Next Generation Manufacturing Study

New England Executive Summary

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 — 195 from New England. This summary presents the results of New England manufacturers next to responses from all manufacturers nationwide that participated.

The NGM Study was coordinated by the American Small Manufacturers Coalition (an association of Manufacturing Extension Partnership centers and partners); conducted by the Manufacturing Performance Institute (MPI); and 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 New England NGM Study was commissioned by the Maine MEP, Massachusetts MEP, New Hampshire MEP, RIMES (Rhode Island Manufacturing Extension Services), and VMEC (Vermont Manufacturing Extension Center).

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 U.S. 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 in New England and across the U.S. are already being guided by NGM philosophies. 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 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 be proactive in implementing NGM strategies. But 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.

Table of Contents

Introduction 1
Table of contents 3
NGM Study Highlights 4
Reading Tables in This Summary 7
Profile of NGM Study Companies 8
Customer-Focused Innovation 10
Engaged People/Human Capital Acquisition, Development and Retention 12
Superior Processes/Improvement Focus 14
Supply-Chain Management and Collaboration 16
Green/Sustainability 19
Global Engagement 21
Going Forward 23
Conclusion — Becoming a Next Generation Manufacturer 25
Methodology 26
NGM Organizations 26

NGM Study Highlights

The Next Generation Manufacturing (NGM) Study points to a clear path for New England manufacturers 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 New England manufacturers and U.S. manufacturing in general. 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. New England manufacturers identify customer-focused innovation (60% of manufacturers rated it "highly important") and superior process improvement (57%) as the most important NGM strategies to their firms' success over the next five years. Receiving less attention among New England manufacturers were human-capital acquisition, development and retention (46%); supply-chain management (41%); global engagement (29%); and green/sustainability (19%).

Unfortunately, recognition that an NGM activity is 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 "highly important" is well below that reporting themselves as world-class[1]). 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 New England manufacturers are hitting these marks. For example, 12% of firms report value-added per employee of greater than $175,000. Yet 32% of firms report value-added per employee of less than $75,000. Awakening *all* New England manufacturers to the importance of NGM strategies and helping them 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 firms won't be around 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 national data for 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. The group of national manufacturers "at or near world-class status" for each specific NGM strategy is cited throughout this summary to provide a benchmark performance against which to compare manufacturers in the state.

Next Generation Competitiveness

New England 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:

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

Currently, only a fraction of New England manufacturers are at or near world-class in any of the six NGM strategies. The good news is that this means that benchmark firms exist for others to emulate. The bad news, however, is that many firms are struggling. For example, many New England manufacturers report "no progress" toward world-class status for the strategies.

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

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 to world-class status in each of the NGM strategies, with the highest percentage occurring for superior process improvement (38%). 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 frequently have 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, to rate themselves as having achieved *no progress* toward world-class status for a strategy, to have the fewest best practices in place, and to achieve the poorest performances.

Differences in management for small manufacturers nationwide are particularly noticeable regarding the existence of measurement systems and review processes for the six NGM strategies. Smaller firms are more likely to indicate "no measurement system per se or reviews" than larger firms. For example, 38% of national manufacturers with revenues of $10 million or less have no measurement system or reviews in place to assess customer-focused innovation vs. just 19% of larger manufacturers.[2]

What Gets Measured in the Next Generation Gets Better

What gets measured, gets done. But manufacturers across the country and New England 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. Yet a surprising number of New England manufacturers lack even rudimentary or ad hoc systems or review processes (e.g., "No measurement systems per se or reviews"): for example, 27% have no measurements systems or reviews in place to track supply-chain management.

---

[2] Data for individual states was not crosstabulated by size of manufacturers (i.e., revenues) because sample sizes varied dramatically by state. Aggregated national data offers greater statistically relevance.

Similarly, very few manufacturers have the most advanced systems in place ("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 New England manufacturers are making a substantial effort to adopt Greener practices and produce Greener products. For example, only 24% of New England manufacturers have been able to annually reduce their energy usage per unit of product by more than 10%, and 30% 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 in sustainable strategies (12% believe it is "not important").

Obviously, manufacturers in New England and across the country have a dim view of the importance of implementing green/sustainable strategies in their firms, and increased education, awareness, or market changes will be necessary to increase the importance of green to the nation's manufacturers. Until these manufacturers open their eyes to the importance of NGM strategies — and how far behind they're falling — they have no chance of improvement or of achieving global competitiveness.

Changing Leadership in the Next Generation

Approximately 20% of New England manufacturers have a leadership succession planned in the next five years; another 35% 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 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 those leaders are currently 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 that will squander an opportunity for global competiveness. Will companies bring in NGM-focused leaders, or 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 New England and across the U.S.

Next Generation Manufacturers Require Support Services

The vast majority of New England manufacturers report that assistance in their geographic region — support services, peer groups, training opportunities and resources — exists to some degree in helping them follow through on NGM strategies. But a high percentage believe that "no support" exists. In some regions this may be the case, but it's important to note that other factors may be at play.

Manufacturers nationwide that are 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

The highlights above and NGM findings overall are surprisingly 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.

Reading Tables in This Summary

Tables in this summary present overall national findings from the NGM Study ("National") along side responses from "New England" manufacturers. Data is intended to be read down the columns (columns sum to 100%): For example, for the table below, 22.2% of national manufacturers have less than 1% of their workforce dedicated to new-product development/R&D; 18.2% of New England manufacturers have less than 1% of their workforce dedicated to new-product development/R&D.

What percentage of your workforce is dedicated to new-product development/R&D?	National	New England
<1%	22.2%	18.2%
1-5%	43.3%	32.8%
6-10%	18.9%	26.0%
>10%	15.7%	22.9%

Most comparisons of New England responses to national responses (all manufacturers that participated, including New England manufacturers) within the text throughout this summary (i.e., is the state performing better or worse) have been made by taking into consideration the sample size of participating New England manufacturers and the resulting margin of error due to that sample size and New England's population of manufacturers: a difference of approximately ±6 points is required for the New England data to denote a statistically significant difference.

The group of national manufacturers "at or near world-class status" for each specific NGM strategy is cited throughout summary text portions to provide a benchmark performance against which to compare manufacturers in the state.

The Manufacturing Performance Institute performed the initial analysis for this summary; individual states then had the opportunity to apply their own analysis or to append other materials to this summary.

Profile of NGM Study Companies

The majority of New England responses to the NGM Study (81%) were received from organizations identified as a "company," with the other 19% identified as a "division/unit of a larger company." The NGM Study companies in New England have been in operation for 29 years (median), are staffed with 60 full-time employees (median), and generated annual revenues of $9.5 million (median).

Which of the following describes your organization?	National	New England
Company	79.8%	81.4%
Division/unit of a larger company	20.2%	18.7%

How many years has your organization been in operation?	National	New England
Median	32	29
Average	41	36
75th Percentile	55	44
25th Percentile	19	16

What are your approximate annual revenues?	National	New England
Median	$10,000,000	$9,500,000
Average	$159,603,620	$31,050,867
75th Percentile	$30,000,000	$23,875,000
25th Percentile	$3,000,000	$2,575,000

How many full-time employees (and equivalents)?	National	New England
Median	55	60
Average	445	109
75th Percentile	140	110
25th Percentile	21	18

Industries with the highest percentage of respondents — as identified by three-digit North American Industry Classification System codes — were machinery manufacturing and computer and electronic product manufacturing, both with 15% of the New England sample.

Product Category	National	New England
Food Mfg.	3.9%	4.1%
Beverage and Tobacco Product Mfg.	0.3%	0.0%
Textile Mills	1.1%	0.5%
Textile Product Mills	0.7%	2.1%
Apparel Mfg.	0.9%	0.0%
Leather and Allied Product Mfg.	0.6%	0.5%
Wood Product Mfg.	2.8%	4.1%
Paper Mfg.	2.5%	1.0%
Printing and Related Support Activities	2.4%	1.0%
Petroleum and Coal Products Mfg.	0.5%	0.5%
Chemical Mfg.	7.3%	5.1%
Plastics and Rubber Products Mfg.	6.6%	3.6%
Nonmetallic Mineral Product Mfg.	2.3%	3.6%
Primary Metal Mfg.	8.3%	6.7%
Fabricated Metal Product Mfg.	16.2%	13.9%
Machinery Mfg.	16.2%	15.4%
Computer and Electronic Product Mfg.	10.0%	14.9%
Electrical Equipment, Appliance, and Component Mfg.	2.8%	2.1%
Transportation Equipment Mfg.	6.5%	8.2%
Furniture and Related Product Mfg.	2.6%	6.2%
Miscellaneous Mfg.	4.3%	5.6%
Other	1.3%	1.0%

Nearly two-thirds of New England companies responding to the NGM Study (62%) are led by a chief executive who is older than 50 years old; 20% are led by an executive who is older than 60 years old. Approximately 20% of New England firms anticipate a planned leadership succession in the next five years.

What is the age of your organization's chief executive?	National	New England
< 30	0.4%	0.5%
31-40	5.7%	8.2%
41-50	29.8%	29.7%
51-60	40.7%	42.1%
>60	23.5%	19.5%

Do you anticipate a planned succession of leadership in the next five years?	National	New England
Yes	24.9%	20.0%
Maybe	29.3%	35.4%
No	45.9%	44.6%

Customer-Focused Innovation: Develop, make, and market new products and services that meet customers' needs at a pace faster than the competition.[3]

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; few products last more than a few years. Approximately 50% of New England manufacturers are at or near world-class status in customer-focused innovation (rated 4 or 5), and 5% report no progress toward world-class status with this NGM strategy. A majority of New England manufacturers recognize how important this NGM strategy is, as 60% rate customer-focused innovation as highly important to their organization's success over the next five years. Among all NGM Study manufacturers nationwide that are at or near world-class, 72% rate customer-focused innovation as highly important.

Rate your organization's progress toward world-class customer-focused innovation:	**National**	**New England**
1=No progress	4.7%	4.6%
2	14.9%	20.0%
3	34.8%	25.6%
4	33.3%	38.0%
5=World-class	12.2%	11.8%

Rate the importance of customer-focused innovation to your organization's success over the next five years:	**National**	**New England**
1=Not important	1.8%	2.6%
2	3.6%	4.6%
3	10.0%	10.3%
4	26.4%	23.1%
5=Highly important	58.2%	59.5%

Like the NGM strategies to follow, it's important to support customer-focused innovation with both people and dollars. Yet a high percentage of New England manufacturers and manufacturers across the country appear to be doing neither. Eighteen percent have less than 1% of their workforce dedicated to product development. Similarly, 18% of New England manufacturers invest less than 1% of sales into product development. But New England manufacturers are more likely than manufacturers nationwide to have a high percentage of workforce dedicated (23% dedicating more than 10% of staff) and money invested (24% investing more than 10% of sales) in new-product development.

What percentage of your workforce is dedicated to new-product development/R&D?	**National**	**New England**
<1%	22.2%	18.2%
1-5%	43.3%	32.8%
6-10%	18.9%	26.0%
>10%	15.7%	22.9%

What percentage of sales is invested into new-product development/R&D?	**National**	**New England**
<1%	23.1%	17.6%
1-5%	44.7%	40.4%
6-10%	17.6%	18.1%
>10%	14.6%	23.8%

[3] Description of world-class performance.

Nearly one-third of New England manufacturers (30%) 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"). About 26% have no system or reviews in place, prompting the 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?

What best describes your measurement system for reviewing return from customer-focused innovation?	National	New England
No measurement system per se or reviews	27.6%	25.9%
Ad hoc monitoring of basic measures and ad hoc reviews	31.1%	32.6%
Company-specific metrics monitored regularly by operations staff	10.7%	11.4%
Regular monitoring and review of company-specific metrics by CEO and senior staff	19.2%	17.1%
Regular monitoring and review of company-specific metrics by CEO and senior staff and transparency and clarity throughout the organization	11.4%	13.0%

Half of New England manufacturers annually launch 5% or more of total stock-keeping units (SKUs) as new products. A longer (three years) and different view (sales) of innovation finds that 71% of manufacturers derive 5% or more of their annual sales from products introduced in the past three years; 34% of New England manufacturers report that more than 25% of sales are from products introduced in the last three years. By either measure, New England manufacturers were more likely to be releasing new products than manufacturers nationwide.

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	New England
<5%	57.7%	49.5%
5-10%	26.5%	26.8%
11-20%	9.6%	13.2%
>20%	6.1%	10.5%

Approximately what percentage of annual sales are derived from products introduced in the past three years?	National	New England
<5%	30.4%	28.5%
5-25%	45.0%	37.8%
26-50%	16.0%	22.3%
>50%	8.6%	11.4%

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.[4]

Nearly one-third of New England manufacturers (32%) are at or near world-class status in human-capital acquisition, development and retention; 8% have made no progress toward world-class status. Like manufacturers nationwide, fewer than half of New England manufacturers (46%) rate engaged people/human-capital acquisition, development and retention as "highly important" to their organization's success over the next five years. Seventy percent of national manufacturers at or near world-class status rate human-resource management as important to their firm's success.

Rate your organization's progress toward world-class human-capital acquisition, development and retention:	National	New England
1=No progress	9.4%	7.7%
2	22.5%	23.2%
3	37.6%	37.1%
4	24.4%	28.9%
5=World-class	6.1%	3.1%

Rate the importance of human-capital acquisition, development and retention to your organization's success over the next five years:	National	New England
1=Not important	2.5%	2.6%
2	6.1%	5.1%
3	14.6%	12.8%
4	30.8%	33.9%
5=Highly important	45.9%	45.6%

More than one-third of New England manufacturers (37%) have a *majority* of their employees regularly participating in empowered work teams. Yet empowered workers are sparse at many New England firms, as 37% also have less than a quarter of their workforces participating in empowered teams. It's important to note that nationwide, half of manufacturers at or near world-class status (50%) have a *majority* of their employees regularly participating in empowered work teams. Training is essential to implement modern manufacturing strategies, yet 30% of New England manufacturers offer less than 8 hours of training annually to employees; 11% offer more than 40 hours. Approximately 19% of manufacturers at or near world-class status train more than 40 hours annually.

What percentage of employees regularly participate in empowered work teams (i.e., make decisions without supervisor approval)?	National	New England
<25%	41.4%	36.8%
25-50%	27.6%	26.4%
51-75%	17.8%	19.7%
76-90%	8.0%	10.9%
>90%	5.2%	6.2%

How many formal training hours are devoted annually to each employee?	National	New England
8 or fewer	29.6%	29.9%
9-20	41.1%	35.1%
21-40	18.8%	23.7%
>40	10.5%	11.3%

[4] Description of world-class performance.

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. But 22% of New England manufacturers dedicate less than 1% of employees to assessing and upgrading the talent pool, and 32% have no measurement systems or reviews in place to measure return on HR efforts.

What percentage of employees are dedicated to assessing and upgrading your organization's talent pool?	National	New England
<1%	28.5%	21.9%
1-5%	46.7%	47.9%
6-10%	16.1%	19.3%
>10%	8.7%	10.9%

What best describes your measurement system for reviewing return from human-capital acquisition, development and retention?	National	New England
No measurement system per se or reviews	29.1%	32.1%
Ad hoc monitoring of basic measures and ad hoc reviews	33.7%	34.7%
Company-specific metrics monitored regularly by operations staff	13.5%	11.9%
Regular monitoring and review of company-specific metrics by CEO and senior staff	17.2%	15.5%
Regular monitoring and review of company-specific metrics by CEO and senior staff and transparency and clarity throughout the organization	6.5%	5.7%

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). About two-thirds of New England manufacturers (65%) report value-added per employee of $125,000 or lower, and 30% report labor turnover of more than 5%. New England manufacturers are more likely to be holding their labor turnover rates under 1% than manufacturers nationwide.

What is your value-added per employee ([sales – cost of materials] ÷ number of employees)?	National	New England
< $75,000	34.9%	32.3%
$75,000-$125,000	37.1%	32.8%
$125,001-$175,000	17.2%	23.1%
> $175,000	10.8%	11.8%

What is your organization's annual labor turnover rate (number of voluntary and involuntary separations ÷ typical staffing level)?	National	New England
0%	8.2%	12.0%
0.1-1%	21.1%	24.5%
1.1-5%	32.6%	33.3%
5.1-10%	24.5%	17.7%
>10%	13.6%	12.5%

Superior Processes/Improvement Focus: Record annual productivity and quality gains that exceed the competition through a companywide commitment to continuous improvement.[5]

Core to every manufacturer is the capability to produce goods and continuously improve the processes that enable efficient production. Forty-three percent of New England manufacturers are at or near world-class status in processes and process improvement. A majority of New England manufacturers (57%) recognize the importance of having superior processes and a process-improvement focus. Almost three-fourths of national 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.

Rate your organization's progress toward world-class processes and process improvement:	National	New England
1=No progress	3.3%	2.1%
2	16.3%	16.1%
3	36.6%	38.9%
4	33.2%	33.2%
5=World-class	10.6%	9.8%

Rate the importance of process improvement to your organization's success over the next five years:	National	New England
1=Not important	0.8%	1.0%
2	2.8%	2.1%
3	10.1%	7.8%
4	26.5%	32.6%
5=Highly important	59.8%	56.5%

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. Approximately 14% of New England manufacturers have 100% of their workforces engaged in their improvement approaches; 52% of New England manufacturers have a majority of the workforces engaged in the improvement method. Two-thirds of manufacturers at or near world-class status (65%) have a majority of their workforces engaged in their improvement approaches.

Approximately 61% of New England 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.

What percentage of your workforce has been fully engaged in your organization's specific improvement method/approach?	National	New England
<26%	33.3%	28.6%
26-50%	22.8%	19.6%
51-75%	19.4%	22.8%
76-99%	15.1%	15.3%
100%	9.5%	13.8%

What is your organization's investment in capital equipment as a percentage of sales (three-year average)?	National	New England
<1%	10.2%	12.5%
1-5%	48.1%	48.4%
6-10%	28.1%	25.5%
>10%	13.6%	13.5%

[5] Description of world-class performance.

Production performances and metrics are some of the easiest measures for a manufacturer to monitor, yet, surprisingly, 19% of New England manufacturers have no measurement systems or review processes in place; 34% of firms have the most advanced systems or reviews in place. Approximately 49% of manufacturers nationwide at or near world-class status for process improvement have advanced measurement systems and reviews.

What best describes your measurement system for reviewing return from process improvements?	**National**	**New England**
No measurement system per se or reviews	16.8%	18.8%
Ad hoc monitoring of basic measures and ad hoc reviews	29.3%	32.3%
Company-specific metrics monitored regularly by operations staff	19.8%	15.1%
Regular monitoring and review of company-specific metrics by CEO and senior staff	21.5%	20.3%
Regular monitoring and review of company-specific metrics by CEO and senior staff and transparency and clarity throughout the organization	12.7%	13.5%

With customers demanding more value from manufacturers along with lower costs, it's imperative that manufacturers focus on "perfect deliveries" (on time, high quality, and to all customers specifications, including labeling and container format); delighting customers; and increasing productivity in the form of value add. Many New England manufacturers and manufacturers nationwide excel in these areas. The following is a comparison between New England manufacturers and the national manufacturers at or near world-class status:

- *Perfect deliveries* more than 98% of the time: 30% of New England manufacturers vs. 33% of national manufacturers at or near world-class status.
- Highest level of *customer satisfaction*: 54% vs. 55%.
- Three-year *productivity increase* of more than 50%: 25% vs. 31%.

What percentage of deliveries reach customers in perfect order (on time, high quality, to all customer specifications)?	**National**	**New England**
<80%	6.6%	6.8%
80-90%	14.7%	18.2%
91-95%	21.1%	21.9%
96-98%	28.8%	23.4%
>98%	28.8%	29.7%

Describe your customers' satisfaction with your overall performance?	**National**	**New England**
Threatens to pull business because we don't match the competition	1.8%	0.5%
Indifferent to buying our product or competitors	4.7%	4.7%
Preference for our products by virtue of price, quality, and delivery performance	45.7%	40.9%
Strong loyalty to our products due to ongoing trust in our organization's people and capabilities	47.7%	53.9%

By what percentage has productivity (i.e., value add) improved over the past three years?	**National**	**New England**
<25%	43.3%	43.6%
26-50	34.2%	31.7%
51-75%	14.7%	16.7%
76-99%	5.7%	5.4%
>100%	2.0%	2.7%

Supply-Chain Management & Collaboration: Develop and manage supply chains and partnerships that provide flexibility, response time, and delivery performance that exceeds the competition.[6]

For many manufacturers, managing internal processes and functions is a challenge; managing processes external to the company is even more difficult. Approximately one-fourth of New England manufacturers (26%) are at or near world-class status for supply-chain management and collaboration, and 41% of New England manufacturers deem this NGM strategy to be highly important for success over the next generation. Again, however, national manufacturers at or near world-class status are far more likely to recognize the importance of this NGM strategy: 61% rate it highly important.

Rate your organization's progress toward world-class supply-chain management and collaboration:	National	New England
1=No progress	9.1%	10.5%
2	24.5%	24.6%
3	38.8%	38.7%
4	22.1%	22.5%
5=World-class	5.5%	3.7%

Rate the importance of supply-chain management and collaboration to your organization's success over the next five years:	National	New England
1=Not important	3.6%	2.6%
2	8.8%	6.8%
3	19.4%	18.2%
4	30.6%	31.3%
5=Highly important	37.6%	41.2%

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

- Employees dedicated to the strategy: 72% of New England manufacturers have 5% or less of their workforces engaged in supply-chain operations. Approximately 44% of national manufacturers at or near world-class status have *more than 5%* of their workforces engaged in supply-chain operations.
- Investments: 81% of New England manufacturers invest 5% or less of sales in information technologies (three-year average). One-third of national manufacturers at or near world-class status (34%) invest *more than 5%* in information technologies.
- Measurement systems: 56% of New England manufacturers have either no measurement systems or reviews or, at best, ad hoc systems and reviews. Approximately 45% of national manufacturers at or near world-class status have advanced measurements systems.

What percentage of your workforce is dedicated to supply-chain and partner development, management, and collaboration?	National	New England
<1%	24.2%	19.9%
1-5%	50.6%	51.8%
6-10%	17.7%	20.4%
>10%	7.5%	7.9%

[6] Description of world-class performance.

What is your organization's investment in information technologies (hardware and software) as a percentage of sales (three-year average)?	National	New England
<1%	28.8%	26.7%
1-5%	49.9%	53.9%
6-10%	15.1%	13.1%
>10%	6.2%	6.3%

What best describes your measurement system for reviewing return from supply-chain management and collaboration?	National	New England
No measurement system per se or reviews	26.2%	26.6%
Ad hoc monitoring of basic measures and ad hoc reviews	30.9%	29.7%
Company-specific metrics monitored regularly by operations staff	18.5%	15.6%
Regular monitoring and review of company-specific metrics by CEO and senior staff	17.5%	21.4%
Regular monitoring and review of company-specific metrics by CEO and senior staff and transparency and clarity throughout the organization	6.9%	6.8%

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 characteristics of a supply chain in which a manufacturer participates. Approximately 12% of New England manufacturers describe their supply chains as advanced — "Real-time communication of demand signal and entire supply chain flexible to demand spikes — standard delivery times consistently met and just-in-time inventories." Approximately 23% of national manufacturers at or near world-class status identify their supply chains as advanced extended enterprises.

What best describes your end-to-end supply chain's ability to respond to unexpected customer demand for existing products?	National	New England
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%	4.2%
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%	37.2%
Efficient communication of demand signal throughout chain with most suppliers efficiently satisfying demand — standard delivery times nearly met and right-sized inventories	50.1%	46.6%
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%	12.0%

While many firms boast of their ability to control inventories, it's clear that some of this management is merely shifting inventory to suppliers. More than half of manufacturers nationwide and New England 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.

An important byproduct of reduced inventory in the supply chain is the extended enterprise's ability to quickly respond to customer demand and get new products to market. Few manufacturers describe their supply chains as advanced in this area: Approximately 19% of New England manufacturers 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 41% of manufacturers at or near world-class status described their supply chain in these ways.

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**	**New England**
<10%	52.8%	52.9%
10-25%	33.0%	32.3%
26-50%	10.9%	10.6%
>50%	3.3%	4.2%

How is your supply chain a competitive advantage in terms of flexibility and speed to the marketplace?	**National**	**New England**
Suppliers regularly measured on cost, quality, and delivery performance	34.9%	32.5%
Suppliers regularly measured on cost, quality, and delivery performance as well as total acquisition cost	11.8%	12.2%
Suppliers regularly measured on cost, quality, and delivery performance as well as total acquisition cost and "soft" qualities (e.g., trust, flexibility)	30.7%	36.2%
Strategic suppliers and customers are active participants in our operations, continuous improvement, and product development efforts	17.2%	16.5%
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%	2.7%

Green/Sustainability: Design and implement waste and energy-use reductions at a level that provides superior cost performance and recognizable customer value.[7]

Very few New England or national manufacturers rate themselves at or even near world-class status in green/sustainability: 23% New England believe they're at or near world-class status in green/sustainability, and 18% report no progress toward world-class status. Contributing to this is the high percentage of New England manufacturers that believe that green is not important (12%); only 19% believe it's highly important. Yet 50% of national manufacturers at or near world-class status in green/sustainability believe this strategy is highly important.

Rate your organization's progress toward world-class Green/Sustainability:	National	New England
1=No progress	20.8%	18.1%
2	32.0%	23.8%
3	27.2%	35.2%
4	14.7%	15.0%
5=World-class	5.4%	7.8%

Rate the importance of Green/Sustainability to your organization's success over the next five years:	National	New England
1=Not important	15.6%	12.4%
2	22.6%	21.2%
3	26.7%	27.5%
4	19.4%	19.7%
5=Highly important	15.7%	19.2%

New England manufacturers are more likely to be dedicating workforce to green efforts than manufacturers nationwide, but many in the region are not: 35% have dedicated less than 1% of their workforces to reducing energy, material or emissions in their operations, and 49% have less than 1% of their workforces dedicated to green products. National 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	New England
<1%	45.0%	34.6%
1-5%	33.6%	38.7%
6-10%	8.9%	7.9%
>10%	12.5%	18.9%

What percentage of the workforce is dedicated to Green products (product and packaging impact, green products and markets)?	National	New England
<1%	54.5%	48.7%
1-5%	28.3%	29.1%
6-10%	8.4%	9.5%
>10%	8.9%	12.7%

[7] Description of world-class performance.

Half of New England manufacturers have a measurement system or review process of some kind in place to assess return on green/sustainability efforts, and 13% have advanced systems or reviews in place. The perspective from national manufacturers at or near world-class status offers a sharp contrast, though, as 40% have advanced systems or reviews in place. With fuel costs rising, energy credits available, and green trade regulations emerging, it's surprising how few New England manufacturers are monitoring operations in this area.

What best describes your measurement system for reviewing return from Green/Sustainability efforts?	National	New England
No measurement system per se or reviews	53.4%	50.3%
Ad hoc monitoring of basic measures and ad hoc reviews	25.0%	32.6%
Company-specific metrics monitored regularly by operations staff	8.4%	4.7%
Regular monitoring and review of company-specific metrics by CEO and senior staff	8.8%	7.8%
Regular monitoring and review of company-specific metrics by CEO and senior staff and transparency and clarity throughout the organization	4.5%	4.7%

The majority of manufacturers in New England and nationwide have achieved little yet in the way of green performance metrics, as the following comparisons to national manufacturers at or near world-class green status attest:

- *Energy usage:* 76% of New England manufacturers have annual reductions of energy per unit of product of less than 10%; national manufacturers at or near world-class status are more successful, with 37% reducing energy annually by *10% or more* (8% with reductions of more than 25%).
- *Recycled material:* 70% of New England manufacturers have annual reductions in the usage of non-recycled material per unit of product of less than 10%; 48% of national manufacturers at or near world-class status have reduced non-recycled materials annually by *more than 10%* (17% with reductions of more than 25%).
- *Recyclable/reusable products:* 65% of New England manufacturers report that less than half of their products are completely recyclable/reusable; 59% of manufacturers nationwide at or near world-class status report that *more than half* of their products are completely recyclable/reusable.

What is your annual reduction in energy per unit of product output?	National	New England
<10%	83.4%	76.2%
10-25%	14.0%	18.9%
26-50%	2.1%	3.8%
>50%	0.5%	1.1%

What is your annual reduction in usage of non-recycled material per unit of product output?	National	New England
<10%	77.6%	70.0%
10-25%	16.6%	23.9%
26-50%	3.3%	2.2%
>50%	2.6%	3.9%

What percentage of your products (by sales volume) are completely recyclable/reusable?	National	New England
<50%	59.9%	65.0%
51-75%	8.7%	4.9%
76-89%	9.5%	11.5%
90-99%	13.8%	9.3%
100%	8.2%	9.3%

Global Engagement: Secure business advantages by having people, partnerships, and systems in place capable of engaging global markets and talents better than the competition.[8]

Approximately 26% of New England manufacturers consider themselves at or near world-class status when it comes to being global player, comparable to manufacturers nationwide, and 29% believe global engagement is highly important. Believing that global engagement is important goes a long way toward achieving world-class status; two-thirds of national manufacturers at or near world-class status rate global engagement as highly important.

Rate your organization's progress toward becoming a world-class global player:	National	New England
1=No progress	25.8%	18.2%
2	28.0%	35.4%
3	21.5%	20.8%
4	18.1%	18.8%
5=World-class	6.5%	6.8%

Rate the importance of global engagement to your organization's success over the next five years:	National	New England
1=Not important	18.1%	15.2%
2	18.1%	18.9%
3	17.5%	18.3%
4	18.6%	18.9%
5=Highly important	27.7%	28.8%

Global engagement requires a workforce in foreign countries or in the U.S. directing international operations: 48% of New England manufacturers have some percentage of the workforce working on global business activities. Approximately 82% of national manufacturers at or near world-class status have *someone* dedicated to global business in this manner.

What percentage of your total direct workforce is located overseas and/or located domestically and responsible for global business activities?	National	New England
0%	53.7%	51.8%
1-25%	38.5%	40.3%
26-50%	4.8%	5.8%
>50%	3.0%	2.1%

Forty-six percent of New England manufacturers have measurement systems or review processes of some kind in place to assess returns on global engagement; 47% of national manufacturers at or near world-class status have *advanced* systems or reviews in place.

What best describes your measurement system for reviewing return from global engagement?	National	New England
No measurement system per se or reviews	53.9%	54.5%
Ad hoc monitoring of basic measures and ad hoc reviews	17.6%	18.3%
Company-specific metrics monitored regularly by operations staff	9.2%	6.3%
Regular monitoring and review of company-specific metrics by CEO and senior staff	14.4%	16.2%
Regular monitoring and review of company-specific metrics by CEO and senior staff and transparency and clarity throughout the organization	4.8%	4.7%

[8] Description of world-class performance.

Global engagement among New England manufacturers is comparable to manufacturers nationwide: 23% report that over the past three years sales outside the U.S. have increased by 25% or more (compared to 25% of manufacturers nationwide). Some 48% of New England manufacturers operate or partner in at least one production facility outside the U.S. (compared to 44% of manufacturers nationwide), and 49% have at least one sales and/or distribution facility outside the U.S. (compared to 46% of manufacturers nationwide).

By what percentage has dollar volume of sales outside the United States changed over the past three years?	National	New England
<25%	74.6%	76.7%
26-50%	17.4%	18.0%
51-100%	5.3%	4.2%
>100%	2.7%	1.1%

In how many countries outside of the United States does your organization operate or partner in production facilities?	National	New England
0	55.5%	52.4%
1-5	32.4%	33.5%
6-10	5.5%	6.8%
>10	6.7%	7.3%

In how many countries outside of the United States does your organization have sales and/or distribution facilities?	National	New England
0	53.6%	51.3%
1-5	29.3%	33.3%
6-10	6.3%	6.9%
>10	10.8%	8.5%

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 state's regions specific to each NGM strategy. Across the country for each NGM strategy, a sizeable percentage of national manufacturers and those in New England believe that "no support" is available.

But analysis of national data also shows that awareness of support and actual support may not be synonymous: i.e., manufacturers at or near world-class status were less likely to believe that support was lacking, suggesting that some firms that cite "no support" may not have actually sought it out in the first place.

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?	**National**	**New England**
Customer-focused innovation		
1=No support	14.9%	19.6%
2	24.2%	27.0%
3	30.3%	26.5%
4	20.3%	18.0%
5=Full support	10.3%	9.0%
Engaged people/Human-capital acquisition, development and retention		
1=No support	10.7%	11.6%
2	24.9%	29.5%
3	31.9%	32.6%
4	22.5%	17.9%
5=Full support	10.0%	8.4%
Superior processes/Improvement focus		
1=No support	11.6%	12.1%
2	19.4%	19.5%
3	28.4%	34.7%
4	27.0%	20.5%
5=Full support	13.7%	13.2%

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?	National	New England
Supply-chain management and collaboration		
1=No support	14.2%	17.7%
2	24.7%	30.0%
3	32.5%	31.6%
4	20.3%	13.9%
5=Full support	8.5%	7.0%
Green/Sustainability		
1=No support	18.3%	19.7%
2	30.6%	26.6%
3	30.1%	30.3%
4	13.3%	16.0%
5=Full support	7.7%	7.5%
Global engagement		
1=No support	21.4%	19.1%
2	30.3%	38.8%
3	28.0%	26.8%
4	13.2%	12.0%
5=Full support	7.1%	3.3%

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 among manufacturers across the country as well as in New England. Analysis of the entire group of national manufacturers reveals that three 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 reveals:

1. Firms that believe they are at or near world-class status in a given Next-Generation Manufacturing activity are more likely to outperform firms that rate themselves as furthest from world-class.

2. Manufacturers at or near world-class status achieve superior performance by managing in significantly different ways, including being more likely to use best practices and investing in NGM strategies.

3. Underlying both improved performances and application of best practices and investments are core differences in the awareness of NGM strategies between manufacturers at or near world-class status and those firms furthest from world-class status. Those firms at or near world-class status are far more likely to have placed more *emphasis* on NGM strategies.

The opportunity for manufacturers in New England and elsewhere 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?

Methodology

The Next Generation Manufacturing 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; in New England, 195 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 the Manufacturing Performance Institute (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 a NGM Performance Report, similar to this Data 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.

NGM Organizations

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

The American Small Manufacturers Coalition (ASMC) is a trade association of manufacturing extension agents who work to improve the innovation and productivity of America's manufacturing community. ASMC advocates for legislative and programmatic resources that allow small manufacturing clients to better compete in the global marketplace. One ASMC program of primary focus is the National Institute of Standards and Technology (NIST) Manufacturing Extension Partnership (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.magnetwork.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)