

NEXT GENERATION MANUFACTURING STUDY

National Executive Summary



prepared by
The Manufacturing Performance Institute

Introduction

The *Next Generation Manufacturing Study* was developed to better define the strategies and business activities necessary for world-class performance and success into the next generation. More than 2,500 manufacturers across the United States responded to the Next Generation Manufacturing (NGM) Study, a national research effort coordinated by the American Small Manufacturers Coalition (an association of Manufacturing Extension Partnership centers and partners); conducted by the Manufacturing Performance Institute (MPI); and actively supported by Manufacturing Extension Partnership centers and partnering organizations in the following states and regions:

- Dakotas (North Dakota and South Dakota)
- Florida
- Illinois
- Kentucky
- Missouri
- New England (Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont)
- New Jersey
- Ohio
- Oklahoma
- Pennsylvania
- South Carolina
- Texas
- Wisconsin

The NGM Study consisted of a questionnaire that sought to assess manufacturers' awareness of NGM strategies, progress in implementing best practices to support NGM strategies, and success in achieving NGM operational and financial performances. Why? Because forward-looking NGM strategies are likely to drive manufacturing growth and profitability into the 21st century:

- *Customer-focused innovation:* Develop, make, and market new products and services that meet customers' needs at a pace faster than the competition.
- *Engaged people/human capital acquisition, development and retention:* Secure a competitive performance advantage by having superior systems in place to recruit, hire, develop, and retain talent.
- *Superior processes/improvement focus:* Record annual productivity and quality gains that exceed the competition through a companywide commitment to continuous improvement.
- *Supply-chain management and collaboration:* Develop and manage supply chains and partnerships that provide flexibility, response time, and delivery performance that exceeds the competition.
- *Green/sustainability:* Design and implement waste and energy-use reductions at a level that provides superior cost performance and recognizable customer value.
- *Global engagement:* Secure business advantages by having people, partnerships, and systems in place capable of engaging global markets and talents better than the competition.

The NGM Study results establish a "scorecard" for manufacturers by which to measure progress in defining strategies within their organizations, implementing best practices to support those strategies, and then reaping the performance improvements that can move them into the next generation. A key first step in any manufacturing improvement initiative is to benchmark and compare performances; the NGM Study provides these benchmarks.

The good news in the NGM Study is that many manufacturers are already being guided by NGM strategies. The bad news is twofold: First, many manufacturers face a sizeable gap between good intentions (awareness of the importance of NGM strategies) and their ability to implement these strategies through best practices. Second, some manufacturers simply are not looking to the future (i.e., they don't recognize the importance of these strategies) and, consequently, don't even recognize the growing gap between their current performances and what will be required of them in the years ahead.

Manufacturers need to be proactive in implementing NGM strategies, and national, state and local policy-makers must also look for ways to bring awareness of NGM strategies to their manufacturing constituencies — and to help these firms implement NGM strategies more quickly and broadly than their competitors around the globe.



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Reading Tables in This Summary

Most tables in this summary present overall findings from the NGM Study (“National”) along side columns of responses from those manufacturers that rate themselves “Furthest from world-class” status for the NGM strategy in that particular section (rated 1, 2 or 3 on the world-class status question) and those manufacturers “At or near world-class” status for the NGM strategy in that section (rated 4 or 5 on the world-class status question). Exceptions are those tables in the Profile section and the questions in each NGM strategy section by which respondents rate their progress toward world-class status.

Data is intended to be read down the columns (columns sum to 100%): For example, for the table below, 12.6% of manufacturers that are at or near world-class status in customer-focused innovation (the section from which this table was taken) have less than 1% of their workforces dedicated to new-product development/R&D; 30.2% of manufacturers furthest from world-class status in customer-focused innovation have less than 1% of their workforces dedicated to new-product development/R&D.

What percentage of your workforce is dedicated to new-product development/R&D?	National	Furthest from world-class	At or near world-class
<1%	22.2%	30.2%	12.6%
1–5%	43.3%	46.2%	39.9%
6–10%	18.9%	13.8%	24.9%
>10%	15.7%	9.7%	22.6%

NGM Study Highlights

The Next Generation Manufacturing (NGM) Study points to a clear path for manufacturers if they want to succeed in the next generation, offering strategies to improve execution that will result in achieving aggressive new performance goals. Following this path — or ignoring it — will likely mean the difference between success and failure for manufacturers. Study highlights include:

Becoming a Next Generation Manufacturer

Improvements required to compete in the next generation move through two distinct phases: Recognizing the need to improve (i.e., identifying that a given NGM strategy is important), and then executing the NGM strategy by applying best practices and investing in people, equipment, and product and process technologies to bring about positive changes.

Fortunately, most manufacturers have entered the first phase, recognizing the importance of NGM strategies to their business success. Manufacturers across the U.S. identify superior process improvement (60% of manufacturers rated it “highly important”) and customer-focused innovation (58%) as the most important NGM strategies to their firms’ success over the next five years. Receiving less attention among manufacturers were human-capital acquisition, development and retention (46%); supply-chain management (38%); global engagement (28%); and green/sustainability (16%).

But note that recognition of an NGM activity as important doesn’t necessarily lead to superior performance or *world-class* status for the strategy. In fact, there’s a gap between firms’ *recognition* of the importance of NGM strategies and these firms’ *actual ability* to achieve superior performances (i.e., the percentage that report the strategy is “highly important” is well above the percentage reporting themselves as world-class in that strategy¹). Some manufacturers have adopted the best practices necessary to achieve high performance in an NGM activity, but many other firms are either unaware of best practices, unable to execute them, or unwilling to try. This is illustrated by stark contrasts in performance.

The NGM Study establishes aggressive thresholds for assessing superior performance levels within each of the six categories. The good news is that many manufacturers are hitting these marks. For example, 11% of firms report value-added per employee of greater than \$175,000. Yet 35% of firms report value-added per employee of less than \$75,000. Awakening *all* manufacturers to the importance of NGM strategies and helping them to develop the practices, acquire the tools, and grow NGM-enabled workforces must be a priority for government and manufacturing associations. Without a nudge and assistance, many won’t be around in the next generation.

Next Generation Competitiveness

U.S. manufacturers must do more to remain globally competitive. The NGM Study finds that manufacturers at or near world-class status for NGM strategies do three things differently than manufacturers furthest from world-class status:

- They invest more resources into that particular NGM strategy.
- They manage differently, implementing best practices at higher rates.
- They outperform manufacturers furthest from world-class status on a wide array of operational and financial metrics.

Currently, less than half of U.S. manufacturers are at or near world-class status in any of the six NGM strategies. The good news is that this means that some benchmark firms exist for others to emulate. The bad news, however, is that many firms are struggling. For example, 9% of manufacturers report “no progress” toward world-class supply-chain management and collaboration; without the ability to manage and work with their supplier bases, these manufacturers face uncertain futures.

There was a day when “good enough” might have been good enough for manufacturers and their markets. Those days are gone. Manufacturers need to make progress toward world-class status or they won’t be competing against the world in the next generation.

¹ Each NGM strategy section includes the definition for what is considered world-class for that strategy. This summary uses the phrase “at or near world-class status” to refer to those firms that answered “4” or “5” on a scale of 1-5 when asked “Rate your organization’s progress toward world-class” in each of the six NGM strategies (where 1= no progress and 5= fully achieved). Analysis of this “at or near world-class” group vs. “furthest from world-class” (those that answered “1,” “2,” or “3”) shows that the world-class group outperforms across the board — in awareness of NGM strategies, in adoption and implementation of best practices, and in achieving pace-setting financial and operational metrics. This Executive Summary uses these easy-to-understand groups to demonstrate leading and lagging performances in becoming Next Generation Manufacturers.

Size Matters in the Next Generation

Significantly less than half of small U.S. manufacturers (those with less than \$10 million revenues) rate themselves as at or near world-class status in each of the NGM strategies, with the highest percentage for superior process improvement (38% of small firms). This data indicates that a substantial swath of the U.S. manufacturing base is *not yet at a level necessary to compete* in this economy.

It should come as no surprise that many smaller manufacturers are having trouble improving as much or as quickly as larger firms — smaller staffs and scarce resources often limit their capacity for change. Smaller firms were often more likely to believe a strategy was not important, rate themselves as having achieved *no progress* toward world-class for a strategy, report the fewest best practices in place, and achieve the poorest performances. For example, 17% of small manufacturers believe supply-chain management is “not important” or the rating nearest to “not important,” vs. 8% of firms with more than \$10 million in revenues that rated importance similarly; 14% of smaller firms report no progress toward world-class supply-chain management vs. just 5% of larger firms.

Differences in management for small manufacturers are particularly noticeable regarding the existence of measurement systems and review processes for the six NGM strategies. Smaller firms are more likely than larger firms to indicate “no measurement system per se or reviews” for assessing return from a strategy. For example, 38% of manufacturers with revenues of \$10 million or less have no measurement system or reviews in place to assess return from customer-focused innovation vs. just 19% of larger manufacturers.

What Gets Measured in the Next Generation Gets Better

What gets measured, typically gets done. But U.S. manufacturers don’t measure well. The presence of sophisticated measurement systems or review processes is a reliable indicator of an organization’s willingness and ability to continuously improve and an important input for accomplishing NGM strategies. Yet a surprising number of manufacturers lack even rudimentary or ad hoc systems or review processes (i.e., “No measurement systems per se or reviews”): for example, 26% have no measurements systems or reviews in place to track supply-chain management.

Similarly, very few U.S. manufacturers have the most advanced systems in place. Manufacturers were most likely to measure the strategy of process improvement: 34% of manufacturers report “Regular monitoring and review of company-specific metrics by CEO and senior staff” or “Regular monitoring and review of company-specific metrics by CEO and senior staff and transparency and clarity throughout the organization.”

How can companies improve without measurement systems? How can they even hope to become world-class and progress into the next generation?

Going Green in the Next Generation?

While the public at large is rapidly embracing Green, few manufacturers are making a substantial effort to adopt Greener practices and produce Greener products. For example, only 17% of manufacturers have been able to annually reduce their energy usage per unit of product by more than 10%, and only 22% have reduced their use of non-recycled material per unit of product by more than 10%. There's also a surprising lack of interest among many manufacturers in sustainable strategies (16% believe it is "not important").

U.S. manufacturers are reluctant to implement green/sustainable strategies in their firms, and increased education, awareness, or market changes will likely be necessary to increase the importance of green to the nation's manufacturers. Until these manufacturers open their eyes to the importance of a green NGM strategy — and to how far behind they're falling — they have no chance of improvement or of achieving global competitiveness.

Changing Leadership in the Next Generation

One-quarter of manufacturers (25%) have a leadership succession planned in the next five years; another 29% may have a transition in leadership ("maybe"), meaning that more than half of all manufacturers are already considering their own next-generation leaders. This represents a significant challenge *and* opportunity for manufacturers over the next five years.

Transforming a firm into a Next Generation Manufacturer requires leadership, consistency in direction, energy, passion and skill. With so many manufacturing leaders expected to exit executive ranks, it will be critical for these firms facing succession — and critical for policymakers who believe in manufacturing — to address this leadership transition while today's leaders are still in place.

Management succession over the next five years will put into place leadership that will either drive the adoption of NGM strategies and superior performance by the manufacturing base — or do little and see an opportunity for global competitiveness squandered. Will companies bring in NGM-focused leaders, or will they instead opt for more traditional managers without the awareness, skills and daring to seize the growth and leadership available to them? These choices may determine the fates of thousands of organizations in particular and manufacturing in general.

Next Generation Manufacturers Require Support Services

The vast majority of U.S. manufacturers report that assistance in their geographic region — support services, peer groups, training opportunities and resources — exist to some degree in helping them to follow through on NGM strategies. But a high percentage believe that "no support" exists: from a high of 22% (global engagement) to a low 11% (human-capital acquisition, development and retention). In some regions of the country this may be the case, but it's important to note that other factors may be in play.

Manufacturers at or near world-class status for an NGM strategy are more likely to indicate a stronger level of regional support than their non world-class peers. This could mean that world-class manufacturers have greater access to support services, or it could mean that world-class manufacturers are more likely to seek out and engage regional support services.

One Nation of Manufacturers Looking Toward the Next Generation

While NGM Study findings do vary based on the type of company, the highlights illustrated above are similar across regions of the country and across industries. All face the same pressures to compete, the same needs to implement best practices, and the same requirements for performance. Every manufacturer — regardless of industry or location — must either transform itself into a Next Generation organization or accept permanent second- or third-tier profitability.

Profile of NGM Study Companies

The majority of responses to the NGM Study (80%) were received from organizations identified as a “company,” with the other 20% identified as a “division/unit of a larger company.” All product-category manufacturers, as identified by three-digit North American Industry Classification System (NAICS) codes, were represented within the NGM Study sample; industries with the highest number of respondents were fabricated metal product manufacturing and machinery manufacturing, each with 16% of the sample. The NGM Study companies have been in operation for median 32 years (average 41 years), are staffed with median 55 full-time employees (average 445), and generated median annual revenues of \$10 million (average \$159.6 million).

Which of the following describes your organization?	National
Company	79.8%
Division/unit of a larger company	20.2%

Do you anticipate a planned succession of leadership in the next five years?	National
Yes	24.9%
Maybe	29.3%
No	45.9%

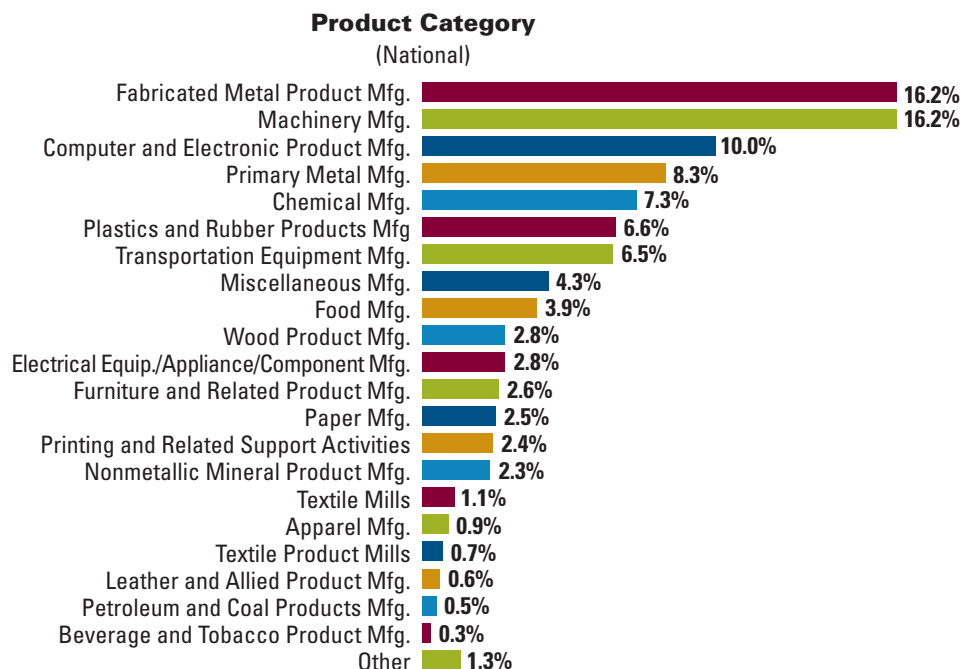
How many years has your organization been in operation?	National
Median	32
Average	41
75th Percentile	55
25th Percentile	19

What are your approximate annual revenues?	National
Median	\$10,000,000
Average	\$159,603,620
75th Percentile	\$30,000,000
25th Percentile	\$3,000,000

How many full-time employees (and equivalents)?	National
Median	55
Average	445
75th Percentile	140
25th Percentile	21

The majority of NGM Study companies (64%) are led by a chief executive who is more than 50 years old; nearly one-fourth of the manufacturers are led by an executive who is more than 60 years old. Not surprisingly, approximately 25% of firms anticipate a planned leadership succession in the next five years.

What is the age of your organization’s chief executive?	National
< 30	0.4%
31–40	5.7%
41–50	29.8%
51–60	40.7%
>60	23.5%

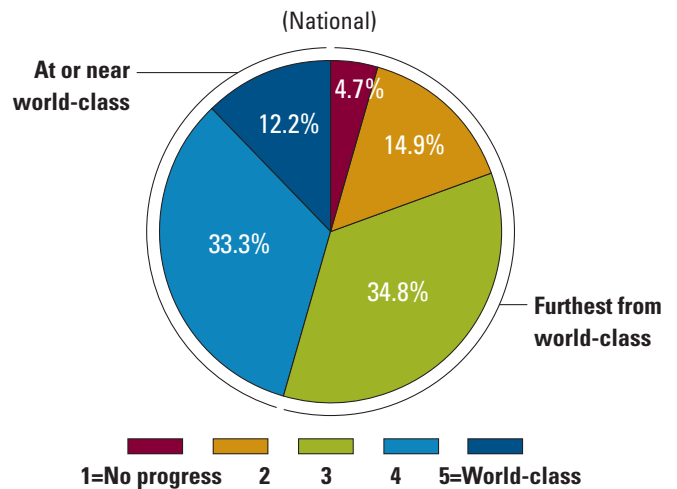


Customer-Focused Innovation

World-class status definition: Develop, make, and market new products and services that meet customers' needs at a pace faster than the competition.

Few facets of a business are more critical to next-generation success than customer-focused innovation — the ability to profitably and continually develop new products focused on customers' needs now and into the next generation. Approximately 12% of manufacturers report that they have achieved world-class status in customer-focused innovation, but 5% report no progress toward world-class status with this NGM strategy. A majority of manufacturers recognize how important this NGM strategy is, as 58% rate customer-focused innovation as highly important to their organization's success over the next five years. Among manufacturers at or near world-class, 72% rate customer-focused innovation as highly important; just 46% of firms furthest from world-class status rate the strategy as highly important.

Rate your organization's progress toward world-class customer-focused innovation:



Rate the importance of customer-focused innovation to your organization's success over the next five years:

	National	Furthest from world-class	At or near world-class
1=Not important	1.8%	3.2%	0.3%
2	3.6%	6.2%	0.6%
3	10.0%	15.7%	3.1%
4	26.4%	28.7%	23.8%
5=Highly important	58.2%	46.3%	72.3%

Like all the NGM strategies, it's important to support customer-focused innovation with both people and dollars. Yet a high percentage of manufacturers appear to do neither. One in five manufacturers (22%) have less than 1% of their workforces dedicated to product development. Similarly, 23% of manufacturers invest less than 1% of sales into product development. Approximately 16% of manufacturers dedicate less than

1% of their workforces and invest less than 1% of sales in product development.

Approximately 23% of manufacturers at or near world-class status have *more than 10%* of their workforces dedicated to product development and 21% have *more than 10%* of sales invested in R&D — vs. just 10% and 9%, respectively, of manufacturers furthest from world-class.

What percentage of your workforce is dedicated to new-product development/R&D?

	National	Furthest from world-class	At or near world-class
<1%	22.2%	30.2%	12.6%
1–5%	43.3%	46.2%	39.9%
6–10%	18.9%	13.8%	24.9%
>10%	15.7%	9.7%	22.6%

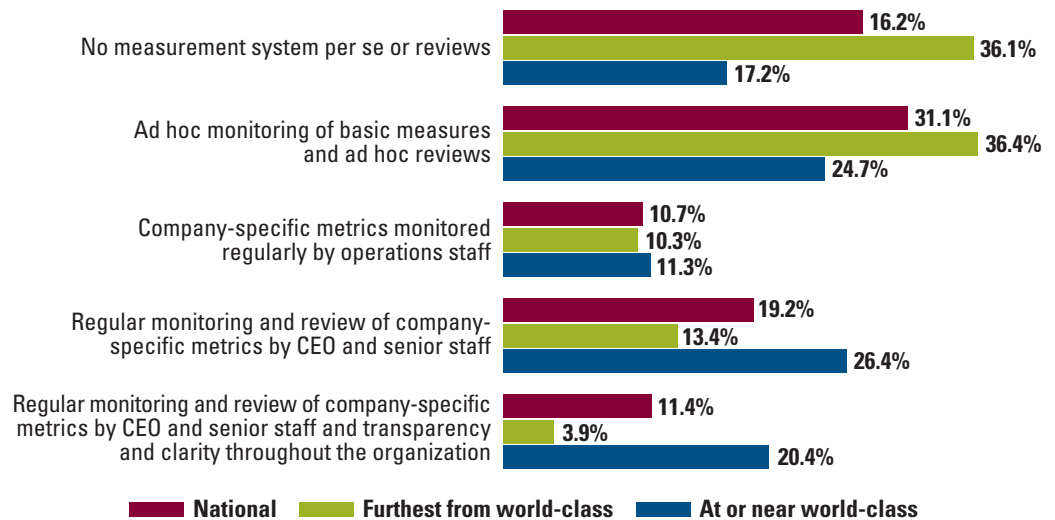
What percentage of sales is dedicated to new-product development/R&D?

	National	Furthest from world-class	At or near world-class
<1%	23.1%	31.0%	13.6%
1–5%	44.7%	46.5%	42.7%
6–10%	17.6%	13.1%	23.1%
>10%	14.6%	9.4%	20.6%

About one-third of manufacturers (31%) have an advanced measurement system in place for reviewing the return on customer-focused innovation (i.e., “Regular monitoring and review of company-specific metrics by CEO and senior staff” or “Regular monitoring and review of company-specific metrics by CEO and senior staff and transparency and clarity throughout the organization”). More than one-fourth of manufacturers (28%) have no system or reviews in place, prompting a question: If a manufacturer is not tracking product launch success (on-budget, on-time, sales, rejects, etc.), how can it expect to improve innovation processes?

Manufacturers at or near world-class status were far more likely to have put in place advanced performance monitoring and management: 47% vs. 17% of firms furthest from world-class status. Nearly three-fourths of manufacturers furthest from world-class innovation (73%) have, at best, ad hoc monitoring and reviews in place.

What best describes your measurement system for reviewing return from customer-focused innovation?



Most manufacturers (58%) annually launch fewer than 5% of total stock-keeping units (SKUs) as new products. A longer (three years) and different view (sales) of innovation finds that 70% of manufacturers derive 5% or more of their annual sales from products introduced in the past three years; one-quarter of manufacturers report that more than 25% of sales are from products introduced in the last three years. Approximately 32% of manufacturers at or near world-class status derive more than 25% of sales from products introduced in the last three years vs. just 18% of manufacturers furthest from world-class status.

How many new products as a percentage of total SKUs are launched annually (count only new SKUs, not a product iteration or line extension)?

	National	Furthest from world-class	At or near world-class
<5%	57.7%	67.6%	46.0%
5–10%	26.5%	21.9%	32.1%
11–20%	9.6%	6.5%	13.4%
>20%	6.1%	4.0%	8.5%

Approximately what percentage of annual sales are derived from products introduced in the past three years?

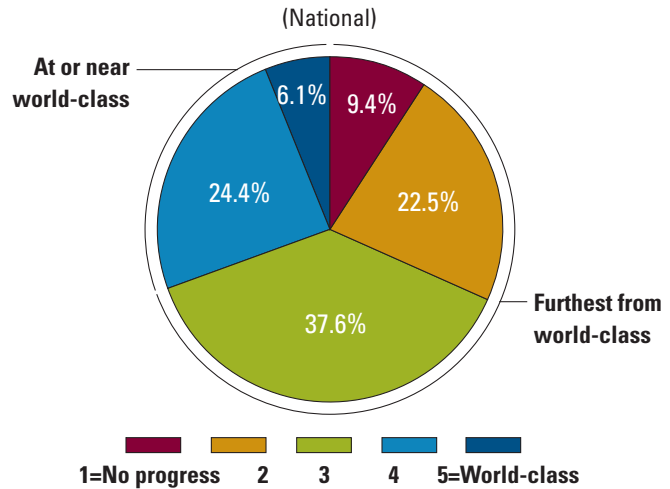
	National	Furthest from world-class	At or near world-class
<5%	30.4%	38.4%	20.8%
5–25%	45.0%	43.4%	47.0%
26–50%	16.0%	12.0%	20.8%
>50%	8.6%	6.3%	11.4%

Engaged People/Human-Capital Acquisition, Development and Retention

World-class status definition: Secure a competitive performance advantage by having superior systems in place to recruit, hire, develop, and retain talent.

Less than one-third of manufacturers (31%) are at or near world-class human-capital acquisition, development and retention; 9% of manufacturers have made no progress toward world-class status. Surprisingly, fewer than half of manufacturers (46%) rate engaged people/human-capital acquisition, development and retention as “highly important” to their organization’s success over the next five years. Manufacturers at or near world-class status were nearly twice as likely to rate human-resource management as important to their firm’s success: 70% vs. 36% of firms furthest from world-class status.

Rate your organization’s progress toward world-class human-capital acquisition, development and retention:



Rate the importance of human-capital acquisition, development and retention to your organization’s success over the next five years:

	National	Furthest from world-class	At or near world-class
1=Not important	2.5%	3.6%	0.1%
2	6.1%	8.7%	0.1%
3	14.6%	20.0%	2.5%
4	30.8%	32.2%	27.7%
5=Highly important	45.9%	35.5%	69.5%

Approximately one-third of manufacturers (31%) have a *majority* of their employees regularly participating in empowered work teams. Yet empowered workers are sparse at many firms: 41% of manufacturers have less than a quarter of their workforces participating in empowered teams. Half of manufacturers at or near world-class status (50%) have a *majority* of their employees regularly participating in empowered work teams vs. 23% of firms furthest from world-class status.

Training is essential to implement modern manufacturing strategies, allowing employees to learn how to solve problems and seek improvements on their own — yet 30% of manufacturers offer less than 8 hours of training annually to employees; only 11% offer more than 40 hours. Approximately 44% of manufacturers at or near world-class status train each employee more than 20 hours annually vs. 23% of firms furthest from world-class status.

What percentage of employees regularly participate in empowered work teams (i.e., make decisions without supervisor approval)?

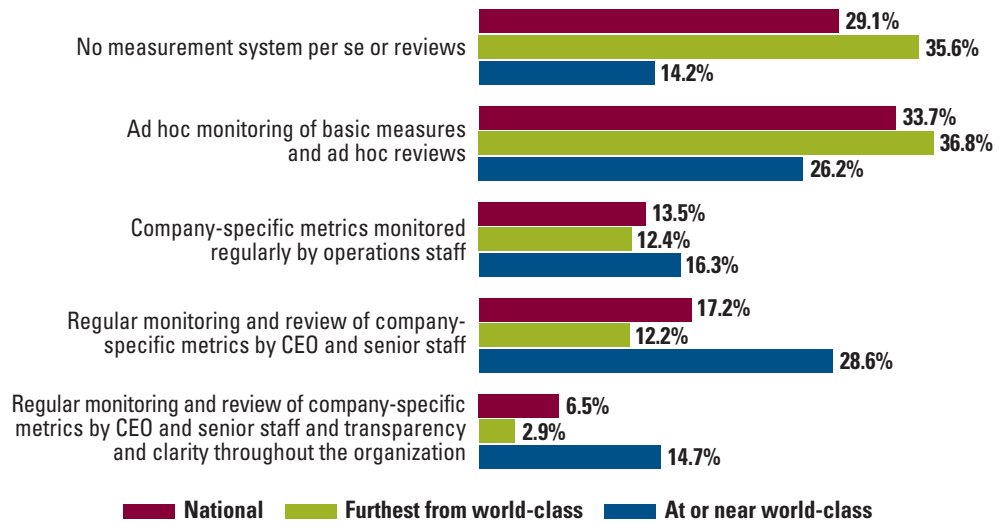
	National	Furthest from world-class	At or near world-class
<25%	41.4%	48.8%	24.5%
25–50%	27.6%	28.6%	25.2%
51–75%	17.8%	14.5%	25.6%
76–90%	8.0%	5.1%	14.7%
>90%	5.2%	3.1%	10.1%

How many formal training hours are devoted annually to each employee?

	National	Furthest from world-class	At or near world-class
8 or fewer	29.6%	36.1%	15.2%
9–20	41.1%	41.3%	40.4%
21–40	18.8%	16.0%	25.3%
>40	10.5%	6.6%	19.1%

In order to develop, nurture and hold on to talented individuals, manufacturers must have an adequate HR staff to recruit and hire, manage compensation and benefits programs, coordinate skills and technical training, and manage individual performances. Approximately 29% of manufacturers dedicate less than 1% of employees to assessing and upgrading the talent pool, and, similarly, 29% have no measurement systems or reviews in place to measure return on HR efforts. More than one-third of manufacturers at or near world-class status (38%) have more than 5% of employees dedicated to assessing and upgrading the talent pool, and 43% are using advanced measurements and reviews for the HR function.

What best describes your measurement system for reviewing return from human-capital acquisition, development and retention?



What percentage of employees are dedicated to assessing and upgrading your organization’s talent pool?

	National	Furthest from world-class	At or near world-class
<1%	28.5%	34.0%	15.8%
1–5%	46.7%	46.8%	46.4%
6–10%	16.1%	13.2%	22.8%
>10%	8.7%	6.0%	14.9%

Two NGM output measures with which to evaluate human-resources effectiveness are value-added per employee (an indicator of labor contribution to product value) and labor turnover (satisfaction of employees with the company, and of management with employees). A majority of all manufacturers (72%) report value-added

per employee of \$125,000 or lower, and 38% report labor turnover of more than 5%. Value-add per employee is higher among manufacturers at or near world-class status — 47% indicate value add is more than \$125,000. Approximately 68% of manufactures at or near world-class status report labor turnover of 5% or less.

What is your value-added per employee ([sales – cost of materials] ÷ number of employees)?

	National	Furthest from world-class	At or near world-class
< \$75,000	34.9%	38.2%	27.5%
\$75,000–\$125,000	37.1%	38.1%	35.3%
\$125,001–\$175,000	17.2%	15.0%	21.9%
> \$175,000	10.8%	8.7%	15.3%

What is your organization’s annual labor turnover rate (number of voluntary and involuntary separations ÷ typical staffing level)?

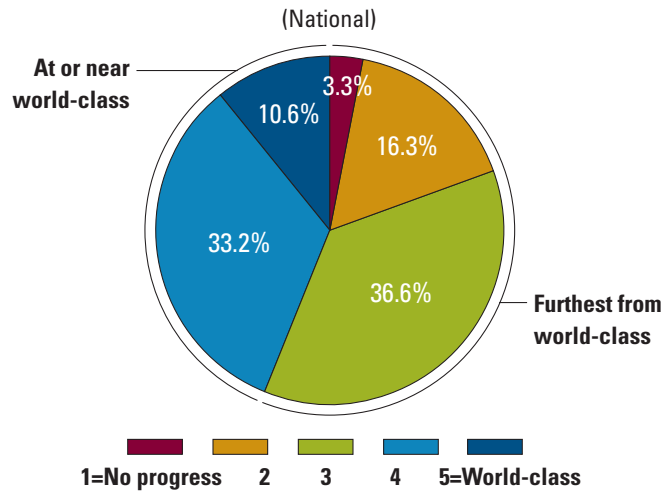
	National	Furthest from world-class	At or near world-class
0%	8.2%	8.3%	8.2%
0.1–1%	21.1%	20.0%	23.8%
1.1–5%	32.6%	31.1%	36.0%
5.1–10%	24.5%	24.7%	23.8%
>10%	13.6%	16.0%	8.2%

Superior Processes/Improvement Focus

World-class status definition: Record annual productivity and quality gains that exceed the competition through a companywide commitment to continuous improvement.

Core to every manufacturer is the capability to produce goods and continuously improve the processes that enable efficient production. Eleven percent of manufacturers report they have world-class processes and process improvement. A majority of manufacturers (60%) recognize the importance of having superior processes and a process-improvement focus. Almost three-fourths of manufacturers (73%) at or near world-class status for this strategy view process improvement as highly important to their success over the next five years; just half of manufacturers furthest from world-class status (50%) rate it as highly important.

Rate your organization's progress toward world-class processes and process improvement:



Rate the importance of process improvement to your organization's success over the next five years:

	National	Furthest from world-class	At or near world-class
1=Not important	0.8%	1.3%	.2%
2	2.8%	4.8%	.3%
3	10.1%	16.0%	2.6%
4	26.5%	28.3%	24.2%
5=Highly important	59.8%	49.6%	72.7%

Ideally, everyone in a company is engaged in a company's improvement method or approach, from shop-floor operators to office staff to sales representatives. Yet only 10% of manufacturers have 100% of their workforces engaged in their improvement approaches; 44% of manufacturers have a majority of the workforces engaged. Two-thirds of manufacturers at or near world-class status for this strategy (65%) have a majority of their workforces

engaged in their improvement approaches vs. 28% of manufacturers furthest from world-class status.

Approximately 58% of manufacturers invest 5% or less of sales in capital equipment (three-year average). Half of manufacturers at or near world-class status (50%) invest *more than 5%* in capital equipment vs. 25% of manufacturers furthest from world-class status.

What percentage of your workforce has been fully engaged in your organization's specific improvement method/approach?

	National	Furthest from world-class	At or near world-class
<26%	33.3%	47.1%	15.5%
26–50%	22.8%	25.0%	19.7%
51–75%	19.4%	15.2%	24.8%
76–99%	15.1%	7.6%	24.8%
100%	9.5%	5.1%	15.2%

What is your organization's investment in capital equipment as a percentage of sales (three-year average)?

	National	Furthest from world-class	At or near world-class
<1%	10.2%	13.1%	6.5%
1–5%	48.1%	51.9%	43.2%
6–10%	28.1%	24.9%	32.3%
>10%	13.6%	10.1%	17.9%

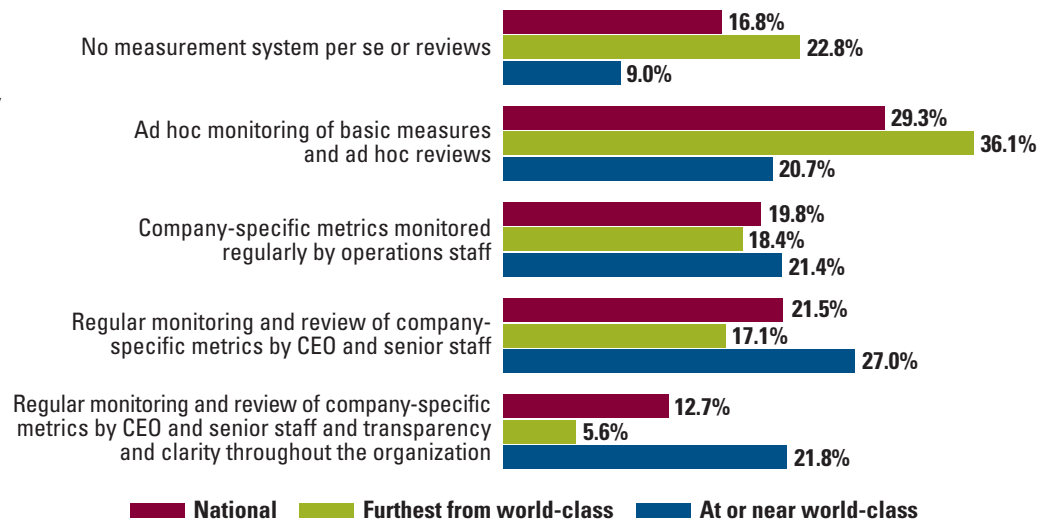
Production performances and metrics are some of the easiest measures for a manufacturer to monitor, yet, surprisingly, 17% of manufacturers have no measurement systems or review processes in place; 33% of firms have advanced systems or reviews in place. Approximately 49% of manufacturers at or near world-class status have advanced measurement systems and reviews vs. 23% of firms furthest from world-class status.

With customers demanding more value and lower costs, manufacturers must ensure “perfect deliveries,” delight customers and increase productivity.

While some excel in these areas, others struggle:

- *Perfect deliveries more than 98% of the time:* 29% of all manufacturers; 33% of manufacturers at or near world-class status vs. 25% of manufacturers furthest from world-class status.
- *Highest level of customer satisfaction:* 48% of all

What best describes your measurement system for reviewing return from process improvements?



manufacturers; 55% of manufacturers at or near world-class status vs. 42% of manufacturers furthest from world-class status

- *Three-year productivity increase of more than 50%:* 22% of all manufacturers; 31% of manufacturers at or near world-class status vs. 16% of manufacturers furthest from world-class status.

What percentage of deliveries reach customers in perfect order (on time, high quality, to all customer specifications)?

	National	Furthest from world-class	At or near world-class
<80%	6.6%	8.8%	3.7%
80–90%	14.7%	16.7%	12.3%
91–95%	21.1%	21.9%	20.2%
96–98%	28.8%	27.5%	30.5%
>98%	28.8%	25.1%	33.4%

Describe your customers’ satisfaction with your overall performance?

	National	Furthest from world-class	At or near world-class
Threatens to pull business because we don’t match the competition	1.8%	2.2%	1.3%
Indifferent to buying our product or competitors	4.7%	7.0%	1.7%
Preference for our products by virtue of price, quality, and delivery performance	45.7%	48.9%	41.8%
Strong loyalty to our products due to ongoing trust in our organization’s people and capabilities	47.7%	41.9%	55.2%

By what percentage has productivity (i.e., value add) improved over the past three years?

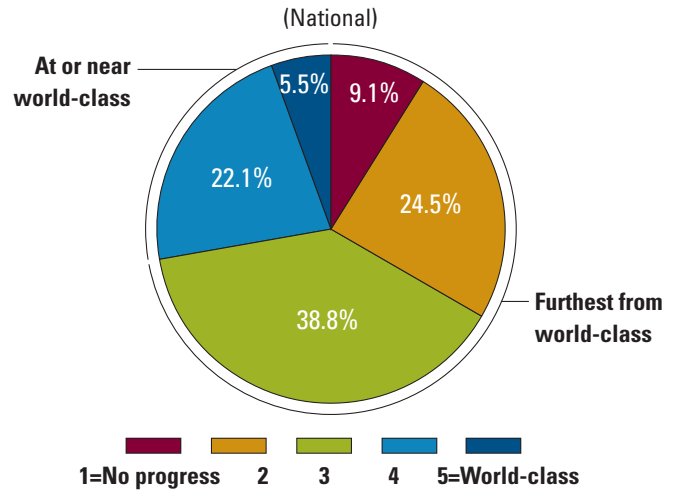
	National	Furthest from world-class	At or near world-class
<25%	43.3%	53.2%	30.5%
26–50	34.2%	31.1%	38.2%
51–75%	14.7%	11.4%	19.0%
76–99%	5.7%	3.0%	9.3%
>100%	2.0%	1.2%	3.1%

Supply-Chain Management & Collaboration

World-class status definition: Develop and manage supply chains and partnerships that provide flexibility, response time, and delivery performance that exceeds the competition.

For many manufacturers, managing internal processes and functions is a challenge; managing processes external to the company is even more difficult. For example, only 6% of manufacturers report world-class status for supply-chain management and collaboration. Just 38% of manufacturers deem this NGM strategy to be highly important for success over the next generation, which is surprising given that every manufacturer has external supply-chain relations. Again, however, manufacturers at or near world-class status are far more likely to recognize the importance of this NGM strategy: 61% rate it highly important vs. 29% of firms furthest from world-class status.

Rate your organization's progress toward world-class supply-chain management and collaboration:



Rate the importance of supply-chain management and collaboration to your organization's success over the next five years:

	National	Furthest from world-class	At or near world-class
1=Not important	3.6%	4.8%	0.1%
2	8.8%	12.2%	0.0%
3	19.4%	25.3%	4.2%
4	30.6%	29.1%	34.6%
5=Highly important	37.6%	28.6%	61.0%

As with other NGM strategies, supply-chain management and collaboration requires:

- **Employees dedicated to the strategy:** 75% of manufacturers have 5% or less of their workforces engaged in supply-chain operations. Approximately 44% of manufacturers at or near world-class supply-chain management and collaboration have more than 5% of their workforces engaged in supply-chain operations vs. 18% of firms furthest from world-class status.
- **Investments:** 79% invest 5% or less of sales in information technologies (three-year average). One-third of manufacturers at or near world-class status (34%) invest

more than 5% in information technologies vs. just 17% of firms furthest from world-class status.

- **Measurement systems:** 57% have either no measurement systems or reviews or, at best, ad hoc systems and reviews. Approximately 45% of manufacturers at or near world-class status have advanced measurements systems ("Regular monitoring and review of company-specific metrics by CEO and senior staff" or "Regular monitoring and review of company-specific metrics by CEO and senior staff and transparency and clarity throughout the organization") vs. 17% of firms furthest from world-class status.

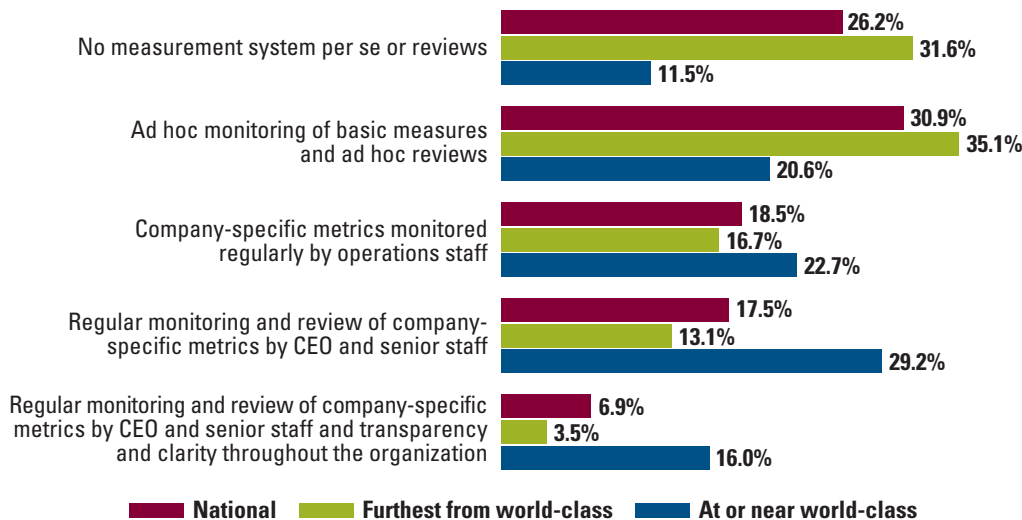
What percentage of your workforce is dedicated to supply-chain and partner development, management, and collaboration?

	National	Furthest from world-class	At or near world-class
<1%	24.2%	30.0%	8.5%
1-5%	50.6%	52.2%	47.1%
6-10%	17.7%	13.7%	28.1%
>10%	7.5%	4.2%	16.3%

What is your organization’s investment in information technologies (hardware and software) as a percentage of sales (three-year average)?

	National	Furthest from world-class	At or near world-class
<1%	28.8%	32.7%	18.7%
1–5%	49.9%	50.9%	47.3%
6–10%	15.1%	12.1%	23.0%
>10%	6.2%	4.4%	11.0%

What best describes your measurement system for reviewing return from supply-chain management and collaboration?



Assessing the performance of a supply-chain is complex and encompasses myriad metrics (e.g., quality, timeliness, reliability) and cost factors (e.g., carrying costs, transportation). The NGM Study identified overall characteristics of supply chains in which manufacturers participate. Approximately one in 10 manufacturers described their supply chains as advanced and fully able to respond to unexpected customer demand for existing

products — “Real-time communication of demand signal and entire supply chain flexible to demand spikes — standard delivery times consistently met and just-in-time inventories.” Manufacturers at or near world-class status were far more likely to identify their supply chains as advanced: 23% vs. 9% of firms furthest from world-class status.

What best describes your end-to-end supply chain's ability to respond to unexpected customer demand for existing products?

	National	Furthest from world-class	At or near world-class
Major delays communicating demand signal throughout chain and most suppliers struggle to efficiently meet demand — standard delivery times dramatically exceeded and/or excessive inventory	4.4%	5.6%	1.4%
Minor delays in communicating demand signal throughout chain and some suppliers struggle to efficiently meet demand — standard delivery time exceeded and/or too much inventory	33.0%	38.9%	18.3%
Efficient communication of demand signal throughout chain with most suppliers efficiently satisfying demand — standard delivery times nearly met and right-sized inventories	50.1%	47.0%	57.3%
Real-time communication of demand signal and entire supply chain flexible to demand spikes — standard delivery times consistently met and just-in-time inventories	12.6%	8.5%	23.0%

While individual firms across the U.S. have frequently boasted of their ability to manage inventories, it's clear that some of that management was merely shifting inventory to suppliers. More than half of manufacturers (53%) report that the total value of inventory in their supply chains has been reduced by less than 10% over the last three years. Manufacturers at or near world-class status are more likely to have success influencing inventory across their chains (21% have reduced supply-chain inventory by more than 25%), but others, even at the world-class level, have made only small reductions (40% have reduced inventory by less than 10%).

An important byproduct of reduced inventory in the supply chain is the ability to quickly respond to customer

demand and get new products to market. Few manufacturers describe their supply chains as advanced in this area: Only 23% identified their supply chain as either "Strategic suppliers and customers are active participants in our operations, continuous improvement, and product development efforts" or "Strategic suppliers and customers are active participants in our operations, continuous improvement, and product development efforts and participate fully in strategic planning and identifying and responding to new markets." Approximately 42% of manufacturers at or near world-class status described their supply chains in these ways vs. just 15% of firms furthest from world-class status.

By approximately what percentage has total value of inventory throughout the supply chain for your primary product (furthest supplier to end customer) been reduced over the last three years?

	National	Furthest from world-class	At or near world-class
<10%	52.8%	57.5%	40.3%
10–25%	33.0%	30.9%	38.6%
26–50%	10.9%	8.9%	16.2%
>50%	3.3%	2.7%	4.9%

How is your supply chain a competitive advantage in terms of flexibility and speed to the marketplace?

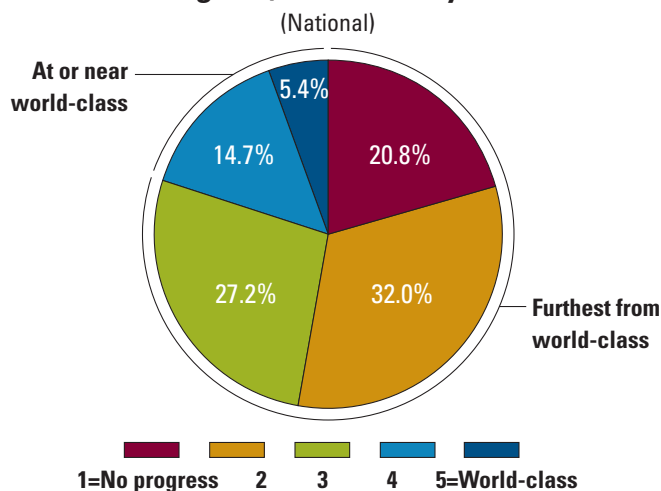
	National	Furthest from world-class	At or near world-class
Suppliers regularly measured on cost, quality, and delivery performance	34.9%	42.2%	16.2%
Suppliers regularly measured on cost, quality, and delivery performance as well as total acquisition cost	11.8%	12.4%	10.6%
Suppliers regularly measured on cost, quality, and delivery performance as well as total acquisition cost and "soft" qualities (e.g., trust, flexibility)	30.7%	30.1%	31.7%
Strategic suppliers and customers are active participants in our operations, continuous improvement, and product development efforts	17.2%	12.9%	27.9%
Strategic suppliers and customers are active participants in our operations, continuous improvement, and product development efforts and participate fully in strategic planning and identifying and responding to new markets	5.5%	2.4%	13.6%

Green/Sustainability

World-class status definition: Design and implement waste and energy-use reductions at a level that provides superior cost performance and recognizable customer value.

Only 20% of manufacturers rate themselves as at or near world-class status in green/sustainability; 21% report no progress toward world-class status in green/sustainability. Contributing to this is the high percentage of manufacturers that believe green is not important (16%). Yet 50% of manufacturers at or near world-class status in green/sustainability believe this strategy is highly important vs. just 7% of firms furthest from world-class status.

Rate your organization's progress toward world-class green/sustainability:



Rate the importance of green/sustainability to your organization's success over the next five years:

	National	Furthest from world-class	At or near world-class
1=Not important	15.6%	19.1%	1.4%
2	22.6%	27.2%	4.4%
3	26.7%	31.0%	10.1%
4	19.4%	15.7%	34.2%
5=Highly important	15.7%	7.0%	49.9%

Many manufacturers have done little to provide the resources to manage green/sustainability: 45% have dedicated less than 1% of their workforces to reducing energy, material or emissions in their operations, and 55% have less than 1% of their workforces dedicated to green

products. Manufacturers at or near world-class status are at the other end of the green spectrum: 86% have 1% or more of their workforces dedicated to reducing energy, material and emissions, and 82% have 1% or more dedicated to green products.

What percentage of your workforce is dedicated to reducing energy, material, or emissions in your operations?

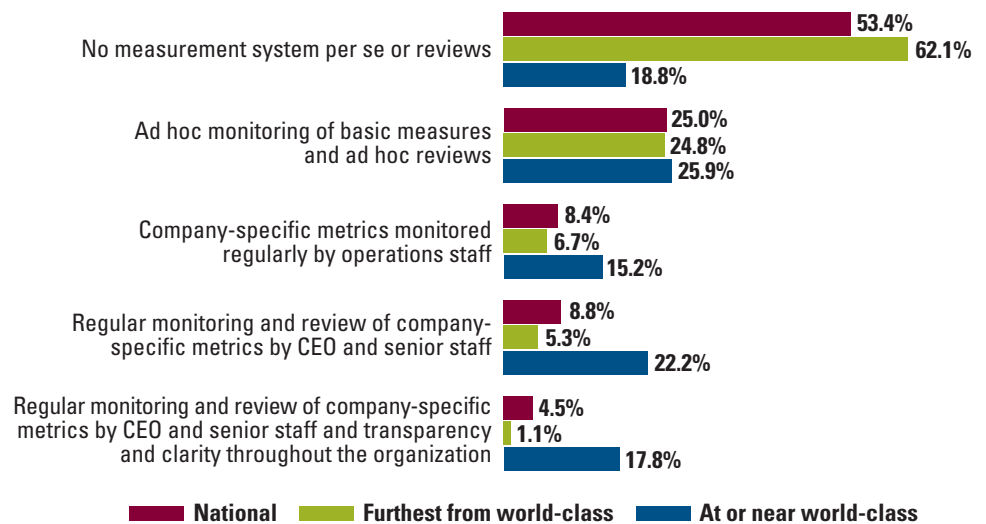
	National	Furthest from world-class	At or near world-class
<1%	45.0%	52.8%	14.2%
1-5%	33.6%	33.2%	34.9%
6-10%	8.9%	6.5%	18.4%
>10%	12.5%	7.5%	32.5%

What percentage of your workforce is dedicated to green products (product and packaging impact, green products and markets)?

	National	Furthest from world-class	At or near world-class
<1%	54.5%	63.6%	17.9%
1-5%	28.3%	26.9%	33.9%
6-10%	8.4%	5.4%	20.3%
>10%	8.9%	4.1%	27.9%

A majority of manufacturers (54%) have no measurement systems or reviews in place to assess return on green/sustainability efforts, and relatively few (13%) have advanced systems or reviews in place. The perspective from manufacturers at or near world-class status offers a sharp contrast, as 40% have advanced systems or reviews in place vs. just 6% of firms furthest from world-class. With fuel costs rising, energy credits available, and green trade regulations emerging, it's surprising that so few firms are monitoring operations in this area.

What best describes your measurement system for reviewing return from Green/Sustainability efforts?



The majority of manufacturers have achieved little in the way of green performance metrics:

- **Energy usage:** 83% of all manufacturers have annual reductions of energy per unit of product of less than 10%; 37% of manufacturers at or near world-class status are reducing energy annually by 10% or more vs. 11% of manufacturers furthest from world-class green/sustainability.
- **Recycled material:** 78% of all manufacturers have annual reductions in the usage of non-recycled material per unit of product of less than 10%; 48% of manufacturers at or

near world-class status have reduced non-recycled materials annually by more than 10% vs. 16% of manufacturers furthest from world-class green/sustainability.

- **Recyclable/reusable products:** 60% of all manufacturers report that less than half of their products are completely recyclable/reusable; 59% of manufacturers at or near world-class status report that more than half of their products are completely recyclable/reusable vs. 35% of manufacturers furthest from world-class green/sustainability.

What is your annual reduction in energy per unit of product output?

	National	Furthest from world-class	At or near world-class
<10%	83.4%	88.5%	63.0%
10–25%	14.0%	10.1%	29.4%
26–50%	2.1%	1.2%	5.8%
>50%	0.5%	0.2%	1.9%

What is your annual reduction in usage of non-recycled material per unit of product output?

	National	Furthest from world-class	At or near world-class
<10%	77.6%	84.0%	51.6%
10–25%	16.6%	12.9%	31.5%
26–50%	3.3%	1.7%	9.4%
>50%	2.6%	1.4%	7.5%

What percentage of your products (by sales volume) are completely completely recyclable/reusable?

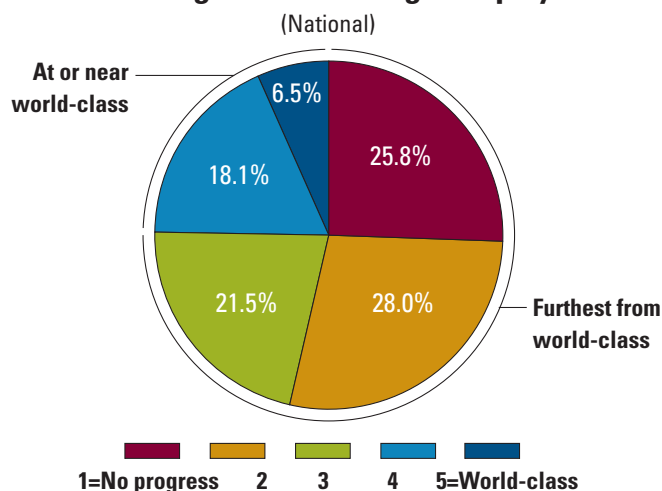
	National	Furthest from world-class	At or near world-class
<50%	59.9%	64.5%	41.2%
51–75%	8.7%	8.1%	11.0%
76–89%	9.5%	8.7%	12.8%
90–99%	13.8%	11.9%	21.1%
100%	8.2%	6.8%	13.9%

Global Engagement

World-class status definition: Secure business advantages by having people, partnerships, and systems in place capable of engaging global markets and talents better than the competition.

Few manufacturers consider themselves at or near world-class status when it comes to being a global player; just 7% are world-class and another 18% are near world-class. More than one-quarter of manufacturers (26%) report no progress toward world-class global engagement. Believing that global engagement is important goes a long way toward achieving world-class status; two-thirds of manufacturers at or near world-class status rate global engagement as highly important vs. just 15% of firms furthest from world-class status.

Rate your organization's progress toward becoming a world-class global player:



Rate the importance of global engagement to your organization's success over the next five years:

	National	Furthest from world-class	At or near world-class
1=Not important	18.1%	23.9%	0.2%
2	18.1%	23.8%	0.8%
3	17.5%	21.7%	4.9%
4	18.6%	15.7%	27.5%
5=Highly important	27.7%	14.9%	66.6%

Global engagement for a U.S. firm requires a workforce in other countries or in the U.S. directing international operations, yet a majority of manufacturers report 0% of their workforces located overseas and/or located domestically and responsible for global business activities. Approximately 82% of manufacturers at or near world-class status have *someone* dedicated to global business in this manner vs. only 35% of firms furthest from world-class status.

What percentage of your total direct workforce is located overseas and/or located domestically and responsible for global business activities?

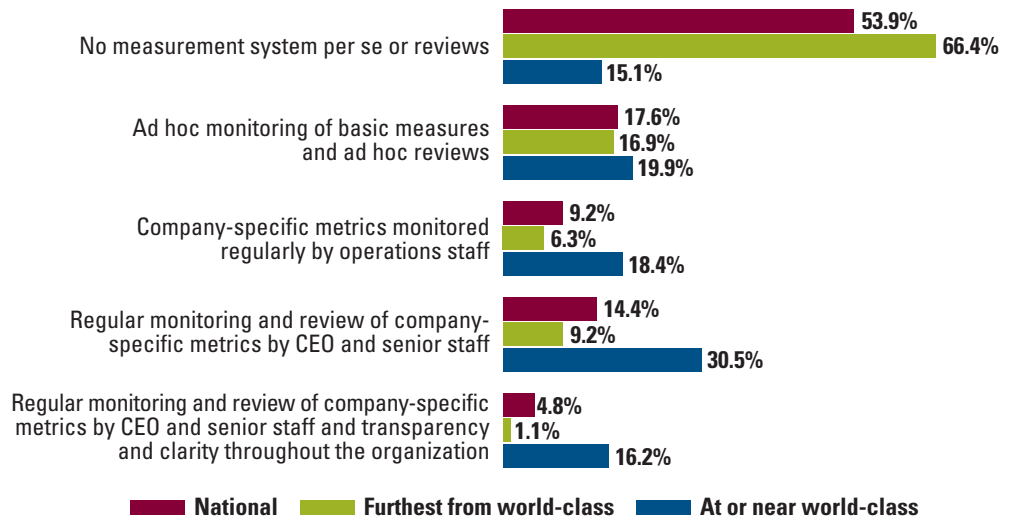
	National	Furthest from world-class	At or near world-class
0%	53.7%	65.3%	17.6%
1-25%	38.5%	32.2%	58.3%
26-50%	4.8%	1.8%	14.1%
>50%	3.0%	0.7%	10.0%

Some 54% of manufacturers don't have the measurement systems or review processes in place to assess returns on global engagement; conversely, 47% of manufacturers at or near world-class status have advanced systems or reviews ("Regular monitoring and review of company-specific metrics by CEO and senior staff" or "Regular monitoring and review of company-specific metrics by CEO and senior staff and transparency and clarity throughout the organization") in place vs. just 10% of firms furthest from world-class status. Surprisingly, even among firms that believe global engagement is highly important, 22% still have no measurement systems or reviews in place.

Most U.S. manufacturers are doing little to increase the pace of sales outside of their home market: 75% report that over the past three years sales outside the U.S. have increased by less than 25%; only 5% of manufacturers have increased non-U.S. sales by 51–100% and just 3% have increased non-U.S. sales by more than 100%. One in five manufacturers at or near world-class status (20%) have increased non-U.S. sales by more than 50% vs. just 4% of firms furthest from world-class.

Some 56% of manufacturers do not operate or partner in a production facility outside the U.S., and 54% do not have sales and/or distribution facilities outside the U.S. Approximately 41% of manufacturers have *neither* a production nor a sales/distribution presence outside the U.S.; 32% of manufacturers have *both* a production and

What best describes your measurement system for reviewing return from global engagement?



sales/distribution presence outside the U.S. Among manufacturers at or near world-class status, 62% have both a production and sales/distribution presence outside the U.S. vs. just 22% of firms furthest from world-class status.

By what percentage has dollar volume of sales outside the United States changed over the past three years?

	National	Furthest from world-class	At or near world-class
<25%	74.6%	83.9%	46.0%
26–50%	17.4%	11.8%	34.5%
51–100%	5.3%	2.7%	13.6%
>100%	2.7%	1.6%	6.0%

In how many countries outside of the United States does your organization operate or partner in production facilities?

	National	Furthest from world-class	At or near world-class
0	55.5%	65.3%	25.2%
1–5	32.4%	28.4%	44.6%
6–10	5.5%	3.5%	11.6%
>10	6.7%	2.9%	18.5%

In how many countries outside of the United States does your organization have sales and/or distribution facilities?

	National	Furthest from world-class	At or near world-class
0	53.6%	62.8%	25.3%
1–5	29.3%	27.1%	35.7%
6–10	6.3%	4.6%	11.7%
>10	10.8%	5.5%	27.3%

Going Forward

The *Going Forward* section of the NGM Study was developed to assess manufacturers' perceptions of the level of support services, peer groups, training opportunities, and resources available in their geographic regions specific to each NGM strategy. For each NGM strategy, a sizeable percentage believed that "no support" was available, ranging from a high of 21% (global engagement) to a low of 11% (human capital acquisition, development and retention). But, similarly, many manufacturers indicate "full support," ranging from a high of 14% (superior processes/improvement focus) to a low of 7% (global engagement).

But perceived levels of support and actual support available may differ. For example, approximately 4% of all manufacturers report that they are *at or near* world-class status for all of the six NGM strategies. This is a small but elite group of performers. The tables below show this group ("at or near world-class in all NGM strategies) compared to all "other manufacturers." This cross-tabulation of NGM Study data provides evidence to suggest that world-class firms may be more likely to look for and recognize support.

To what extent does the geographic region in your state have the support services, peer groups, training opportunities and resources available to support the following?

	Furthest from National	Other manufacturers	At or near world-class in all NGM strategies
Customer-focused innovation			
1=No support	14.9%	15.1%	8.8%
2	24.2%	24.7%	14.3%
3	30.3%	30.5%	19.8%
4	20.3%	20.2%	28.6%
5=Full support	10.3%	9.5%	28.6%
Engaged people/Human-capital acquisition, development and retention			
1=No support	10.7%	10.8%	5.5%
2	24.9%	24.9%	16.5%
3	31.9%	32.5%	26.4%
4	22.5%	22.4%	26.4%
5=Full support	10.0%	9.4%	25.3%
Superior processes/Improvement focus			
1=No support	11.6%	11.5%	7.8%
2	19.4%	19.4%	14.4%
3	28.4%	28.9%	17.8%
4	27.0%	27.1%	32.2%
5=Full support	13.7%	13.0%	27.8%
Customer-focused innovation			
1=No support	14.9%	15.1%	8.8%
2	24.2%	24.7%	14.3%
3	30.3%	30.5%	19.8%
4	20.3%	20.2%	28.6%
5=Full support	10.3%	9.5%	28.6%
Engaged people/Human-capital acquisition, development and retention			
1=No support	10.7%	10.8%	5.5%
2	24.9%	24.9%	16.5%
3	31.9%	32.5%	26.4%
4	22.5%	22.4%	26.4%
5=Full support	10.0%	9.4%	25.3%
Superior processes/Improvement focus			
1=No support	11.6%	11.5%	7.8%
2	19.4%	19.4%	14.4%
3	28.4%	28.9%	17.8%
4	27.0%	27.1%	32.2%
5=Full support	13.7%	13.0%	27.8%

Conclusion — Becoming a Next Generation Manufacturer

The business strategies and best practices that comprise Next Generation Manufacturing are familiar to manufacturers, but the focus on these six strategies — and the effort put into implementing associated best practices — varies widely. These differences correlate to dramatic performance differences, juxtaposing “world-class” performance in a specific NGM strategy against the struggles of other manufacturers. Data from the Next Generation Manufacturing Study confirms:

1. Those firms at or near world-class status in any given NGM strategy are far more likely to recognize the importance of that NGM strategy.
2. Manufacturers at or near world-class status in any given NGM strategy achieve superior performance by managing in significantly different ways, including being more likely to use best practices and investing in NGM strategies.
3. Firms at or near world-class status in any given NGM strategy are more likely to outperform firms furthest from world-class status.

The opportunity for manufacturers to adopt Next Generation Manufacturing strategies is both urgent and compelling — as are the opportunities for local, state and national organizations and governments to support manufacturers with programs centered on Next Generation Manufacturing strategies. The data is clear: Next Generation Manufacturers will outperform their competitors in the years to come, achieving market prominence for themselves and helping to secure economic prosperity for the locales in which they operate. The only questions are: Which manufacturers — supported by resources in their regions — will get to the Next Generation first? More importantly, perhaps: What will the future look like for those manufacturers and regions that fail to adopt these strategies, and fall even farther behind?

NGM Organizations

The NGM Study was coordinated by the American Small Manufacturers Coalition (ASMC); conducted by the Manufacturing Performance Institute (MPI); and supported by Manufacturing Extension Partnership (MEP) centers and partnering organizations.

ASMC is a trade association of manufacturing extension agents who work to improve the innovation and productivity of America's manufacturing community. One ASMC program of primary focus is the National Institute of Standards and Technology (NIST) MEP program.

The MEPs that participated in the NGM Study, either on a state basis or as part of a region of states, are:

- Dakotas: The Dakota Manufacturing Extension Partnership Inc. (www.dakota.mep)
- Florida MEP (www.florida.mep)
- Illinois Manufacturing Extension Center (www.imec.org)
- Kentucky Manufacturing Assistance Center (www.kmac.org)
- Missouri Enterprise (www.missourienterprise.org)
- New England — Maine MEP (www.mainemep.org), Massachusetts MEP (www.massmep.org), New Hampshire MEP (www.nhmep.org), Rhode Island Manufacturing Extension Services (www.rimes.org), and Vermont Manufacturing Extension Center & Process Strategies Group (www.vmec.org)
- New Jersey Manufacturing Extension Program (www.njmep.org)
- Ohio: MAGNET (www.magnetnetwork.org) and TechSolve (www.techsolve.org)
- Oklahoma Manufacturing Alliance (www.okalliance.com)
- Pennsylvania Industrial Resource Centers (IRC) Network (www.pairc.net)
- South Carolina Manufacturing Extension Partnership (www.scmep.org)
- Texas Manufacturing Assistance Center (www.tmac.org)
- Wisconsin Manufacturing Extension Partnership (www.wmep.org)

Methodology

The NGM Study was conducted using an online questionnaire. Respondents also had access to a PDF version of the questionnaire that they could complete and mail back as a hard copy. A total of 2,529 manufacturers participated. Most responses were received in February, March, and April 2009; a majority of respondents from Wisconsin participated in a pilot of the NGM Study in late 2008. MEPs in participating states used various techniques to promote study participation. Responses to the NGM Study were received by MPI; then entered into a database, edited, and cleansed to ensure answers were plausible, where necessary. Most questions were answered by most respondents; the least-answered question had 1,951 responses.

All respondent answers to the survey are confidential. As incentives, respondents who provided contact information along with their specific responses were offered a copy of an NGM Performance Report, which shows their responses next to answer categories comparable to their own organizational profiles. Respondents who wished to remain anonymous while completing the questionnaire could provide contact information at a separate website and, as their incentive, receive a data report of all statistics for the NGM Study.

NEXT GENERATION MANUFACTURING STUDY

National Executive Summary

Prepared by the Manufacturing Performance Institute

