

MANUFACTURING Insights Report

Winning Practices of World-Class Companies



TOOLINGU.com

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BACKGROUND & Key Findings

The *Tooling U-SME Manufacturing Insights Report*, conducted by The MPI Group, was designed to provide the information needed to help manufacturing executives and leaders make better strategic decisions and more efficiently manage operations. The purpose of the study was to evaluate practices and performances associated with three key manufacturing initiatives:

- ▀ Continuous improvement — improving quality, cost, speed, value, and safety
- ▀ Workforce development — building a workforce with skills and motivation
- ▀ Production planning for new products — moving new-product designs efficiently through production and into the market

The Manufacturing Insights Report identified broad threats to competitiveness among manufacturing firms. Among the findings:

- ▀ Many are struggling with these three critical initiatives, despite their importance to world-class manufacturing status and business success.
- ▀ There are dramatic “execution gaps” between high executive awareness of the importance of the three initiatives and low support (e.g., resources, investments) for their implementation.
- ▀ Just 39 percent of manufacturers admit to operating at or close to world-class manufacturing status,¹ underscoring the potential for most organizations to improve via the three strategies — all of which require improved training.
- ▀ Productivity and profitability are directly improved by moving closer to world-class manufacturing status: Manufacturers at or near world-class status outperform others, in large part because they manage and train differently.

The *Tooling U-SME Manufacturing Insights Report* provides insights to help leaders get these three initiatives on track — and to capture new productivity and profits.

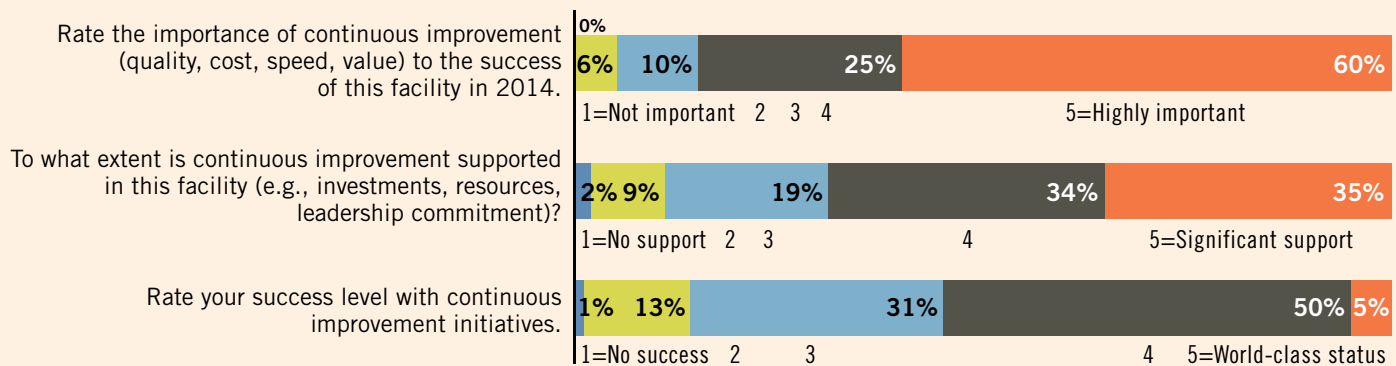
¹ Rated 4 (28 percent of respondents) or 5 (11 percent of respondents) on a scale of 1-5 where 5 equals “world-class status.”

CONTINUOUS Improvement (CI)

Importance, Support, and Success

Most manufacturers embrace continuous improvement. The opportunities — for improved productivity, higher profits, lower costs, and safer workplaces — are simply too great to ignore. All of the executives who participated in the Manufacturing Insights Survey said that continuous improvement was important to the success of their facility in 2014. In fact, 85 percent rate continuous improvement as *important or highly important*.² Yet many of these executives are not supporting their continuous improvement initiatives with investments, resources, training, leadership commitment, etc. — or succeed with their efforts (Figure 1).³

Figure 1. Continuous improvement importance, support, and success (% of facilities)



Manufacturers have trouble moving from recognizing the importance of continuous improvement (CI) to success (e.g., world-class status) with CI initiatives.

Continuous Improvement Objectives and Metrics

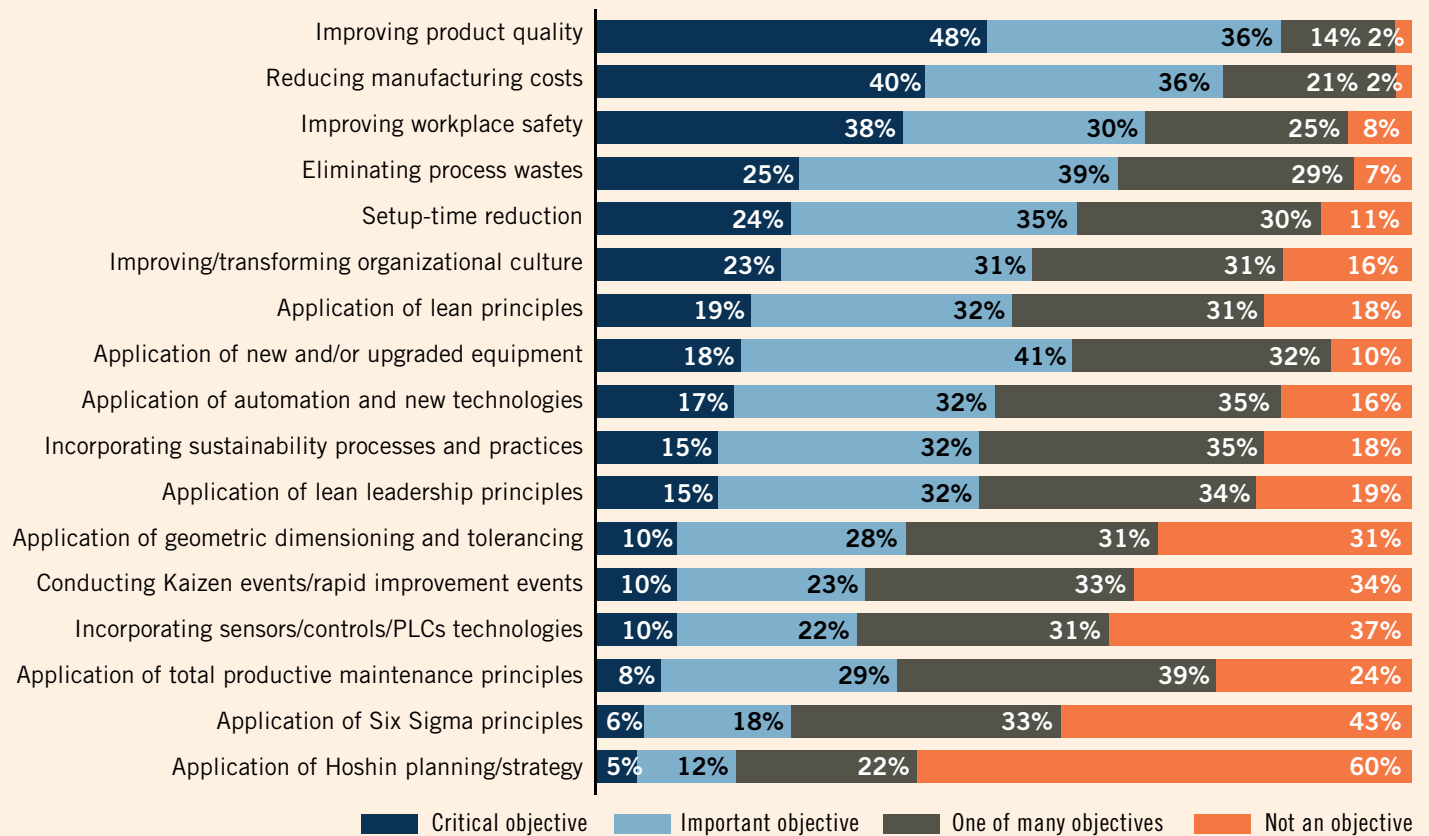
The report reveals that manufacturers typically focus their continuous-improvement efforts on improving quality, reducing manufacturing costs, and improving workplace safety — the top three “critical” objectives. In addition, more than half of executives cite the following objectives as either critical or important (Figure 2):

- ▀ Eliminating process wastes
- ▀ Setup-time reduction
- ▀ Improving/transforming organizational culture
- ▀ Application of lean principles
- ▀ Application of new and/or upgraded equipment

² Rated 4 or 5 on a scale of 1-5 where 5 equals “highly important.”

³ Due to rounding of decimals, not all data will sum to 100%.

Figure 2. Objectives of continuous improvement (% of facilities)



It may seem surprising, given the extent of lean practices throughout manufacturing and their impact on the bottom line, that the “application of lean principles” was found to be critical or important for less than half of the facilities. But note that many lean techniques are getting substantial attention by manufacturers. A focus on *specific lean practices*, such as waste elimination, setup-time reduction, kaizen events, and total productive maintenance, is far more common: 86 percent of plants identified one or more of these as critical or important objectives.

Manufacturers primarily focus their continuous improvement initiatives on — quality, costs, and safety.

Continuous-Improvement Challenges

Manufacturers also identified aspects of continuous improvement that pose challenges:

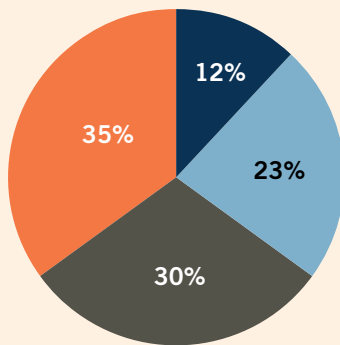
- ▀ Organization accepting the need for change
- ▀ Application of automation and technologies
- ▀ Changing the culture of the workforce
- ▀ Follow-through and sustaining improvements
- ▀ Skill gaps and training needs
- ▀ Time and resources to devote to improvement

Many manufacturers struggle with basic operational performance metrics.

These challenges directly impact performance metrics, with many manufacturers struggling to achieve acceptable results (Figure 3). For example, 16 percent of manufacturers report scrap and rework rates of 4 percent of sales or higher: i.e., a \$50 million plant is effectively wasting \$2 million to revise or discard products. Poor delivery, machine downtime, and safety problems also dramatically impact the bottom line. For example, as safety rates deteriorate, insurance premiums and compensation payouts rise accordingly.

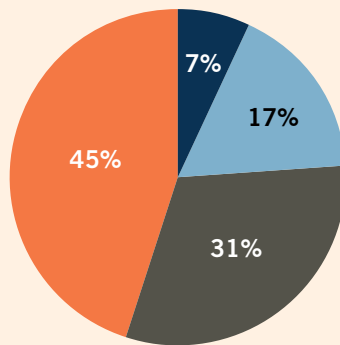
Figure 3. Operations metrics (% of facilities)

Perfect deliveries
(% on time to customer-request date, with perfect quality, and to customer specifications)



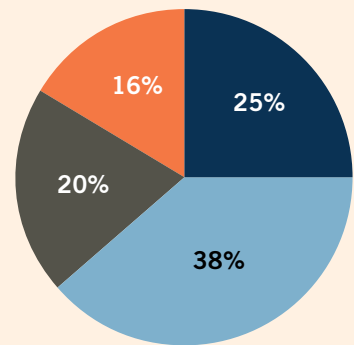
■ <80% ■ 80-90% ■ 91-95% ■ 96-100%

Finished-product first-pass quality yield
(% of product that passes final inspection)



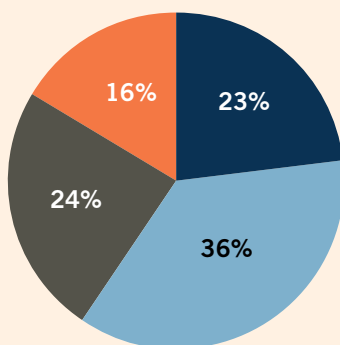
■ <80% ■ 80-90% ■ 91-95% ■ 96-100%

Scrap and rework
(% of facility production volume)



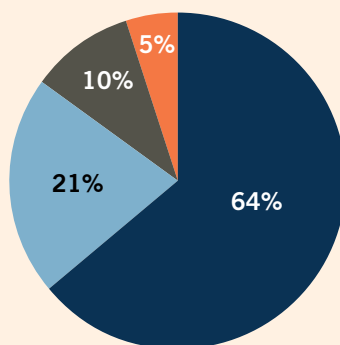
■ <1% ■ 1-2% ■ 2.1-4% ■ >4%

Machine availability
(% of scheduled uptime)



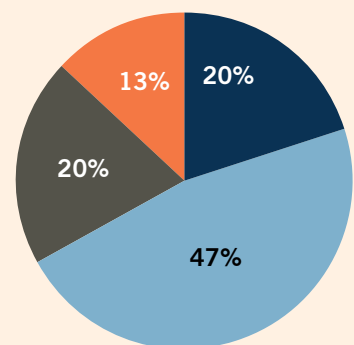
■ <80% ■ 80-90% ■ 91-95% ■ 96-100%

OSHA incident rate
(total injuries and illnesses X 200,000 ÷ hours worked by all employees)



■ <1% ■ 1-2% ■ 2.1-4% ■ >4%

Gross profit
(% of revenue remaining after accounting for cost of goods sold)



■ <10% ■ 10-25% ■ 26-40% ■ >40%

Other metrics cited as useful in monitoring continuous improvement initiatives include:

- ▶ Companywide cost of goods sold vs. previous year's performance
- ▶ Continuous check of action items and timelines
- ▶ Customer complaints
- ▶ Daily quality and on-time shipment information
- ▶ Efficiency (dollars per hour)
- ▶ Error costs
- ▶ Execution to schedule
- ▶ Failure rate/defect rate (parts per million)
- ▶ Gross sales
- ▶ Incident reports
- ▶ Mandatory monthly work-area improvement ideas
- ▶ Net profits
- ▶ Overall equipment effectiveness
- ▶ Productivity
- ▶ Safety activities
- ▶ Total production time (from the time material hits the floor until that specific material is shipped)
- ▶ Value-added per direct labor dollar

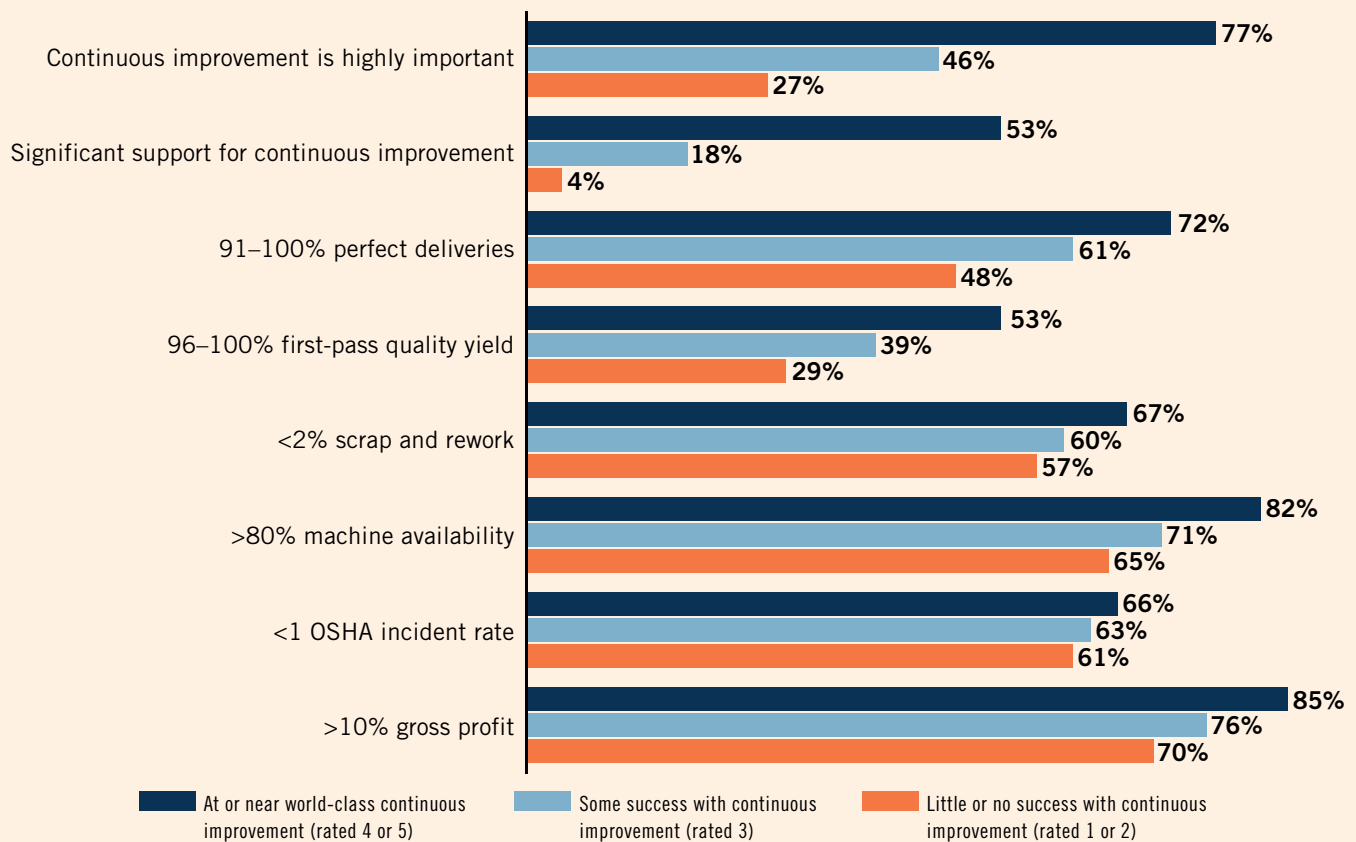


World-Class Continuous Improvement

Continuous improvement is a cornerstone of world-class manufacturing. Manufacturers that excel at continuous improvement are dramatically more likely to achieve overall world-class manufacturing status for their operation. And those manufacturers at or near world-class status in continuous improvement are far more likely to:

- ▶ Believe continuous improvement is highly important to the success of their facility
- ▶ Provide significant support for continuous improvement
- ▶ Report better operations metrics (Figure 4)
- ▶ Indicate that objectives are critical or important

Figure 4. World-class continuous improvement (% of facilities)



WORKFORCE TRAINING & Development

Importance, Support, and Success

It's increasingly clear that training and professional development are not only vital for manufacturing success, but essential tactics in meeting the growing talent challenge.

Economic recovery has manufacturers looking to increase hiring at last. Yet many have difficulties in finding talented employees or critical skillsets. In addition, as the economy improves and retirement accounts regain lost ground, baby boomers are beginning to leave the workforce — taking their skills and knowledge with them.

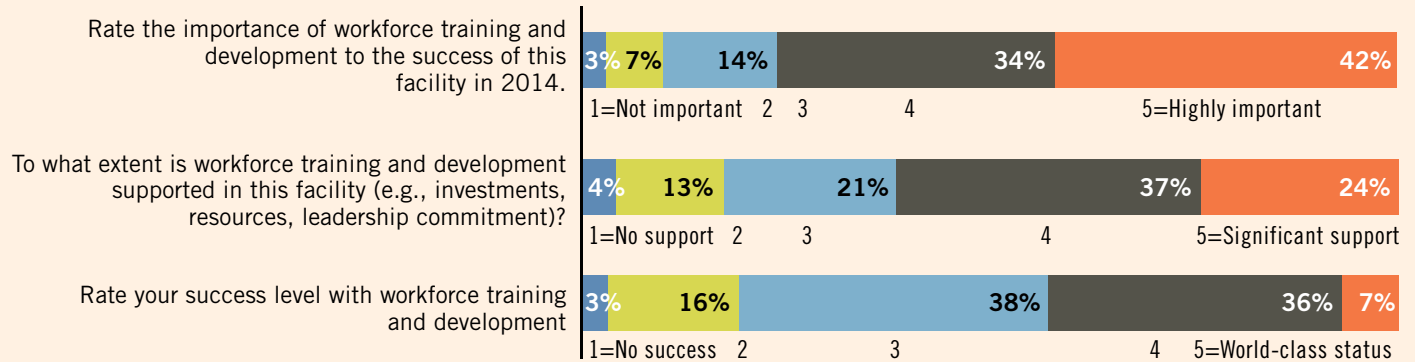
It's increasingly clear that training and professional development are not only vital for manufacturing success, but essential tactics in meeting the growing talent challenge. Skills that can't be found externally can often be grown internally as part of a strategic workforce plan. The Manufacturing Insights Report highlights a direct connection between a skilled, highly trained workforce and organizational improvements that boost the bottom line. That's because workforce training and development programs are an integral component for manufacturers in their quest for world-class manufacturing status and the benefits associated with that level of operational excellence.

Workforce Training and Development Importance, Support, and Success

The Manufacturing Insights Report revealed a serious execution gap regarding talent. Three-quarters of manufacturing executives rate workforce development as important to the success of their facilities in 2014;⁴ only 3 percent report that workforce training and development are not important. Yet far fewer offer support for workforce development initiatives — or achieve notable success with their employee efforts (Figure 5).

⁴ Rated 4 or 5 on a scale of 1-5 where 5 equals "highly important."

Figure 5. Workforce training and development importance, support, and success (% of facilities)



Workforce Training and Development Objectives and Metrics

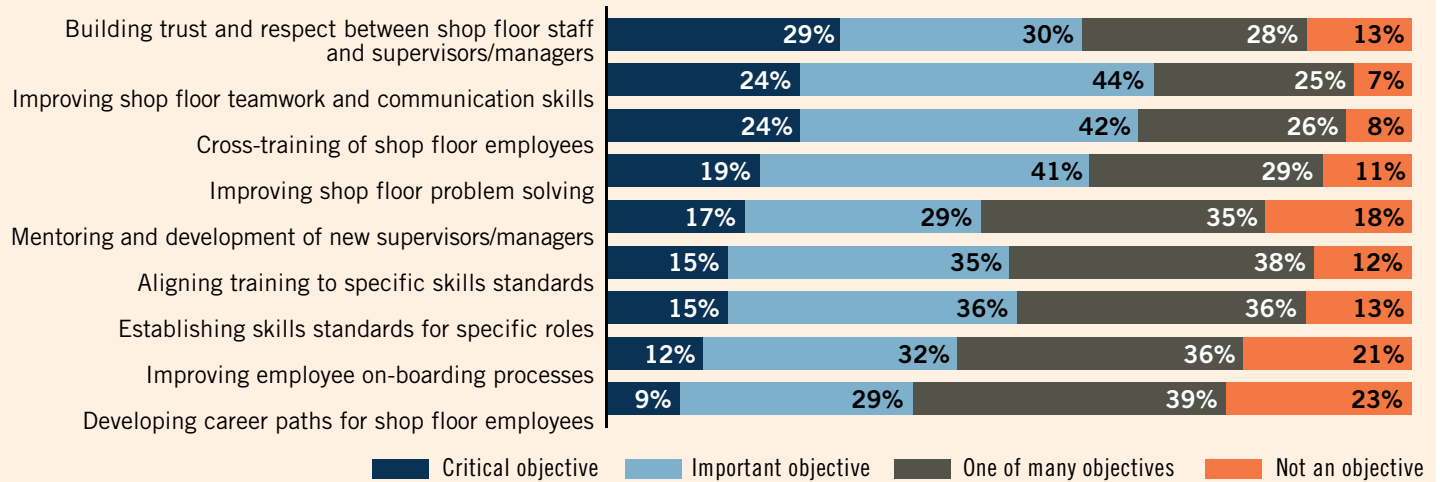
The top objectives of workforce training and development — rated critical or important by more than half of executives — are (Figure 6):

- ▶ Building trust and respect between shop floor staff and supervisors/managers
- ▶ Improving shop floor teamwork and communication skills
- ▶ Cross-training of shop floor employees
- ▶ Improving shop floor problem solving
- ▶ Aligning training to specific skills standards
- ▶ Establishing skills standards for specific roles

The report highlights what many manufacturers increasingly encounter: Workforce development is not just providing employees with the right technical skills to perform “a job.” It also requires helping individuals acquire the soft skills — teamwork, problem-solving, coaching — and day-to-day business skills to succeed in more team-oriented, automated workplaces.

Manufacturers struggle to achieve success (e.g., world-class status) with workforce initiatives.

Figure 6. Objectives of workforce training and development (% of facilities)



Improving soft skills — **Workforce Development Challenges**

trust, respect, and communication —

is critical to workforce training and development.

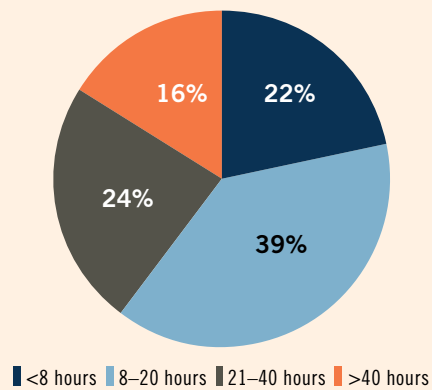
Manufacturers identify the following aspects of workforce training and development as challenges:

- Budget approvals for training, even when clear needs for training have been identified
- Developing managers, supervisors, and leaders in the organization
- Employee buy-in to new methods, techniques, and training
- Finding job candidates with required technical and soft skills
- Finding the people with the right attitude and work ethic
- Finding time to train employees
- Identifying specific training needs by area/department
- Pulling employees from the plant floor in order to train them

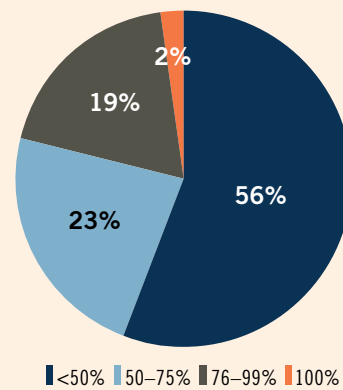
The Manufacturing Insights Report asked manufacturers to identify their organization's performance across four metrics that gauge success of workforce training and development programs (Figure 7). Only 7 percent of all survey respondents report best performances (either of the top two answer categories) for all metrics.

Figure 7. Workforce training and development metrics (% of facilities)

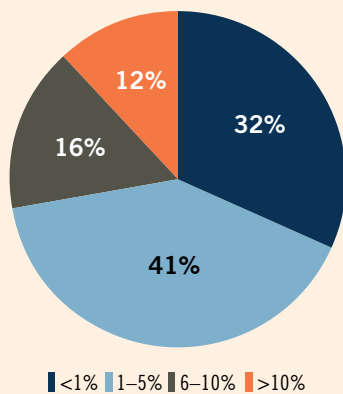
Training hours
(annual hours of training per employee)



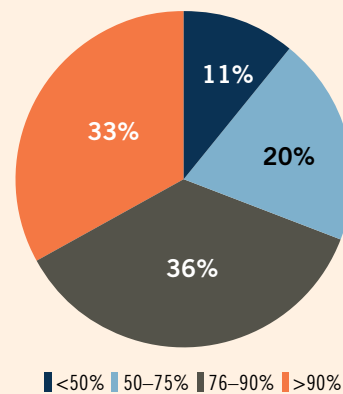
Self-directed employees
(% of employees with autonomous authority for their role/actions)



Annual labor turnover
(voluntary and involuntary separations as % of typical staffing level)



Employee retention
(% of workforce with more than five years with company)



Many executives also report that they lack measures to accurately track success in workforce development. Metrics cited by executives as effective in monitoring progress of workforce training and development initiatives include:

- ISO audits
- Labor times
- Labor turnover
- Production efficiency improvement
- Scores on annual employee surveys
- Self-assessment and scoring proficiency tests
- Skills matrix by job function
- Training hours
- Training modules (E-learning) completed

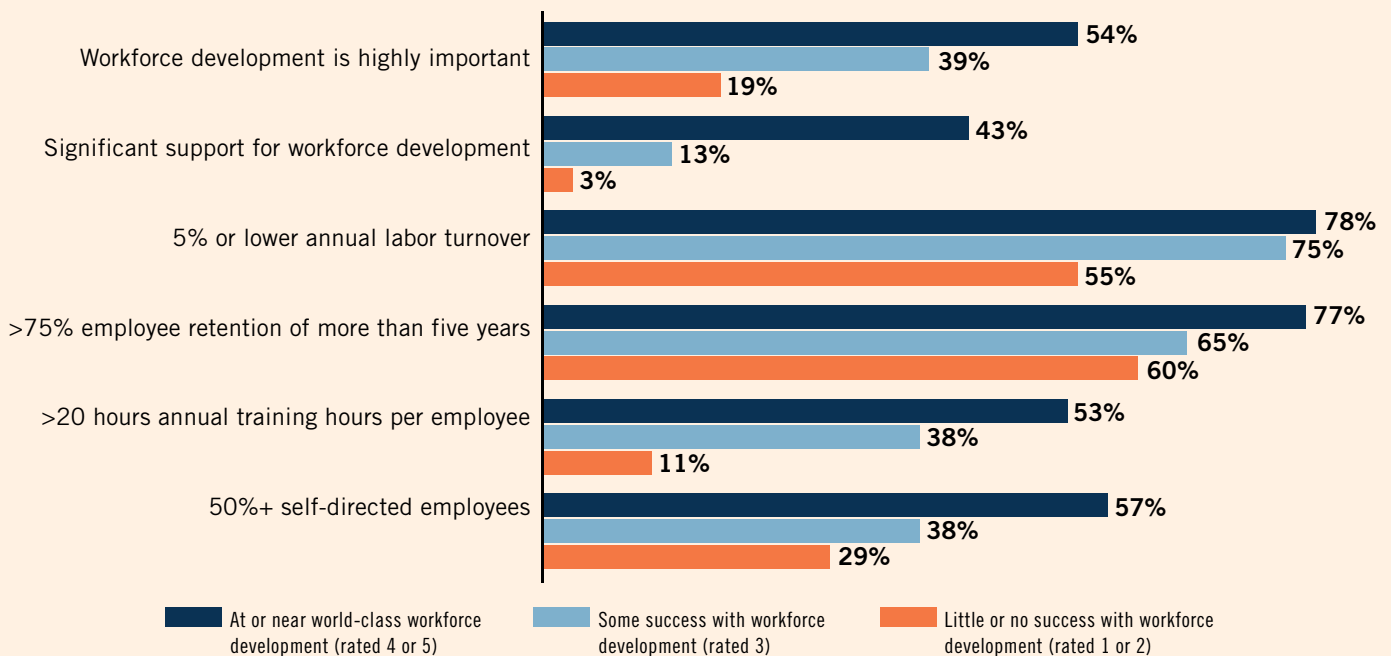
World-Class Workforce Training and Development

Manufacturers at or near world-class workforce training and development recognize its importance, support it with investments and training, and enjoy improved performances.

Workforce training and development is a must for any organization hoping to be a world-class manufacturer. So it's not surprising that manufacturers that excel at workforce training and development are dramatically more likely to achieve *overall* world-class manufacturing status for their operations. And those manufacturers at or near world-class status *in workforce development and training* are far more likely to:

- ▶ Believe workforce development and training is highly important to the success of their facility
- ▶ Provide significant support for workforce development
- ▶ Report better workforce development metrics (Figure 8)
- ▶ Indicate that workforce development and training objectives are critical or important. (For example, 79 percent of manufacturers at or near world-class workforce development rate cross-training of shop floor employees as critical or important vs. just 48 percent of those with little or no success.)

Figure 8. World-class workforce development (% of facilities)



PRODUCTION PLANNING for New Products

Great ideas coming out of R&D and new-product development don't necessarily translate into successful products. These “virtual goods” need to be efficiently incorporated into manufacturing processes that accommodate new product dimensions, materials, equipment, workflows, skills and standards. Profitable innovation is increasingly driven by the speed — and seamlessness — of the handoff from design to manufacturing.

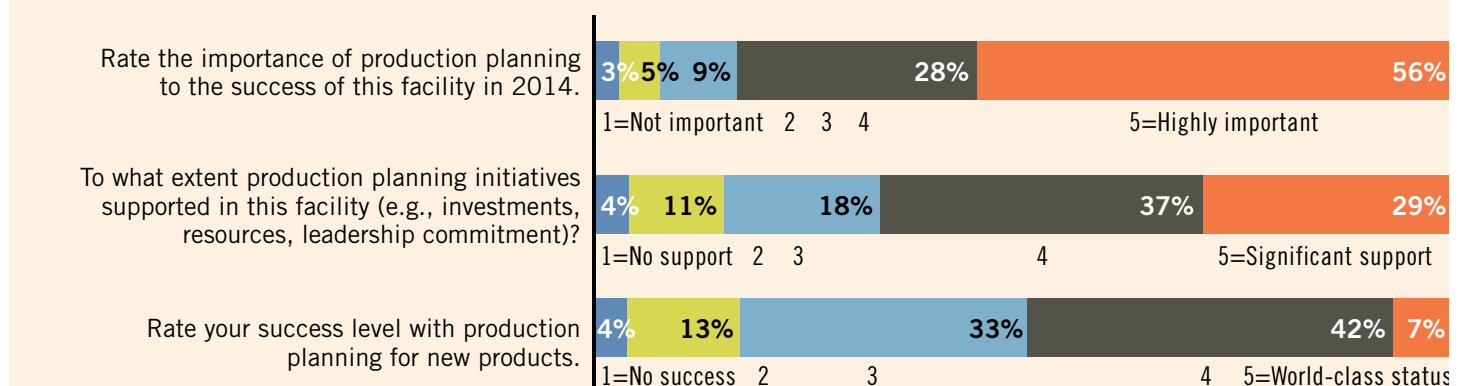
Innovation success today requires the coordination and collaboration of design with manufacturing and an ability to plan for the production of new products. This process involves decision-making and allocation of physical assets (machinery and inventory) as well as soft assets (skills necessary to make or assemble new products, management talent to establish new processes and standards to control production). Without production planning, a great design can turn into a product that misses its window of opportunity and the revenues and profit that go with timely market entry.

Production Planning Importance, Support, and Success

Four out of five executives report that production planning for new products is important to their facility's success in 2014. But another execution gap looms: far fewer manufacturers invest in supporting this initiative, or achieve success with it (Figure 9).⁵

Manufacturers have trouble achieving success with production planning.

Figure 9. Production planning importance, support, and success (% of facilities)



⁵ Rated 4 or 5 on a scale of 1-5 where 5 equals “highly important.”

Production Planning Objectives and Metrics

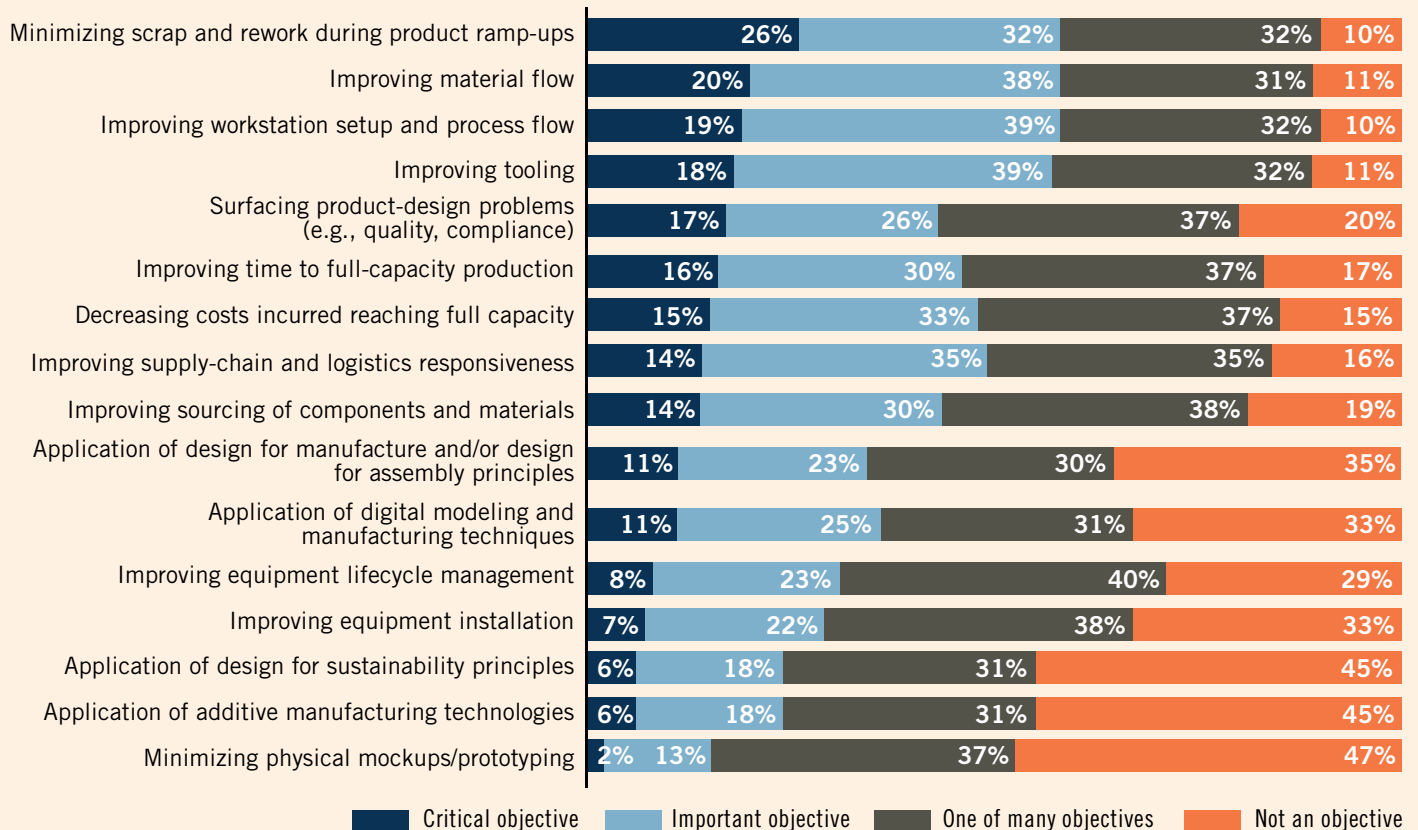
Eliminating waste in the production planning process — scrap, rework, and time (setup and flow) — are critical objectives of production-planning initiatives.

The top objectives of production planning — rated critical or important by more than half of executives — are (Figure 10):

- ▀ Minimizing scrap and rework during product ramp-ups
- ▀ Improving material flow
- ▀ Improving workstation setup and process flow
- ▀ Improving tooling

A wide range of production-planning objectives are rated highly by manufacturers, illustrating both opportunities for improvement as well as the influences of product or industry on production planning. For example, facilities with assembly operations are more likely to rate improving workstation setup and process flow as a critical or important objective. Conversely, facilities with plastics and composite processing are more focused on improving material flow.

Figure 10. Objectives of production planning (% of facilities)



Production Planning Challenges

Manufacturers identify the following aspects of production planning for new products as challenges:

- ▶ Accuracy of planning or lack of planning
- ▶ Organizational silos
- ▶ Capacity constraints
- ▶ Changing customer needs
- ▶ Customer communication of demand changes
- ▶ Demand fluctuations
- ▶ Greater awareness of impact of changes on processes (e.g., manufacturing)
- ▶ Need to improve flow/level loading
- ▶ Poor scheduling
- ▶ Supply-chain and logistics responsiveness



Executives were asked to identify their organization's performance across five metrics that gauge success of production planning for new products (Figure 11). Many manufacturers struggle: One-quarter report that fewer than half of their products launch on budget, and 29 percent report that fewer than half of launches are on time. And one in five manufacturers fail to hit both the budget and time specifications for half or more of their product launches. While many manufacturers clearly rely on new products to sustain their organizations, they may not be considering the need to train management and employees on how to improve the production-planning process — and, thus, squander away both revenues and profits with late, overbudget launches.

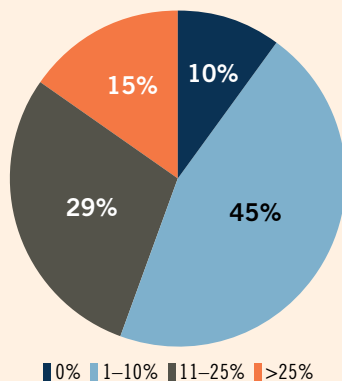
Other metrics cited by executives as effective in monitoring progress of production planning include:

- ▶ Actual vs. scheduled delivery dates
- ▶ Bill of material manufacturing-release percentage relative to temporal targets
- ▶ Customer acceptance rate of first-off samples
- ▶ Delivery to the schedule
- ▶ First-in, first-out

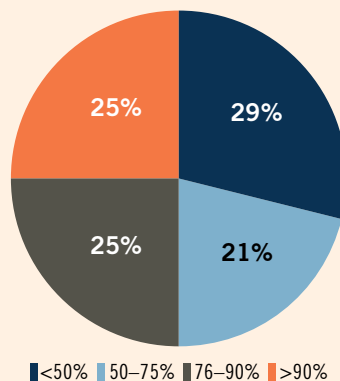
- Manufacturers struggle with late and over-budget product launches.*
- ▢ Internal and supplier on-time delivery
 - ▢ New sales revenue
 - ▢ Revenue generated by products in last three years
 - ▢ Setup time efficiency
 - ▢ Work-in-process and raw-material inventory levels

Figure 11. New-product metrics (% of facilities)

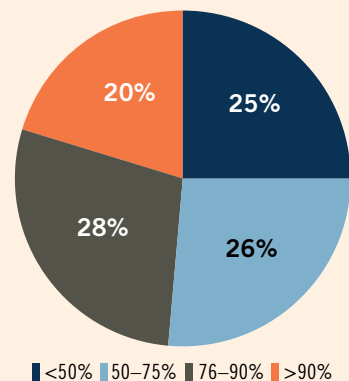
New product sales
(% of recent-year sales represented by products introduced in that year)



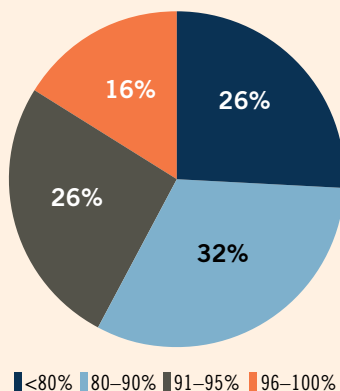
On-time product launches
(% of product launches that reach market on schedule)



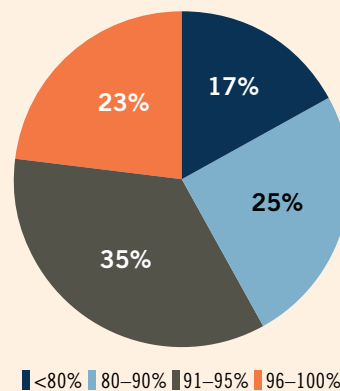
On-budget product launches
(% of product launches that reach market on budget)



Timeliness of supplier components and materials supporting new products
(% on time)



Quality of supplier components and materials supporting new products
(% meeting quality specifications)



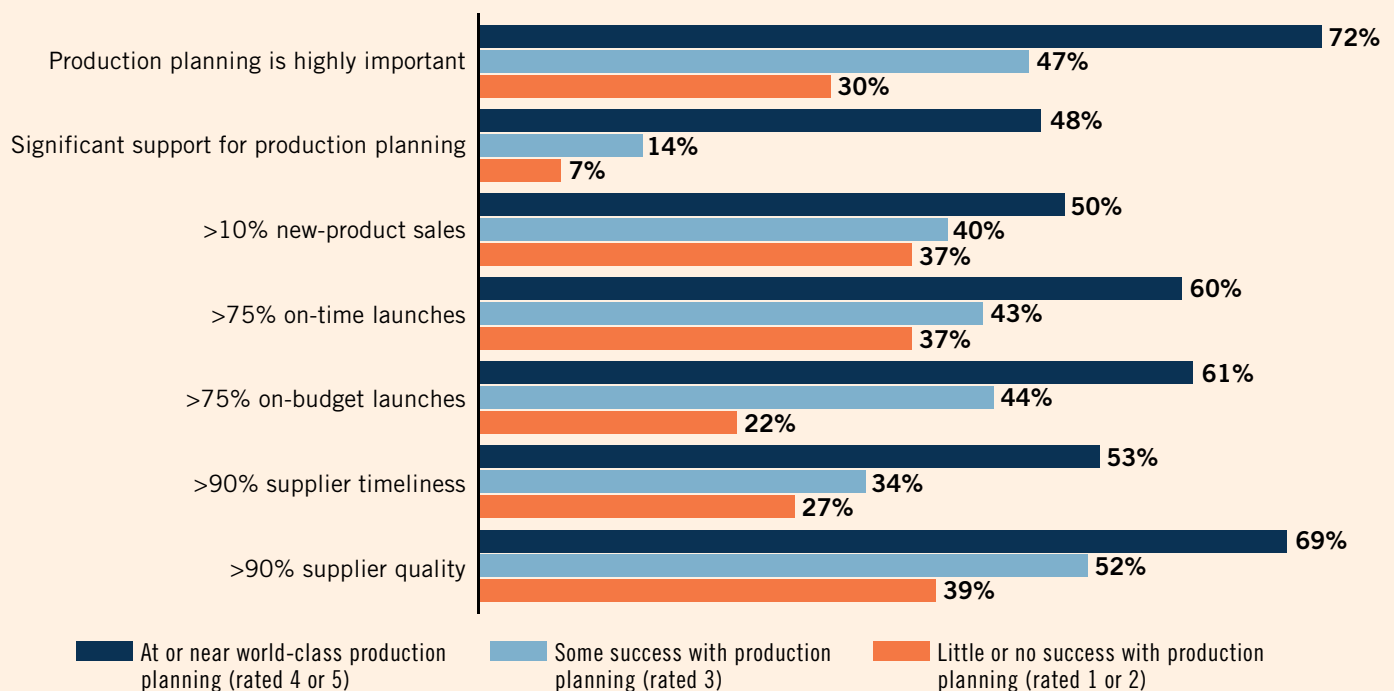
Production Planning Objectives and Metrics

Production planning is necessary to achieve world-class manufacturing, and for organizations focused on innovation and new products, it is critical. Manufacturers that excel at production planning are dramatically more likely to achieve overall world-class manufacturing status for their operation. And those manufacturers at or near world-class status in production planning are far more likely to:

- ▶ Believe production planning for new products is highly important to the success of their facility
- ▶ Provide significant support for production planning
- ▶ Report better new-product metrics (Figure 12)
- ▶ Indicate that production-planning objectives are critical or important

Manufacturers at or near world-class production planning recognize its importance, support it with investments and training, and enjoy improved product-launch performances.

Figure 12. World-class production planning (% of facilities)



MANUFACTURING Support

Where do manufacturers go when they need help? Few world-class manufacturers handle upgrading their continuous improvement, workforce development, and production planning initiatives without external help. A majority of executives report that their facilities seek external support for these efforts at least occasionally (Figure 13). Manufacturers are most likely to seek assistance from the following types of organizations (Figure 14):

Continuous improvement:

- Professional associations
- Service and goods vendors/suppliers
- Consulting and business advisory firms

Workforce training and development:

- Universities/colleges
- Professional associations
- Service and goods vendors/suppliers

Production planning for new products:

- Service and goods vendors/suppliers
- Peer networks
- Consulting and business advisory firms

Most manufacturers routinely seek outside help.

Figure 13. Frequency of external support (% of facilities)

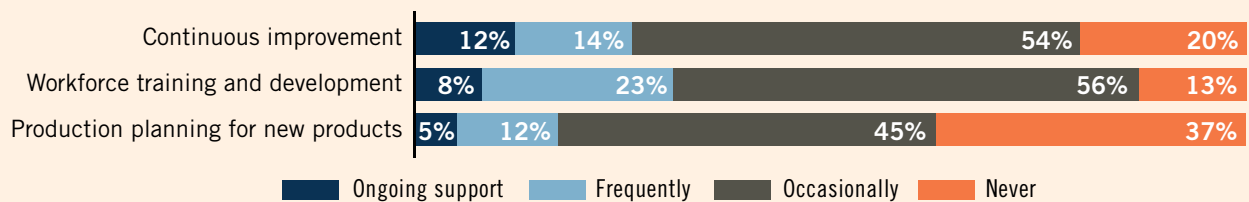


Figure 14. Where facilities seek assistance (% of facilities)

| | Continuous improvement | Workforce development | Production planning |
|-----------------------------------------------------------------------------------------|------------------------|-----------------------|---------------------|
| Professional associations (e.g., SME, ASQ, APICS) | 41% | 34% | 12% |
| Service and goods vendors/suppliers | 38% | 27% | 19% |
| Consulting and business advisory firms | 38% | 26% | 14% |
| Peer networks | 37% | 25% | 19% |
| Industry associations (e.g., National Association of Manufacturers) | 36% | 25% | 13% |
| Universities/colleges | 31% | 45% | 9% |
| Trade/sector associations (e.g., Association for Manufacturing Technology) | 28% | 24% | 11% |
| Business and industry groups (including NIST's Manufacturing Extension Partnerships) | 24% | 18% | 9% |
| State associations | 19% | 23% | 8% |
| Local associations (including Workforce Investment Boards) | 19% | 19% | 5% |
| Traditional advisers (e.g., accountant, legal counsel) | 19% | 11% | 6% |
| Other | 9% | 8% | 7% |
| No assistance | 11% | 12% | 45% |

Average Spend

Many facilities invest relatively little for outside help or, surprisingly, nothing at all. For example, one-quarter or more of facilities spend nothing on external support for the three initiatives, and more than 10 percent seek no assistance for any of the three initiatives. But the average annual spend for external support reveals the extent to which some facilities are willing to invest in outside assistance and the best manufacturers are more willing to retain external experts to assist with their three key initiatives:

- ▶ Continuous improvement: \$99,517 (average)
- ▶ Workforce training and development: \$248,568 (average)
- ▶ Production planning for new products: \$336,352 (average)

Professional associations are vital allies in helping manufacturers improve.

Conclusion

Manufacturers that survived the recession are finally in a better position to profit from improved economic conditions, provided they are establishing programs that allow them to continuously improve their operation, develop and leverage their workforces, and efficiently make new products in their facilities.

As the Tooling U-SME Manufacturing Insights Report reveals, simply acknowledging the desire to attain world-class status isn't enough; the most successful world-class manufacturers not only recognize the importance of Continuous Improvement, Workforce Training & Development, and Production Planning, but also execute against these initiatives. Simply put, a proactive pursuit of these three initiatives puts manufacturers at a competitive advantage allowing them to capitalize during the current economic upturn and achieve success.

- ▶ Continuous Improvement (CI): A sustained, concentrated focus on raising the bar and improving manufacturing performance is essential. However, the Report finds substantial shortcomings between recognizing CI importance and supporting CI initiatives. Those manufacturers who actually commit resources to CI are far more likely to report world-class status.
- ▶ Workforce Training and Development: Respondents confirm that being able to continually develop a competent workforce is crucial to manufacturing success. However, the execution gap within training and development is substantial. Nearly four-in-five respondents acknowledge training and development as important to facility success, but barely half of those report success at achieving world-class status. Additionally, the Report found that even when clear needs for training and development exist, many manufacturers find it difficult to budget for these challenges.
- ▶ Production Planning for New Products: The optimum profit-earning window for new products gets smaller and smaller. Streamlining the handoff from design to manufacturing improves manufacturers' likelihood of hitting the window at the appropriate time and keeping products in the market longer. But similar to the previous two initiatives, respondents who self-identify as falling short of at-or-near world-class status admit to a significant execution gap between recognizing the importance of production planning and supporting its success.

The Tooling U-SME Manufacturing Insights Report clearly identifies the simple steps to push all three initiatives towards world-class capabilities: Recognize the initiative is important and then support it – leadership commitment, training, resources, assets, etc. The correlation between those understanding an initiative's importance and subsequently supporting the initiative is the single-most identifying characteristic of those operating at or near world-class status and those that are not.

PROFILE OF Respondents

Company, division, or facility (% of facilities)

| | |
|----------|-----|
| Company | 66% |
| Division | 14% |
| Facility | 20% |

Executives who answered for a company or division were instructed to base their answers on one specific facility that is most representative of the overall organization.

Locations within organization (% of facilities)

| | |
|------------------------------|-----|
| Single location | 54% |
| Multiple locations, national | 19% |
| Multiple locations, global | 27% |

Half of manufacturers operate a single facility.

Industry (% of facilities)

| | |
|--------------------------------------------------------|-----|
| Job shop | 21% |
| Machining, tooling & equipment | 19% |
| Aerospace & defense | 12% |
| Automotive | 7% |
| Heavy equipment (e.g., construction, agriculture) | 6% |
| Electronics & high-tech | 5% |
| Life sciences (e.g., medical devices, pharmaceuticals) | 5% |
| Oil, gas & energy | 5% |
| Industrial distributor | 2% |
| Government | 1% |
| Weapons & ammunition (not defense-related) | 0% |
| Other | 18% |

The wide range of industries represented in the survey indicates that challenges with the three initiatives are common to all manufacturers.

Processes (% of facilities)

| | |
|-----------------------------------|-----|
| Machining | 77% |
| Assembly | 72% |
| Fabricating | 55% |
| Design and new-product ramp-up | 53% |
| Welding | 49% |
| Molding | 18% |
| Plastics and composite processing | 16% |
| Other | 29% |

Manufacturers focus on machining, assembling, fabricating, and designing products.

Note: More than one answer allowed.

A diverse mix of manufacturing executives took part in the survey.

| Primary role of respondent (% of facilities) | |
|----------------------------------------------|-----|
| Corporate leadership | 34% |
| Production | 19% |
| Engineering | 16% |
| Continuous improvement | 7% |
| Sales and marketing | 6% |
| Human resources | 5% |
| Training | 4% |
| Maintenance | 2% |
| Design/research | 1% |
| Supply chain | 1% |
| Logistics | 0% |
| Other | 6% |

The vast majority of manufacturers have a U.S.-based parent company.

| Parent company location (% of facilities) | |
|-------------------------------------------|-----|
| United States | 83% |
| Canada | 6% |
| Mexico | 0% |
| Other | 11% |

The wide differences between median and average sales and employee figures highlight the broad range of manufacturers participating in the survey.

| Approximate annual revenues | |
|-------------------------------------|-----------------|
| Parent company | |
| Median | \$18,000,000 |
| Average | \$2,758,900,215 |
| This facility | |
| Median | \$12,000,000 |
| Average | \$210,515,636 |
| Full-time employees and equivalents | |
| Parent company | |
| Median | 130 |
| Average | 11,957 |
| This facility | |
| Median | 80 |
| Average | 358 |

Methodology

The Manufacturing Insights Report was conducted using an online questionnaire promoted by Tooling U-SME. There were 337 total valid respondents to the survey, with completed questionnaires received in February and March 2014. Responses were received by The MPI Group, an independent research firm, and then entered into a database, edited, and cleansed where necessary to ensure answers were plausible. All respondent answers to the 2014 Manufacturing Insights Report were either anonymous or confidential. Confidential respondents received a customized benchmark report as an incentive; anonymous respondents received this Executive Summary as an incentive.

Contact

For more information on the Tooling U-SME Manufacturing Insights Report, please call Tooling U-SME at (866) 706-8665 or email swherley@sme.org.

About Tooling U-SME

Tooling U-SME delivers versatile, competency-based learning and development solutions to the manufacturing community, working with more than half of all Fortune® 500 manufacturing companies, as well as educational institutions across the country. Tooling U-SME partners with customers to build high performers who help their companies drive quality, productivity, innovation and employee satisfaction. A division of SME, an organization that connects people to manufacturing solutions, Tooling U-SME can be found at toolingu.com or on Facebook (facebook.com/toolingu) and Twitter (twitter.com/toolingu).

