migration
- Technician (Electrical or Mechanical)
- UAV Technicians

2. Which of those jobs are hard to fill? Why?

- Design Engineer: *lack of hands-on experience; educational programs to provide hands-on experience are in nascent phase*
- Experienced Machinists: *lack of awareness, lack of experience, job jumping, lack of training*
- Quality Assurance (ISO/AS 9100 + Physical Inspection): *no training program; lack of experience*
- Programmer (CNC/Controls): *lack of awareness, lack of experience, job jumping, lack of training*
- General Concerns
  - *Critical thinking vs. standardized tests*
  - *Critical thinkers/agility*
  - *Career awareness of teachers*
  - *Trouble shooters*
  - *Self-teachers*
  - *Off-shoring of manufacturing (and its appeal)*
  - *H.S. "shop" classes extinct*
  - *Unrealistic expectations*
  - *Need for basic skills*
  - *No time to grow people into jobs*
  - *Minimal trade training*
  - *Lack of training resources in the area*
  - *Self-regulators*

All Sectors

3. What challenges do the industry sectors have in common?

- Education and Training
  - Basic skills (read, write, math, tech)
  - Career awareness
  - Certification
  - Internships/apprentice/OJT
  - Leadership skills
  - Soft skills (employability skills)
  - College education → no job → entry level → stuck.
  - Lack of employer-based training
  - Lack of experience/training
  - Saturation of degrees
  - Training: cost, right program, investment (continuous)
  - Educational levels (industry skills needed/engage educators)
- Economic Development
  - Need to train the people who live here
  - Lack of local resources
  - Cost of living
  - Employee retention in an employees' market
  - How do we get people to stay here? (locally and with the same employer)
  - Proximity to L.A. County causes employee(s) to go elsewhere
  - Retention
  - Salary (benefits)
  - Need all jobs to be more green (Manufacturing, Healthcare)

- Technology
  - Cyber security
  - Technology challenges

- Awareness
  - Improve perception of vocational training
  - Negative perception of industry
  - Understanding the "new employee" mindset

4. What action might we take?

- Engage students with industry (site visits, classroom guest speakers from small business to large employers)
- Vocational training day at schools (hands on for students; class field trips)
- Provide opportunities for educators to experience industry demands and environment
- Need school boards on "board"—experience hands-on training to help counter negative perceptions
- Job advancement plan for retention (skill-based/competency-based, not time based)
- Pre-apprenticeship programs: skill-up people in industry trades (*e.g.,* short-term 2000-hour program to touch up on specialty skills and jobs
- Retention (share info across businesses; review compensation/benefits; flex time; do small business outreach for retention and training of employees)
- Sponsor site tours in different sector environments (emulate Manufacturing Committee/Manufacturing Roundtable participation in Manufacturing Week)
- Figure out how to fill in the gaps in the data currently available

7.0 Summary and Next Steps

Cheryl Moore noted that the information and ideas generated would be considered by the individual sector committees in updating their two-year plans and by the WDB in WIOA regional and local plan development. Issues of interest to more than one committee would be addressed collaboratively. Public access to sector meeting content would be provided through meeting packets that are posted to the WDB website: www.workforceventuracounty.org.

8.0 Committee Member Comments

Bill Pratt commented that we should try to determine what the real Ventura County economy looks like, what is missing, and what is getting in the way of Ventura County being a super tech industry.

9.0 Adjournment

Vic Anselmo adjourned the meeting at 10:02 a.m.

Next Regional Sector Committee Meetings

Business Services Committee
To be scheduled

Clean/Green Committee
September 16, 2016 (8:00 a.m.-9:30 a.m.)
VCCF Nonprofit Center (Community Room)
4001 Mission Oaks Blvd., Camarillo, CA

Healthcare Committee
September 23, 2016 (8:00 a.m.-9:30 a.m.)
VCCF Nonprofit Center (Community Room)
4001 Mission Oaks Blvd., Camarillo, CA

Manufacturing Committee
October 20 (8:00 a.m.-9:30 a.m.)
United Food and Commercial Workers (Suite A)
816 Camarillo Springs Rd., Camarillo, CA

2015-2016 YEAR-END REVIEW
Workforce Development Board of Ventura County

WDB MANUFACTURING COMMITTEE

2015-2016 Members

WDB Members: Vic Anselmo, Chair (Applied Powdercoat), Tavi Udrea, Vice Chair (Haas Automation, Inc.), Byron Lindros (Amgen Inc.), Cindy Guenette (Hi-Tech Engineering), Gregory Liu (Jaxx Manufacturing, Inc.), Bill Pratt (Kinamed), Alex Rivera (Milgard Manufacturing, Inc.), Tony Skinner (Tri-Counties Building and Construction Trades Council), Bruce Stenslie (Economic Development Collaborative-Ventura County), Peter Zierhut (Haas Automation, Inc.)

Other Members: Jim Avery (MWS Wire), Mike Bastine (SCCRC Deputy Sector Navigator for Manufacturing), Patrick Grimes (Dynamic Automation), Marybeth Jacobsen (Workforce Education Coalition), Subhash Karkare (Moorpark College), Jason Miller (California State University, Channel Islands), Tiffany Morse (Ventura County Office of Education), Scot Rabe (Ventura College), Mary Anne Rooney (Alliance for Linked Learning)

Committee Accomplishments

In support of the WDB's *Ventura County Regional Strategic Workforce Development Plan 2013-2017,* the WDB Manufacturing Committee:

- Manufacturing Committee Workgroups

  Formed workgroups to draft recommendations for discussion and priority-setting. The groups include Employer Needs, Manufacturing Roundtable of Ventura County, Business/Education, and Regional Partnerships. Work is ongoing, and the committee receives regular updates.

- Career Pathways

  - Served in an advisory role and provided a neutral platform for facilitating employer interaction with educators in support of the California Career Pathways Trust Grants (*Alliance for Linked Learning* and *VC Innovates*) to develop curriculum aligned with manufacturing industry needs. Responded to questions about the California Manufacturing/Engineering Pathways Standards and provided feedback on the Manufacturing and Engineering Career Pathways Career Ladder Chart.

  - Provided feedback to *VC Innovates* on the initial draft of the Manufacturing and Engineering Career Pathways Career Ladder Chart. Discussions generated insightful recommendations on how the charts could more accurately reflect manufacturing jobs and career pathways. Suggestions included production, maintenance and facilities, engineering, quality assurance, regulatory affairs, and supply chain positions. Committee will continue to provide feedback and receive updates from *VC Innovates*.

- Manufacturing Roundtable of Ventura County (MRVC):

  - Partnered with the Manufacturing Roundtable of Ventura County (MRVC) and Amgen to organize a networking event for manufacturing professionals in Ventura County. Agenda included an Amgen presentation on Improving Manufacturing Operations Using Lean Six Sigma.

2015-2016 YEAR-END REVIEW
Workforce Development Board of Ventura County

WDB MANUFACTURING COMMITTEE

Committee Accomplishments (Continued)

- Created an MRVC Manufacturing Network to help engage businesses in regional professional networking and workforce development. Manufacturers in the county will meet informally each quarter on-site at different locations. Businesses volunteering to host 2016-2017 networking events are Kinamed, Inc., Milgard Manufacturing, Inc., Dynamic Automation, Hi-Tech Engineering and Haas Automation, Inc. MRVC will partner with city economic development representatives on Manufacturing Network events to foster local government engagement and collaboration on regional business and workforce issues.
- Identified ways to revitalize the MRVC LinkedIn site for communication and to align and coordinate messages to the manufacturers who are part of the MRVC network.

- National Manufacturing Day

  Collaborated on planning for 2015 National Manufacturing Day with the MRVC, local manufacturers, and the Ventura County Office of Education (VCOE). The event introduced careers in manufacturing to more than 300 students, teachers, counselors, and school administrators. Expressed appreciation to the participating manufacturers: Alcoa Fastening Systems, Amgen, Inc., Applied Powdercoat, Inc., Dynamic Automation, Haas Automation, Inc., and Milgard Manufacturing, Inc.

- Community Colleges

  - The WDB Manufacturing Readiness Skills list was used as a reference by Ventura College to create a curriculum of eight manufacturing-related courses. Scot Rabe was the lead instructor and reported that the State had approved the curriculum, thanks to the input from the manufacturing committee members.
  - Discussed bimonthly updates from the Deputy Sector Navigator for manufacturing, representing the South Central Coast Regional Consortium of Community Colleges. College of the Canyons STEM robotics program awarded robotics kits to six middle schools in Ventura County. A taskforce from industry was established by the College of the Canyons to work on a community college regional study on in-demand manufacturing jobs, and grants to help teachers develop curriculum and obtain new equipment for robotics and 3D printing manufacturing. Updates are provided to the committee at each meeting.

- Advanced Manufacturing Partnership for Southern California (AMP SoCal)

  - Provided a neutral platform for reporting and coordinating Ventura County participation on six AMP SoCal Pillar Committees (Workforce and Training, Supplier Networks, Research and Innovation, Infrastructure and Site Development, Trade and International Development, and Operations Improvement and Capital Access). Leveraged professional networks to help connect educators with aerospace and defense manufacturers to support for federal grant proposals.

2015-2016 YEAR-END REVIEW
Workforce Development Board of Ventura County

WDB MANUFACTURING COMMITTEE

Committee Accomplishments (Continued)

- Manufacturing Committee member Jason Miller (CSUCI) was elected as Chair of the AMP SoCal Research & Innovation Pillar Committee, and serves with Cheryl Moore on the AMP SoCal Executive Council. An application for U.S. Department of Commerce for continuation of the *Investing in Manufacturing Communities Partnership* designation is in progress and includes an expanded AMP SoCal membership of ten counties in Southern California.

Insights

- Continue consistent manufacturing advocacy, collaborate on ongoing regional workforce issues, and leverage resources in order to increase regional economic value and visibility.
- Identify the advanced manufacturing skills (beyond manual skills) that employers expect from job seekers who want to work in manufacturing.
- Find efficient collaborative methods to connect business needs with education curriculum.
- Communicate with manufacturers about how they can participate in building a future skilled workforce by providing teacher externships/professional development opportunities that connect the classroom to the workplace.
- Communicate with manufacturers about how they can participate in building a future skilled workforce by providing student opportunities to gain awareness and appreciation in the value of manufacturing careers.
- Continue supporting the efforts of the Manufacturing Roundtable of Ventura County (MRVC) successful outreach, which has produced a marked increase in manufacturer's participation in Manufacturing Day/Week. MRVC has the potential to reach beyond Manufacturing Day/Week by incorporating a regional speaker's bureau.
- Use MRVC Manufacturing Week as a meaningful rudder for advancing public awareness in Ventura county region to raise appreciation and value of manufacturing careers and economic impact.

MANUFACTURING COMMITTEE 2-YEAR PLAN
Workforce Development Board of Ventura County
2016-2018

Goal

Champion the creation, support, and training of a diverse pipeline of skilled workers to fill in-demand manufacturing positions in Ventura County. Align educational skills development with hiring trends and emerging technologies. Foster an environment that will engage and bring together Ventura County partners to advocate manufacturing workforce needs and support a robust manufacturing sector.

Components of Plan

1. Engage Leaders

Maintain a core team of Ventura County employers, key agencies, and organizations most involved in manufacturing workforce development: Invite others to participate in topic-specific discussions.

- Ventura County manufacturers
- Manufacturing Roundtable of Ventura County
- Economic Development Collaborative-Ventura County
- Chambers of Commerce
- California State University, Channel Islands
- Ventura County Community College District
- Adult education
- Ventura County Office of Education
- Career pathways programs
- Maker Spaces
- Professional Societies
- Labor Unions
- Ventura County STEM Network
- City Incubators
- Naval/ Military Command Staff

2. Analyze Data

Update labor market data annually. Seek local employer feedback regarding data as it relates to regional industry sector workforce needs.

- Form a workgroup to analyze labor market data and report to the committee.
- Interpret data in relation to local business needs.
- Form a workgroup to provide forums for feedback from manufacturers on workforce needs and opportunities.
- Disseminate findings and data analyses.

3. Take Inventory

For the list below, inventory current manufacturing training programs and providers in the region Develop a matrix and/or Venn diagram for communicating easily. Develop a one-stop, online catalog of manufacturing training/education in Ventura County for easy reference by employers and job seekers.

- Industry-recognized certificates
- National certificates
- Stackable credentials
- Apprenticeships
- Internships
- Externships
- On-the-job training
- Career pathways
- Regional Occupational Programs
- Adult education
- Community colleges
- Universities
- Trades
- Community organizations

- Inventory business/education participation opportunities. Develop a one-stop, online resource for employers to see descriptions of the opportunities and register to participate.

- Inventory key manufacturing leaders. Develop a list and a strategy for outreach.

4. Determine Priorities

Group priorities into three areas:

- Linking Business and Educational Communities
  - Develop opportunities for classroom participation (e.g., real world problem solving)
  - Facilitate mentoring and coaching opportunities
  - Internships
  - Externships
  - Job shadowing
  - Manufacturing Day tours

- Promoting the Manufacturing Sector
  - Foster manufacturing networks
  - Find out what manufacturers are willing to do to help promote/support manufacturing in Ventura County
  - Raise business and community awareness of what manufacturing brings to the county
  - Leverage and coordinate communication channels (e.g., Manufacturing Roundtable of Ventura County; Manufacturing Day; Workforce Wednesday; Ventura County Grows Business; government and education activities)
  - Provide inventory of manufacturing support resources (training support, etc.)
  - Identify opportunities to raise awareness of the value of manufacturing sector

MANUFACTURING COMMITTEE 2-YEAR PLAN
Workforce Development Board of Ventura County
2016-2018

- Manufacturing Workforce Development
  - Sector workforce readiness skills
  - Career pathways
  - Sector certifications
  - Apprenticeship programs
  - Curriculum development
  - Preferred applicant programs

5. Identify Gaps

- Identify gaps between education preparedness and manufacturing workforce needs
- Identify gaps in manufacturing support resources

6. Take Action

***Note to Manufacturing Committee**: We need to develop an action plan that is "achievable" in a two-year window. A suggestion would be to form workgroups that could report progress to the Manufacturing Committee:*

- Employer Needs Workgroup Analyze labor market data and report to the committee, Offer forums for hearing feedback from manufacturers on workforce needs and opportunities.
- Manufacturing Roundtable of Ventura County (MRVC): Continue to support Manufacturing Day (Week), including a meeting of manufacturing and educational leaders. Convene informal evening mixers for networking. Participate in the regional manufacturing expo event in spring 2016. Work toward the development of private resources to support MRVC.
- Business/Education: Continue to provide input for the development of manufacturing courses, manufacturing certificates, manufacturing apprenticeships, and other workforce development opportunities. Continue to provide input for career pathways curriculum development and promote manufacturer participation in learning experiences at school and business locations. Explore development of a website that would enable employers to volunteer to offer hands-on learning experiences (all levels of education).
- Regional Partnerships Workgroup Participate in/stay connected with the research and activities of the Advanced Manufacturing Partnership of Southern California (AMP SoCal) and its pillar committees.

7. Monitor Progress

The Manufacturing Committee will report on progress through the annual Workforce Development Board Year-End Review process and a review of the Committee's 2-Year Plan.

WORKFORCE DEVELOPMENT BOARD

Ventura County Regional Planning Unit (RPU)
Occupational Employment Data Growth Projections
WDB MANUFACTURING COMMITTEE

Working Document

U.S. D.O.L. SOC Code*	Occupations	2016 VENTURA COUNTY Median Annual Wages**	2012 VENTURA COUNTY Estimated Annual Employment	2022 VENTURA COUNTY Employment Growth Projection %	2012 VENTURA COUNTY Average Annual Job Openings****	2012 VENTURA COUNTY Average Annual Job Replacement Openings	2012 CALIFORNIA Average Annual Employment	2022 CALIFORNIA Employment Growth Projection %	2012 CALIFORNIA Average Annual Job Openings****	2014 Education and Training Level***
51-2092	Team Assemblers	$30,459	2,220	12.6	64	35.0	78,700	3.9	1,550	H.S. Diploma + OJT
11-9199	Managers, All Other	$125,565	1,790	5.0	49	39.0	88,800	14.1	3,190	H.S. Diploma + OJT
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	$38,809	1,410	7.8	41	31.0	48,200	8.3	1,460	H.S. Diploma + OJT
51-2099	Assemblers and Fabricators	$27,152	1,250	36.0	66	20.0	22,800	9.2	570	H.S. Diploma + OJT
51-2022	Electrical and Electronic Equipment Assemblers	$31,858	1,120	-5.4	14	14.0	28,600	0.7	370	H.S. Diploma + OJT
51-9198	Helpers--Production Workers	$25,611	1,090	7.3	27	7.3	43,600	9.2	1,150	Less Than H.S.
51-4041	Machinists	$43,035	980	17.3	39	22.0	34,000	15.4	1,300	H.S. Diploma + OJT
51-9199	Production Workers, All Other	$30,480	790	17.7	35	17.7	19,000	16.3	800	H.S. Diploma + OJT
17-3023	Electrical and Electronics Engineering Technicians	$73,530	780	-3.8	16	16.0	20,700	1.9	470	Associate's Degree
17-2141	Mechanical Engineers	$96,154	770	14.3	37	26.0	23,500	4.7	910	Bachelor's Degree
17-2071	Electrical Engineers	$110,367	650	-1.5	14	14.0	23,800	4.6	620	Bachelor's Degree
51-8000	Plant and System Operators	-	600	5.0	25	21.0	28,200	5.0	1,130	-
11-3051	Industrial Production Managers	$98,948	580	13.8	18	10.0	19,200	0.5	360	Bachelor's Degree
11-9041	Architectural and Engineering Managers	$150,299	580	8.6	19	14.0	32,300	11.1	1,160	Bachelor's Degree
51-4121	Welders, Cutters, Solderers, and Brazers	$36,747	500	10.0	18	12.0	24,700	6.5	770	H.S. Diploma + OJT
17-2112	Industrial Engineers	$89,883	440	4.5	16	13.0	23,100	8.2	860	Bachelor's Degree
51-9196	Paper Goods Machine Setters, Operators, and Tenders	$56,896	430	-2.3	4	-2.3	6,400	-10.9	60	H.S. Diploma + OJT
51-9023	Mixing and Blending Machine Setters, Operators, and Tenders	$26,407	420	16.7	19	12.0	11,100	7.2	400	H.S. Diploma + OJT
49-9041	Industrial Machinery Mechanics	$57,010	390	23.1	20	11.0	20,900	24.9	1,120	H.S. Diploma + OJT
49-9098	Helpers--Installation, Maintenance, and Repair Workers	$31,028	340	11.8	14	10.0	14,300	14.7	640	H.S. Diploma + OJT
51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	$37,574	320	-12.5	6	6.0	5,200	-13.5	100	H.S. Diploma + OJT
51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	$47,669	280	14.3	12	8.0	8,600	16.3	380	H.S. Diploma + OJT

WORKFORCE DEVELOPMENT BOARD

Ventura County Regional Planning Unit (RPU)
Occupational Employment Data Growth Projections
WDB MANUFACTURING COMMITTEE

Working Document

U.S. D.O.L. SOC Code*	Occupations	2016 VENTURA COUNTY Median Annual Wages**	2012 VENTURA COUNTY Estimated Annual Employment	2022 VENTURA COUNTY Employment Growth Projection %	2012 VENTURA COUNTY Average Annual Job Openings****	2012 VENTURA COUNTY Average Annual Job Replacement Openings	2012 CALIFORNIA Average Annual Employment	2022 CALIFORNIA Employment Growth Projection %	2012 CALIFORNIA Average Annual Job Openings****	2014 Education and Training Level***
49-2094	Electrical and Electronics Repairers, Commercial and Industrial Equipment	$63,164	190	15.8	7	4.0	6,500	9.2	190	Vocational / OJT
27-1021	Commercial and Industrial Designers	$62,665	180	11.1	7	5.0	4,800	10.4	170	Bachelor's Degree
51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	$26,345	180	-5.6	2	2.0	9,900	-16.2	120	H.S. Diploma + OJT
51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	$38,298	170	41.2	10	4.0	3,600	19.4	160	H.S. Diploma + OJT
19-4099	Life, Physical, and Social Science Technicians	$55,341	150	40.0	12	6.0	8,000	20.0	470	Associate's Degree
51-9022	Grinding and Polishing Workers, Hand	$28,050	120	16.7	5	4.0	5,200	0.0	150	Less Than H.S.
51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders	$25,835	110	-9.1	2	2.0	5,500	-7.3	90	H.S. Diploma + OJT
17-3027	Mechanical Engineering Technicians	$37,587	100	-10.0	2	2.0	–	–	–	–
17-3013	Mechanical Drafters	$53,555	90	0.0	1	1.0	4,100	-7.3	50	Associate's Degree
51-4111	Tool and Die Makers	$55,651	90	33.3	3	0.0	3,200	3.1	30	H.S. Diploma + OJT
51-4199	Metal Workers and Plastic Workers	$37,625	90	33.3	4	1.0	–	–	–	–
17-3012	Electrical and Electronics Drafters	$68,225	80	0.0	1	1.0	4,500	11.1	120	Associate's Degree
51-4012	Computer Numerically Controlled Machine Tool Programmers, Metal and Plastic	$56,488	80	37.5	5	2.0	2,500	44.0	180	H.S. Diploma + OJT
51-4191	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic	$36,165	80	25.0	4	2.0	1,400	0.0	30	H.S. Diploma + OJT
51-4193	Plating and Coating Machine Setters, Operators, and Tenders, Metal and Plastic	$31,112	80	0.0	2	2.0	3,400	-8.8	70	H.S. Diploma + OJT
51-9195	Molders, Shapers, and Casters, Except Metal and Plastic	$30,163	80	12.5	4	12.5	3,900	2.6	140	H.S. Diploma + OJT
17-3026	Industrial Engineering Technicians	$54,539	60	0.0	1	1.0	4,200	2.4	90	Associate's Degree
51-8021	Stationary Engineers and Boiler Operators	$72,483	60	0.0	2	2.0	3,800	7.9	150	H.S. Diploma + OJT
51-2031	Engine and Other Machine Assemblers	$36,186	50	60.0	4	1.0	1,300	0.0	20	H.S. Diploma + OJT
51-9012	*Machine Setters, Operators, and Tenders*	$43,382	–	–	–	–	6,400	20.3	350	H.S. Diploma + OJT
51-2041	*Structural Metal Fabricators and Fitters*	$41,279	–	–	–	–	6,000	8.3	290	H.S. Diploma + OJT

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51-9141	*Semiconductor Processors*	$38,819	–	–	–	–	5,800	-22.4	140	Associate's Degree
51-9041	*Machine Setters, Operators, and Tenders*	$29,769	–	–	–	–	4,100	0.0	110	H.S. Diploma + OJT
51-9031	*Cutters and Trimmers, Hand*	$28,009	–	–	–	–	2,900	-13.8	50	Less Than H.S.
17-3024	*Electro-Mechanical Technicians*	$78,075	–	–	–	–	2,800	7.1	70	Associate's Degree
51-9011	*Chemical Equipment Operators and Tenders*	$44,949	–	–	–	–	2,700	7.4	110	H.S. Diploma + OJT
51-9192	*Cleaning, Washing, and Metal Pickling Equipment Operators and Tenders*	$24,886	–	–	–	–	2,300	4.3	70	Less Than H.S.
51-9021	*Operators, and Tenders*	$24,937	–	–	–	–	1,900	0.0	50	H.S. Diploma + OJT
51-2091	*Fiberglass Laminators and Fabricators*	$28,556	–	–	–	–	1,700	-5.9	30	H.S. Diploma + OJT
51-8091	*Chemical Plant and System Operators*	–	–	–	–	–	1,400	-7.1	50	H.S. Diploma + OJT
51-9194	*Etchers and Engravers*	$27,215	–	–	–	–	–	–	–	–

*2010 Standard Occupational Classifications and Occupational Information Network provided by the Department of Labor

**Median Annual Wages are the estimated 50th percentile of the distribution of wages; 50 percent of workers in an occupation earn wages below, and 50 percent earn wages above the median wage.
The wages are from 2016-1st quarter and do not include self-employed or unpaid family workers.

***Occupational training and education classifications were developed by the Bureau of Labor Statistics (BLS).

****Average Annual Job Openings includes new jobs and replacement jobs.

– No data available.

Data Source: State of California Employment Development Department - Labor Market Information Division

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Additional Information:

Living Wage in Ventura County as of December 2013 (California Budget Project)	
$34,109.00	Single Adult
$79,549.00	Single-Parent Family*
$64,203.00	Two-Parent Family* (one working)
$85,713.00	Two-Working-Parent Family*

*All family types are assumed to have two children.

Priority Occupations Identified by WDB Manufacturing Committee
Removed from the 2012-2022 Occupational Employment Projections for Ventura County
Removed from the 2012-2022 Occupational Employment Projections for California

MANUFACTURING WORK READINESS SKILL CATEGORIES

Workforce Development Board of Ventura County

SAFETY	MATH CONCEPTS	MEASUREMENTS	HAND AND POWER TOOLS
• Lock-out, Tag-out, Try-out • Bio mechanics • MSDS • Potential energy sources (gravity, pneumatic, hydraulic, chemical , steam/gas pressure)	• Combined operations of fractions and mixed number • Table of decimal equivalents and combined operations of decimals • Degree of precision, tolerance and clearances • Steel rules and gage blocks • Algebraic operations of additions, subtraction and multiplication • Ratios and proportions • Mathematical conversions from standard to metric • RPM, and implication of gearbox reduction to RPM and torque	• Standards • Units of measurement • Mass and weight measurement • Metric measurement • Measuring motion • Measuring fluids • Indicators • Micrometers • Gauging tools • Calipers • Diameter tape	• Electric drills • Pneumatic drills and hammers • Screwdrivers, nut-runners and wrenches • Air supply for pneumatic tools • Wrenches • Hacksaws • Taps and dies • Hammers • Squares • Levels • Pipe threading machines

BASICS OF QUALITY CONTROL	BLUEPRINT CONCEPTS	EMPLOYABILITY SKILLS	COMPUTER SKILLS
• Process • Basic quality methodology and inspection techniques • Importance of individual – do it right first time • Manufacturing theory and quality • Lean manufacturing and quality	• Introduction to schematics and symbols • Pneumatics and hydraulic schematics • Piping schematics • Piping symbols • Differences in schematics • Views • Electrical symbols • Hydraulic and pneumatic symbols • Hydraulic and pneumatic diagrams • Assembly instructions	• Basics of interviewing • Work ethic • Communication skills • Continuous Improvement skills • Basic company policy understanding • Time management • Task prioritization • Worker, supervisor, manager etiquette and protocol basics	• Excel • Word • OS basics • Computer navigation • Computer security • Computer etiquette • ERP basics • Viewer basics, PDF, CAD, jpg, png, bmp, TIFF, Solid Works, etc • File extension basics

September 2016

WHAT'S WORKING:

How North American Manufacturers Are Optimizing for Global Success

Presented by:

GRAINGER

PRACTICAL MACHINIST .COM

TABLE OF CONTENTS

SUMMARY OF FINDINGS

Despite the fact that the industry is in a period of slow to no growth, a majority of metalworking businesses are entrenched in a period of technology- and process-driven change. More than 70% of respondents report change at their company over the last year and more than half of those call it "significant." This coincides with fairly widespread optimism—twice as many anticipate that business will increase over the next year, compared to those that expect a decrease.

This report focuses on what's driving these changes, which are the most prevalent and which have the most positive impact.

IMPACTFUL INVESTMENTS

The data suggests that investment most frequently focuses on improving efficiency on the shop floor. Major equipment purchases like high-speed, multi-axis and multi-task CNC machines along with entry-level automation are perceived as having the strongest impact.

More expensive and newer technologies such as 3D printing/additive machinery, robotics and advanced data and analysis systems that reach beyond the floor are not as widespread. However, there are high-expectations for these technologies to have a positive impact on the industry in the near future.

Other efforts having a positive impact include reorganizing the shop floor, continuous operational improvements and, perhaps most importantly, developing the workforce.

CHALLENGES

A shortage of skill, interest and raw numbers in the labor pool is reported as the most common concern directly affecting these companies. 45% report that finding and keeping qualified labor is "extremely challenging." In comparison, the cost of new technology was only deemed "extremely challenging" by 32% of respondents. Combining this data with the fairly strong sentiment for future growth, there seems to be both a need and opportunity for companies, and the industry as a whole, to increase focus on education.

Many point to more emphasis on training in educational institutions—to drive interest and improve skill—for the industry to thrive. Respondents also recognize the opportunity to be more creative and proactive in how they develop their own talent pipelines. 55% have training programs for their managers, 36% have apprenticeship programs and 31% say they are partnering with schools.

While the workforce is among them, respondents perceive other factors could have an effect on the wider industry. Respondents worry about the potential influence of geopolitical and macro-economic forces on North American manufacturing, specifically Asian competition, government regulation and taxes. The outcome of the U.S. presidential election and general concerns about the global and U.S. economies were also frequently mentioned.

PURPOSE AND METHODOLOGY

The purpose of this survey is to gain insights from within the industry regarding perceptions of business conditions, the business environment and the changes that are impacting the industry at an individual company level.

This survey was emailed to members of the Practical Machinist online forum and portions of the Grainger customer list on July 20 and August 10, 2016. Respondents represent a balance of large, medium and small companies and the data we are reporting on was filtered to exclusively include companies operating CNC metalworking and manufacturing equipment.

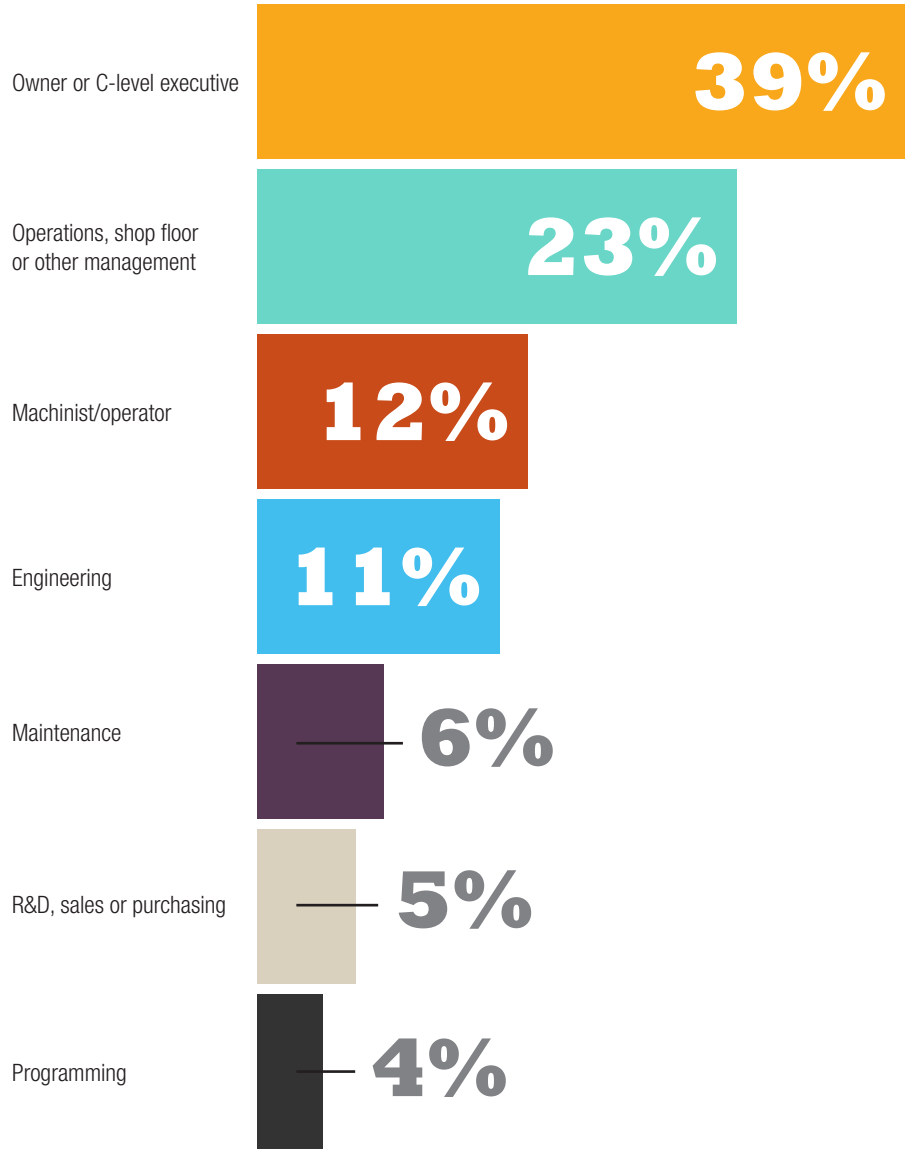
This provided insights from 360 North American professionals, **most being owners or executives with heavy influence at their companies**.

The survey was a combination of open form write-in and multiple choice responses. Minor edits may have been made to write-in responses for clarity.

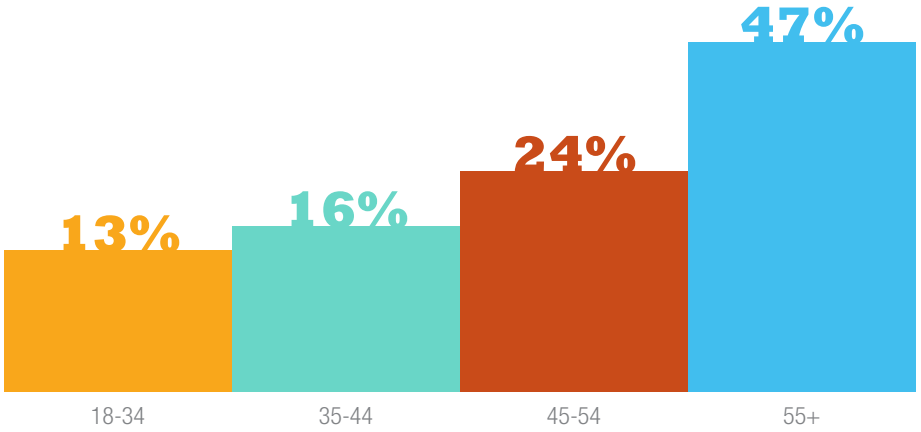
Percentages throughout this report are rounded to the nearest whole number.

SNAPSHOT OF RESPONDENTS

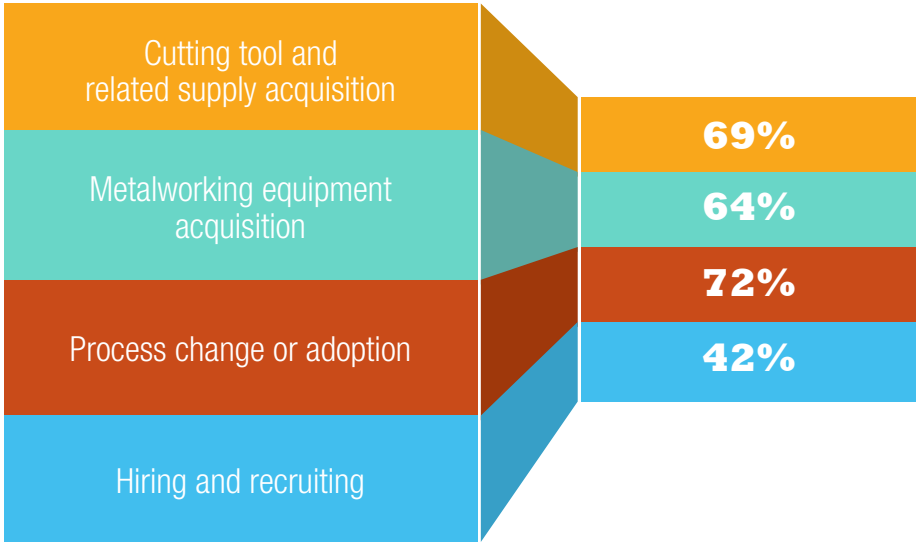
ROLE/JOB TITLE



AGE



AREAS WHERE RESPONDENTS HAVE HEAVY INFLUENCE OR ARE PRIMARY DECISION MAKERS

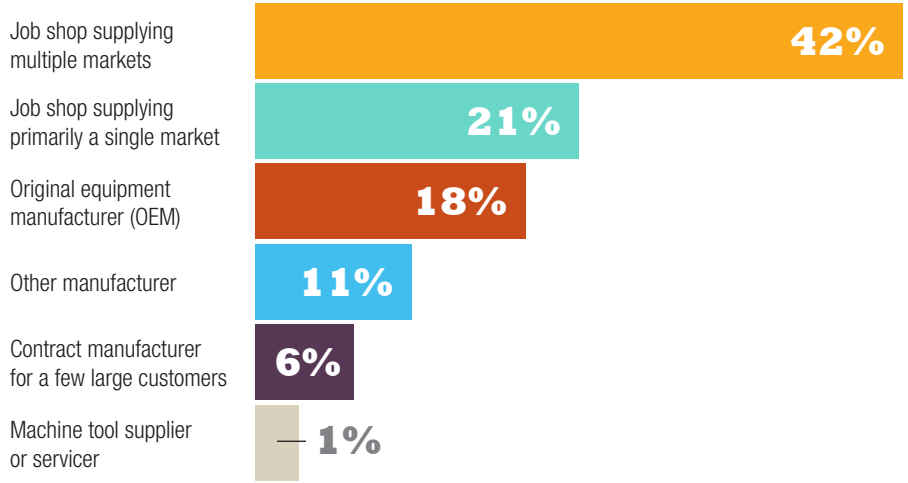


SNAPSHOT OF RESPONDENTS' COMPANIES

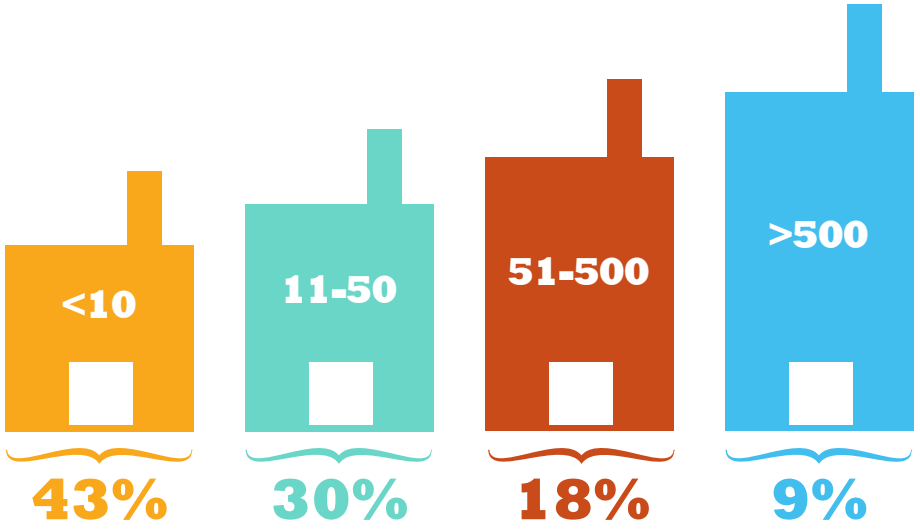
135,022
SQUARE FEET

The average size of the facilities where respondents work

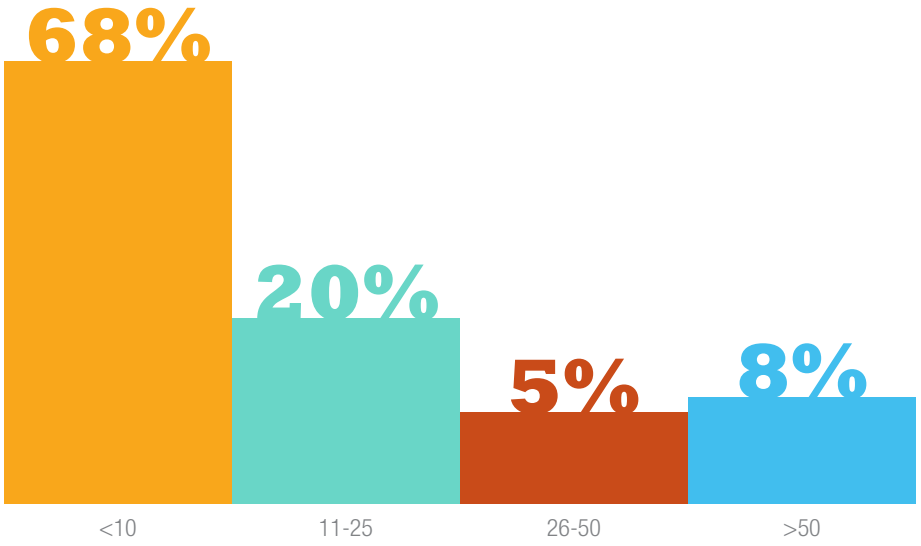
TYPE OF COMPANY



NUMBER OF PEOPLE EMPLOYED IN MANUFACTURING



NUMBER OF CNC MACHINE TOOLS



WORKFORCE *(p.10)*

- College/tech school partnerships have had the most impact.
- The impact of employee and manager training is expected to grow the most.
- A vast majority view staff reductions as an ineffective way to improve or stabilize their company.

EQUIPMENT AND TECHNOLOGY *(p.12)*

- Multi-task equipment has had the most impact.
- The impact of high-speed machining (HSM) and micromachining are expected to grow the most.
- While additive machining (prototyping and production) has yet to make an impact for most, it's clear that there are high expectations across the industry.

AUTOMATION *(p.14)*

- Quick-change tooling/fixturing has had, and is expected to continue to have the most impact.
- While flexible manufacturing systems (FMS) have had the least impact to date, their impact is expected to accelerate faster than any other automation effort.
- The impact of loading robots/auto-loaders is expected to trend up significantly.

CAD/CAM AND PRE-PRODUCTION *(p.16)*

- Tool path verification software has had the most impact.
- The impact of tool inventory systems and design for manufacturability (DFM) is expected to grow the most.
- Digital tooling has not made a major impact yet, but it is expected to increase significantly.

BUSINESS OPTIMIZATION *(p.18)*

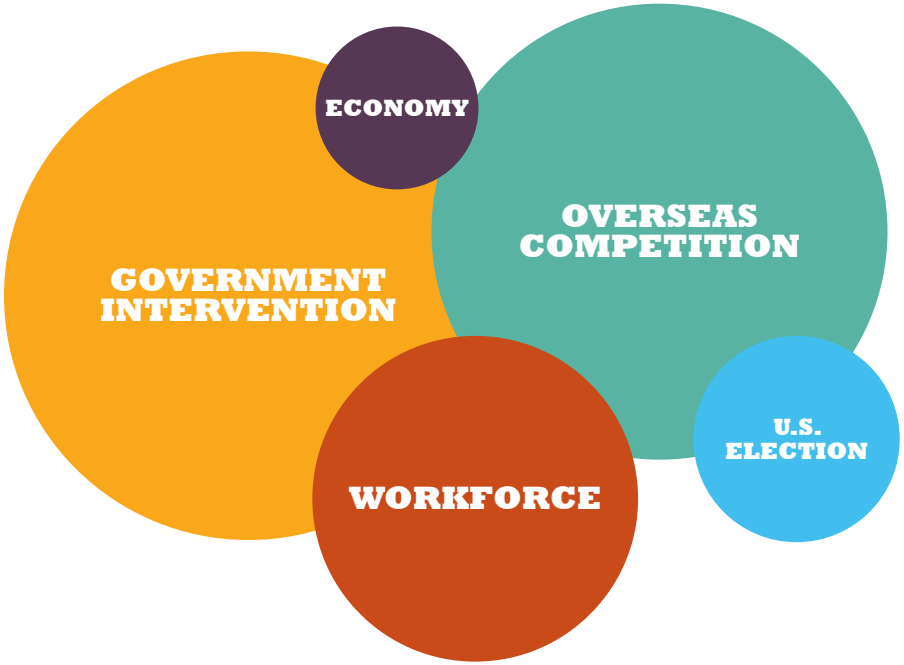
- Shop floor reorganization efforts such as cellular manufacturing have had the most impact and that is expected to continue.
- The impact of ongoing improvement processes like Six Sigma and 5S is expected to grow the most.
- While they've yet to have a major impact for most, respondents believe smart manufacturing and enterprise-level software like ERP and MRP systems are expected to grow significantly.

THE 5 MOST IMPACTFUL INVESTMENTS OVER THE LAST 3 YEARS *(across all sectors)*

1. Multi-task equipment
2. 5-axis/universal machining
3. Quick-change tooling/fixturing
4. High-speed machining (HSM)
5. Tool path verification software

CONCERNS AND CHALLENGES

In an open-ended question, respondents were asked what they thought would be the biggest threats to North American manufacturing in the near future. The most common concerns are represented based on how frequently they were mentioned.



Concerns most often centered on high tax rates and over regulation.

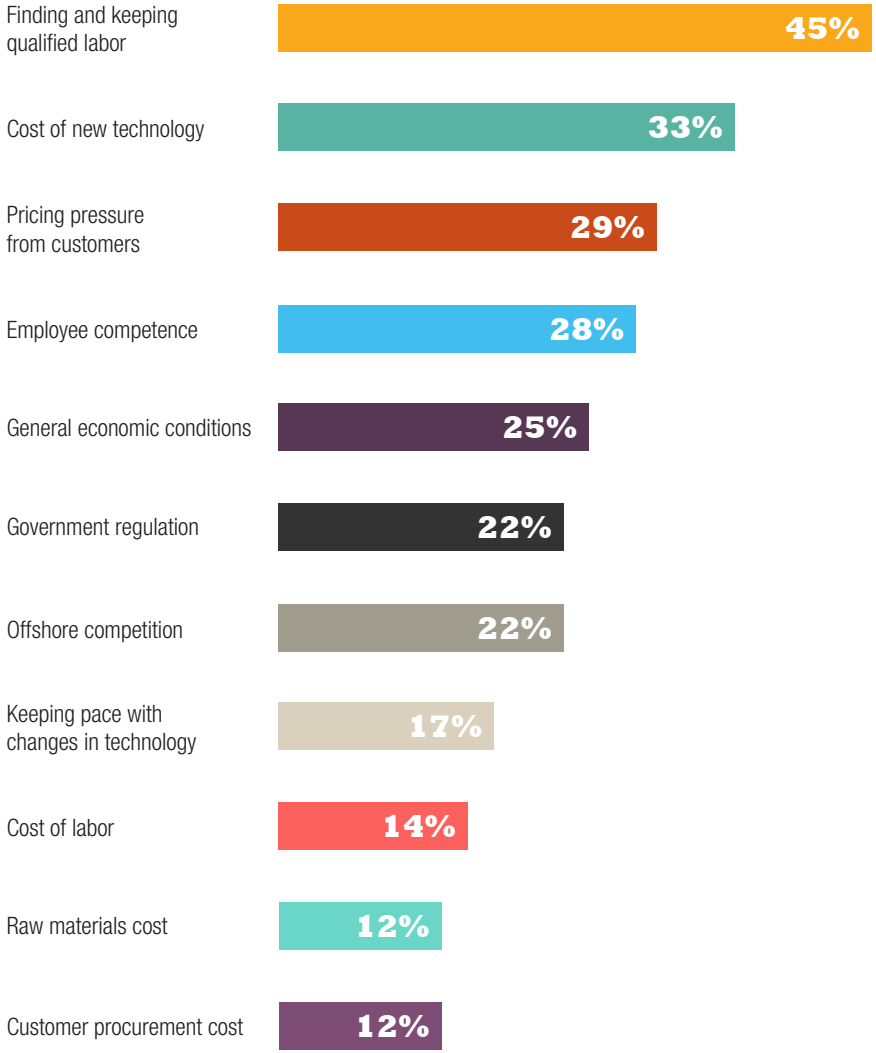
Responses overwhelmingly focused on China and greater Asia, specifically the difficulty competing with their comparably low labor and material costs.

Metalworking professionals are concerned with a growing shortage of qualified, willing and motivated workers.

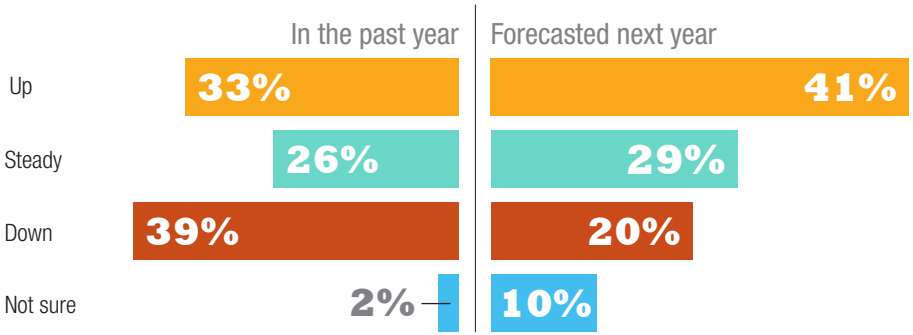
Concerns were expressed about both major party candidates.

Respondents mentioned potential downturns in specific industries such as agriculture, housing and automotive, but most often expressed concern about the global economy as a whole.

Respondents were asked about 11 of the most common challenges to metalworking businesses. Here's how many called them "extremely challenging" for their companies.

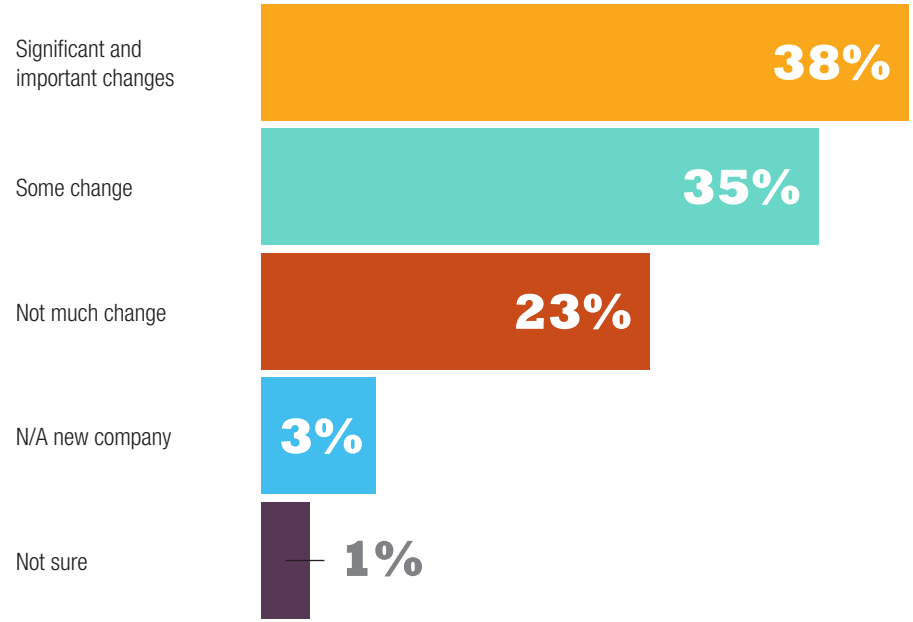


GENERAL BUSINESS CONDITIONS

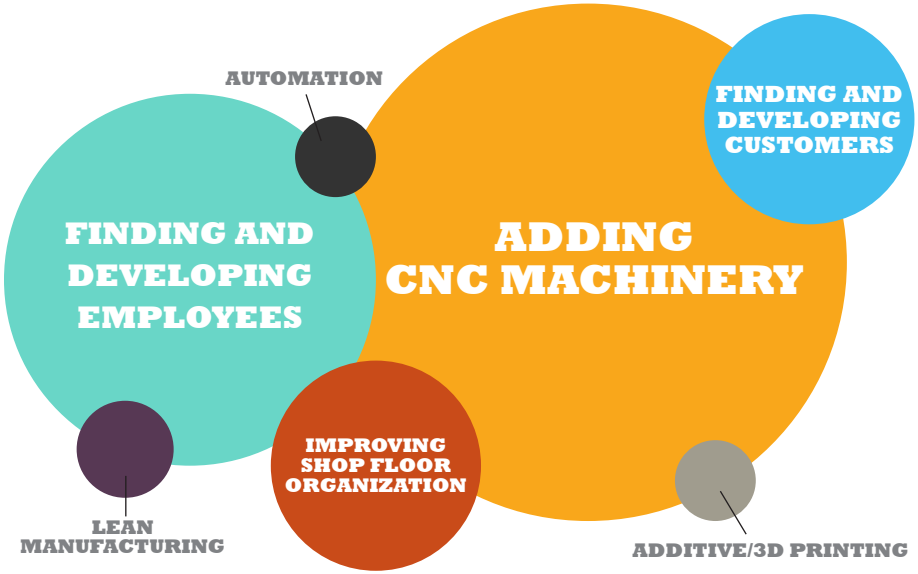


Overwhelmingly, respondents indicated in write-in responses that **the addition of new CNC machinery has been the most impactful change** at their companies over the last three years.

PACE OF CHANGE OVER THE PAST YEAR



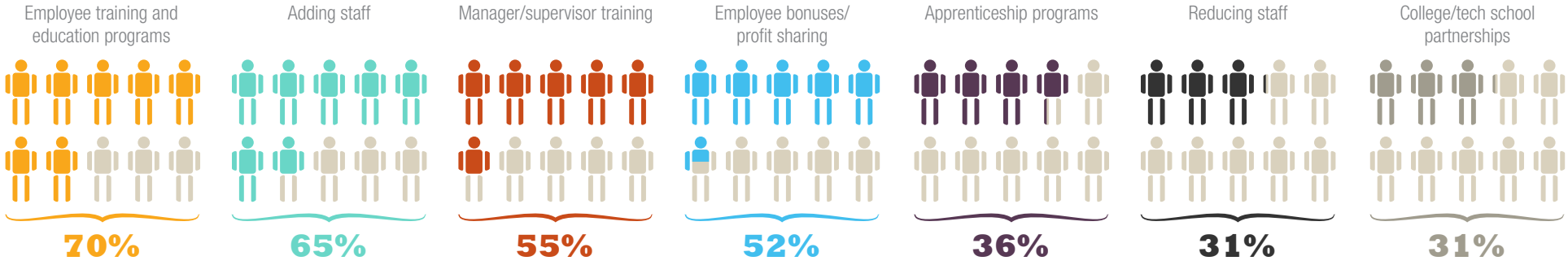
PLANNED CHANGES EXPECTED TO BE MOST HELPFUL OVER THE NEXT 3 YEARS *(based on write-in responses)*



WHAT'S WORKING: WORKFORCE

Some respondents go as far as to suggest that workforce progress must be made for the industry to thrive in North America. While not yet widespread, adoption of practices like apprenticeship programs and partnering with schools to build talent pipelines are taking root. Respondents also call on educational institutions to place more emphasis on trades.

WHO'S DOING IT



NOTABLE WRITE-IN RESPONSES

"I think good old-fashioned tech schools would most impact this industry. If we don't teach young people, we won't have machinists!"

"Automation is only as good as the programmers and I don't see effective programmers coming to the scene because there are not any training programs in schools."

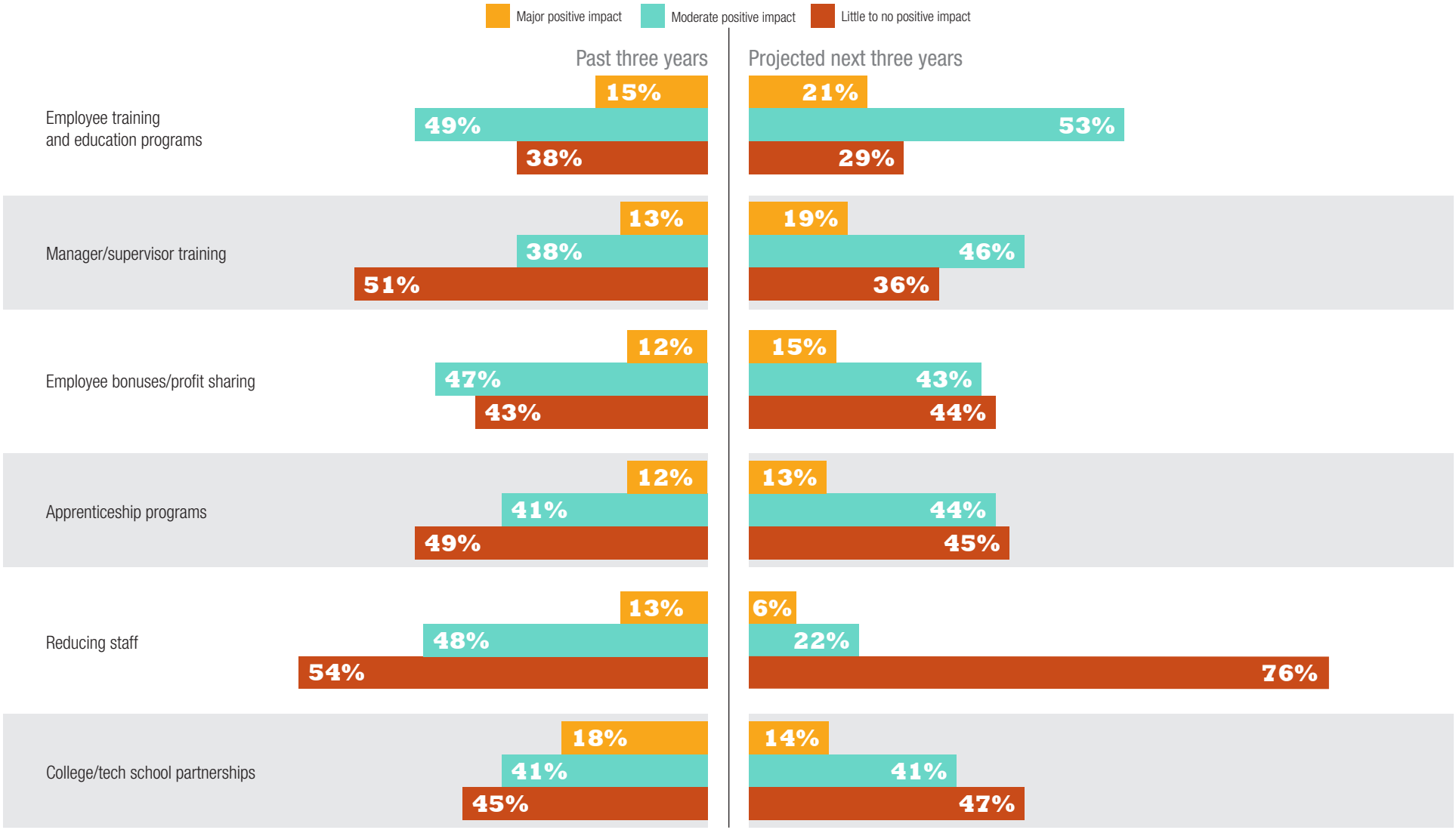
"Although it is not really a new trend, the lack of public education in industrial arts will continue to have an adverse impact on manufacturing of all kinds."

"The elimination of high school vocational programs makes our industry irrelevant in the eyes of young workers."

"Getting back to the apprentice/journey system for highly qualified personnel."

"Working to improve the perception of manufacturing and the careers and technology it can provide."

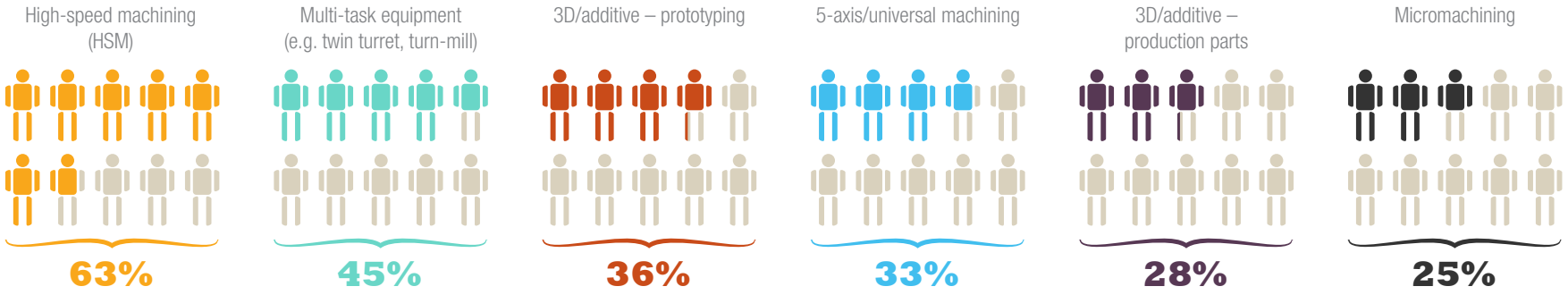
Positive impact of employee recruiting, development and retention efforts on respondents' companies



WHAT'S WORKING:
EQUIPMENT AND TECHNOLOGY

Investments in multi-task equipment and more powerful machine tools are perceived to be paying dividends in terms of both space and process efficiency. Additive and micromachining technologies are yet to make a major impact for most respondents, but are expected to improve efficiency and business significantly.

WHO'S DOING IT



NOTABLE WRITE-IN RESPONSES

"Additive manufacturing will become a bigger part of the industry once the cost associated comes down enough to be competitive with casting."

"We recently introduced HSM and it has really improved run times as well as tool life."

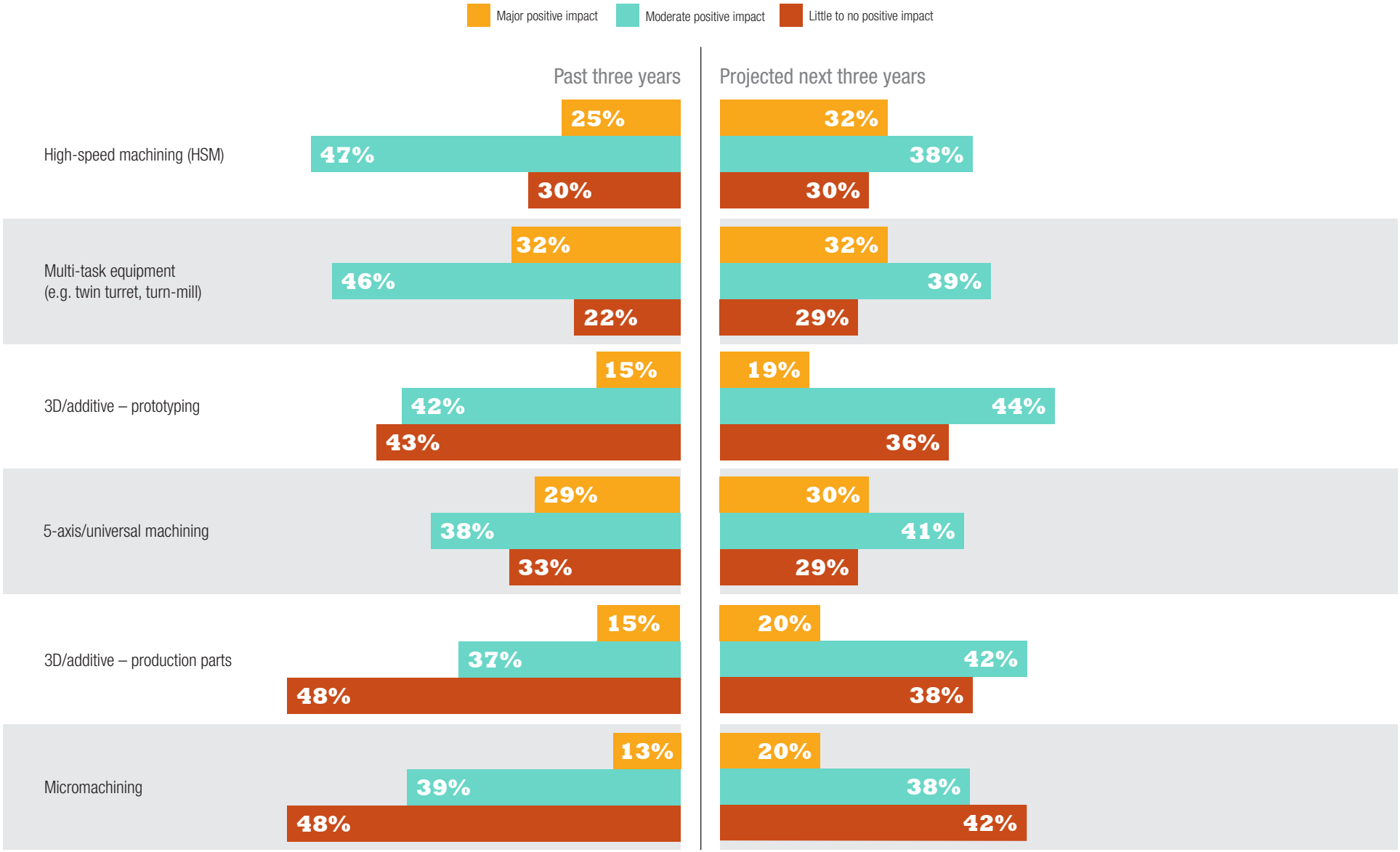
"Multi-tasking machines for flexibility and standalone capability."

"HSM, I feel, will always continue to improve. I also believe that multi-axis, multi-operation machining will continue to progress. I believe we have been on the same trend for many years and that trend will continue on through natural progression."

"Simple tooling and fixturing, (i.e. agile manufacturing techniques)."

"Beefing up the machine tool to take advantage of the high RPM and feeds of the new carbide available."

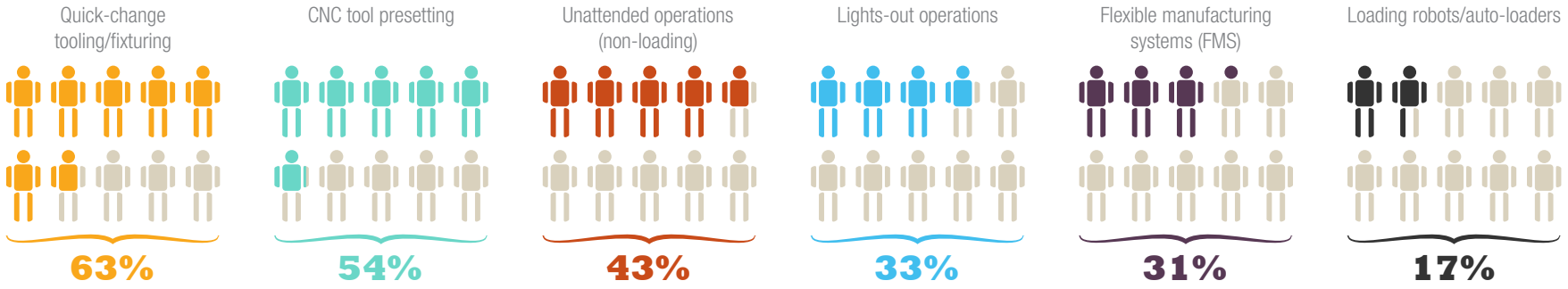
Impact of metalworking equipment and technology on respondents' companies



WHAT'S WORKING: AUTOMATION

Respondents clearly see the promise in automation—gradually working their way toward integrating more advanced processes involving robotics and lights-out operation. Today, less expensive options such as quick-change tooling/fixturing and CNC presetters are prevalent and believed to be making an impact during setup.

WHO'S DOING IT



NOTABLE WRITE-IN RESPONSES

"Increasing labor costs will drive all of these aspects, but especially in robotic loading/unloading (e.g. machine tending)."

"Quicker setup of tools in tool changer systems and easier programming. We need an Apple kind of improvement in software programming."

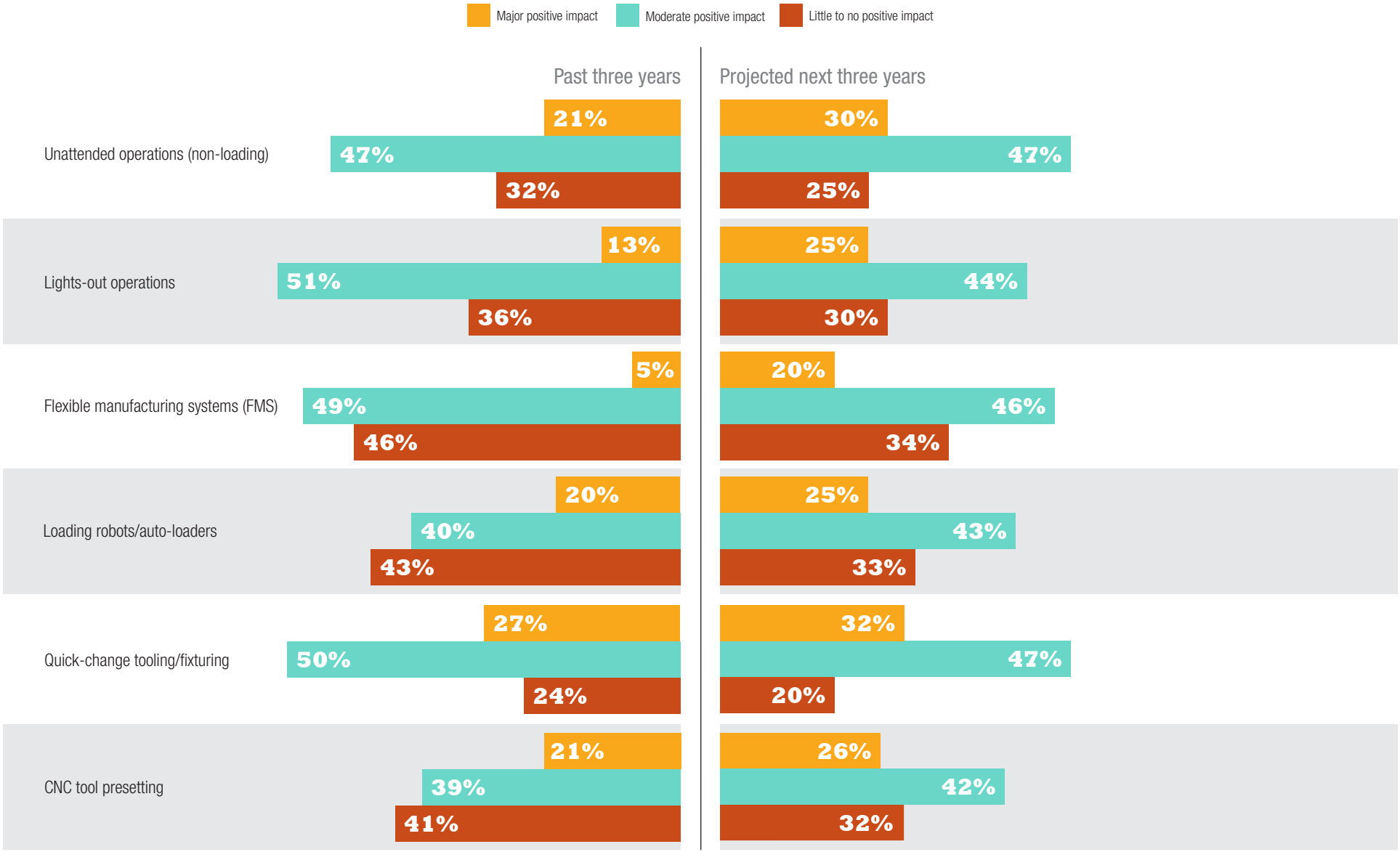
"Unattended machining should grow as video monitoring does because it makes it cheaper and easier to do."

"Lights-out machining and unattended operations are going to play a big part in our industry."

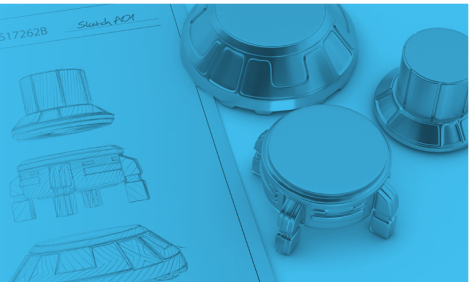
"Automatic tool-life and spindle-load feedback to prevent producing scrap parts."

"More direct plug-and-play interfaces between machines, allowing for very minimal input turn-key setups to occur."

Impact of automated manufacturing efforts on respondents' companies

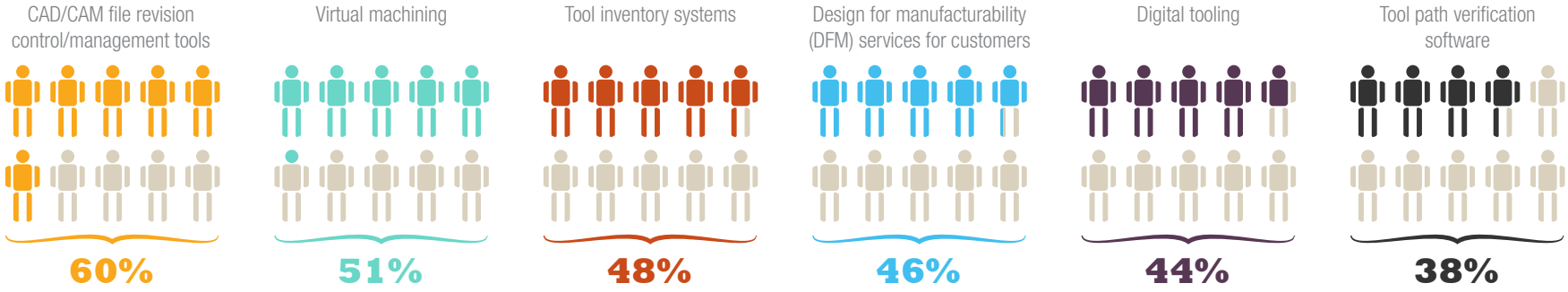


WHAT'S WORKING:
CAD/CAM AND PRE-PRODUCTION



There is a lot of buzz around 3D modeling, not only to prepare cycles, but also as a way to include customers in prototyping and production processes to help get jobs done right the first time. Respondents also appear to be hungry for an infusion of new and different software that can enhance machining capabilities.

WHO'S DOING IT



NOTABLE WRITE-IN RESPONSES

"3D modeling has come such a long way in the last 10 years that the biggest changes and advances outside of additive manufacturing will come in advancing CAM abilities to bring more automation and control into the office—off of the shop floor—where it is time consuming and expensive."

"Continued growth in 3D modeling and 3D printing outputs that show the customer exactly how their product features will appear and perform."

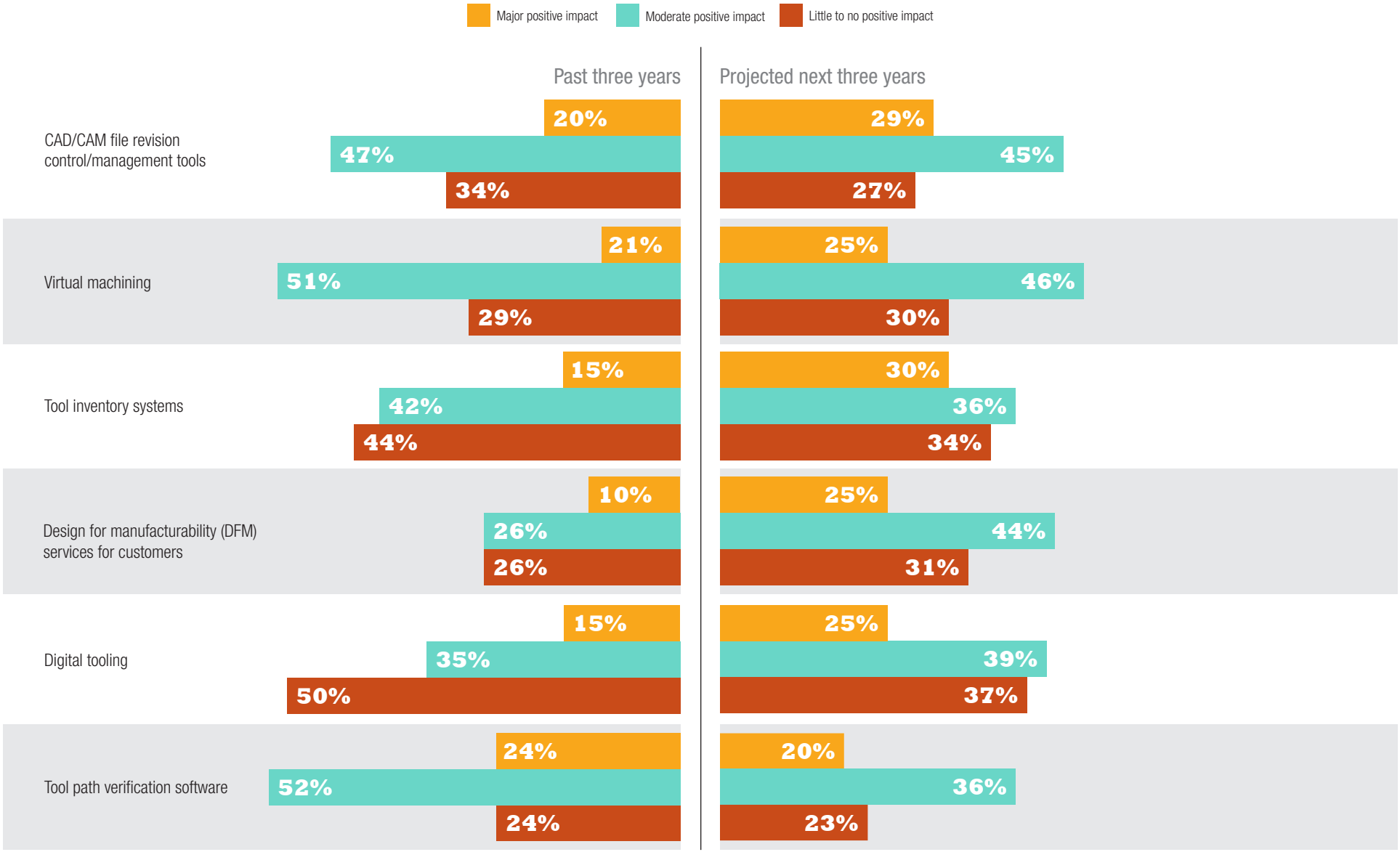
"Better tool path verification and visualization of the machining process, especially with regard to avoiding the fixtures."

"Preloaded tools matched with tool libraries is a must for lights out and unattended machining in a job shop environment. It also makes this overall idea possible."

"Hard to say … we seem to have reached a plateau with CAD and CAM. Nothing on the horizon to equal [the impact of] high speed machining or direct editing that I can see. So I suppose the software companies are going to just tinker with what is there now."

"Make CAD/CAM more user friendly. They should be designed for a machinist not a computer geek."

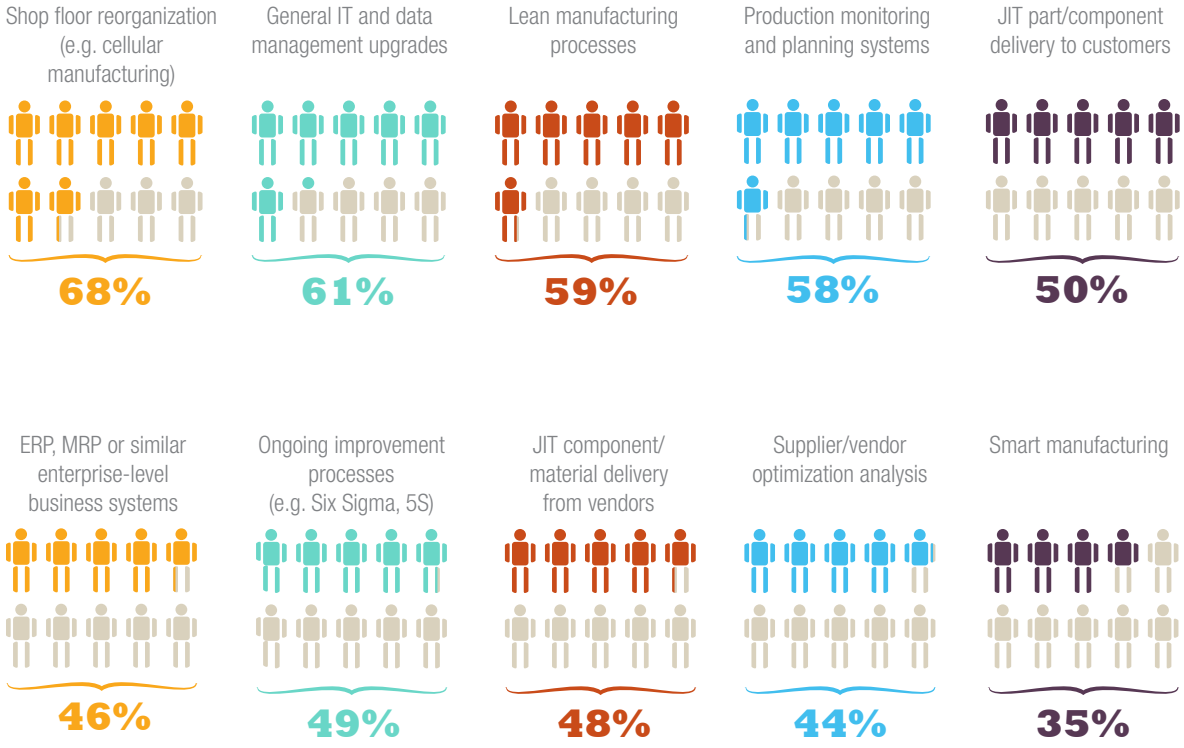
CAD/CAM and pre-production processes on respondents' companies



WHAT'S WORKING:
BUSINESS OPTIMIZATION

Many respondents appear to be searching for ways to make the shop floor more efficient; while not yet widespread, there are high expectations for smart manufacturing and the associated use of data to help achieve this. It appears as if those efforts will go hand in hand with the strong projected growth of ongoing business improvement designed to streamline management and operations throughout the business.

WHO'S DOING IT



NOTABLE WRITE-IN RESPONSES

"I believe the Internet of Things (IoT) will have a huge impact on manufacturing over the next few years."

"I feel smart manufacturing is the single biggest thing we can do to improve our performance."

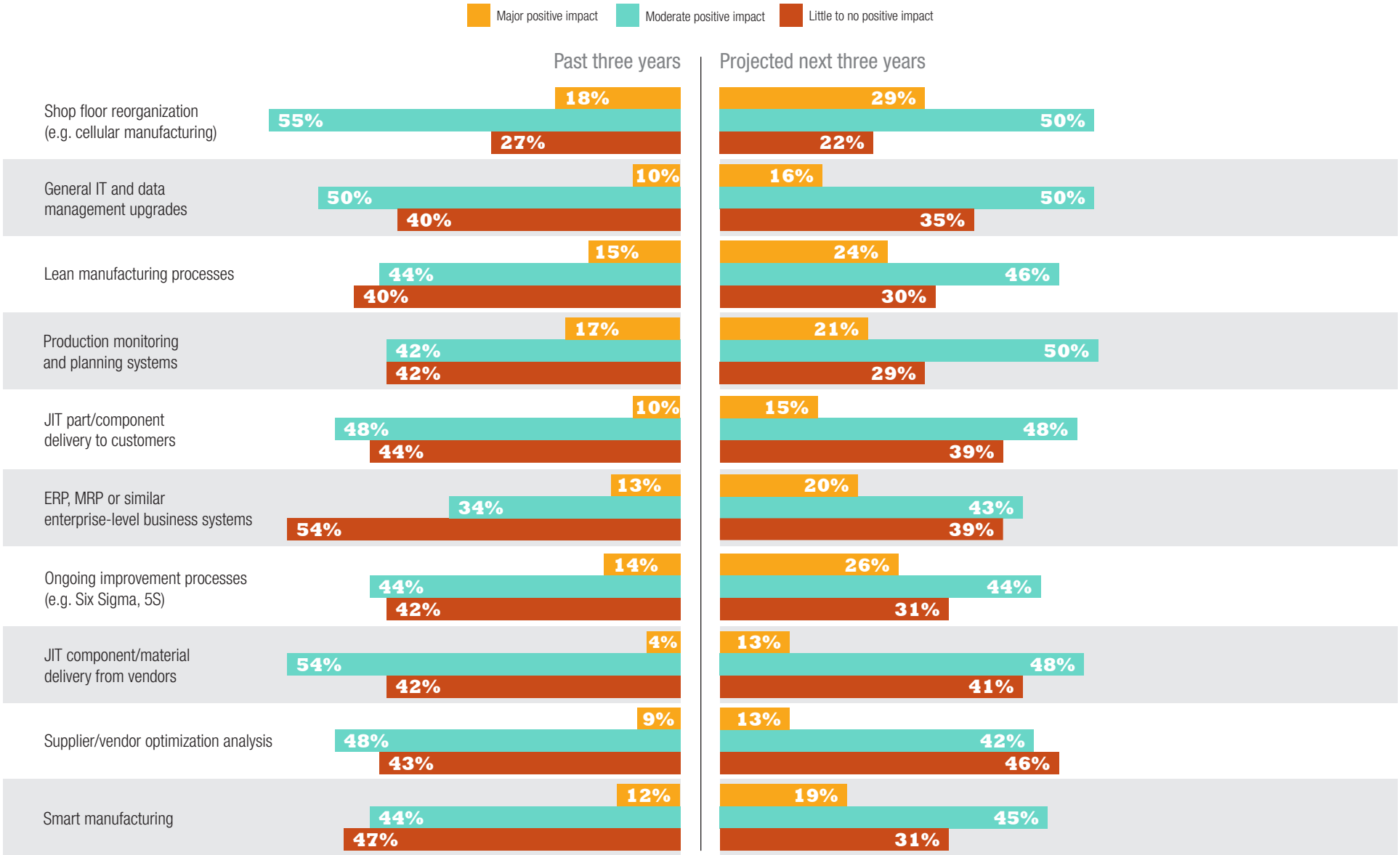
"Small shops like ours will be using Enterprise Resource Planning (ERP) systems widespread."

"Ongoing improvement processes seem to have the most impact for us."

"Organization of the workshop as the problems arise—if issues are addressed quickly the results are positive."

"New database programs to track tools, programs (gcode), time, production numbers and scrap."

Impact of business optimization tools and practices on respondents' companies



Thank you for reading and thank you to those who participated in the survey.

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