

US \$95.00



Manufacturing 2007

Executive Summary

Data from U.S. and Canada Manufacturers

based on findings from

the *IndustryWeek* / Manufacturing Performance Institute 2006 Census of Manufacturers conducted in the U.S. and the 2006 Canada Manufacturing Study, conducted by *Advanced Manufacturing* and the Manufacturing Performance Institute

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About Manufacturing 2007

Table of contents

Introduction	1
Plant Profile	2
Human Resources	4
Operations	8
Supply Chain	16
Capacity / Equipment / Information Technology (IT)	20
Manufacturing Issues	24

Presentation of data

The *Manufacturing 2007 Executive Summary* analyzes comparable data from two different surveys conducted in 2006: The *IndustryWeek*/Manufacturing Performance Institute 2006 Census of Manufacturers and the 2006 Canada Manufacturing Study, conducted by *Advanced Manufacturing* and the Manufacturing Performance Institute (MPI).

Survey questions consisted of directive single-answer questions for which respondents were asked to “check one” answer category; directive multiple answer questions for which respondents were asked to “check all that apply”; and open-ended questions for which respondents were asked to write in a numeric answer. The tables and charts in this report for “check one” and “check all” answer categories are presented either in the format presented on the survey or, where more meaningful, in descending order based on the percentage of responses for a particular answer category (i.e., the answer category with the highest percentage is listed first).

Data for directive questions list the frequency (N) and the percentage of responses for each answer category. The tables for open-ended questions are presented with the frequency (N), mean, median, 25th percentile, and 75th percentile statistics. The *Executive Summary* focuses analysis on the median figure because, unlike arithmetical averages or means, the median is the “typical” measure and is not distorted by a few unusually high or low values that may exist in the sample due to special circumstances. The median figure represents the mid-point of the figures for a particular measure, with one-half of respondents reporting figures above it and one-half below. Where a lower measure is considered the better performance, such as with annual labor turnover, the 25th

percentile and 75th percentile statistics have been reversed; the 75th percentile represents the lower (better) figure.

Specific dollar measurements for this Summary have been converted, by individual response, to U.S. dollars using a conversion rate of \$0.90 Canadian dollars to U.S. dollars (conversion rate on June 30, 2006).

The two surveys collected various profile criteria, which provides unique looks into all data for the facilities and is presented first (*see page 3*) in order to make cross-tabulations that appear throughout the *Executive Summary* easier to understand.

Methodology

IW/MPI 2006 Census of Manufacturers: This survey was conducted using an online questionnaire and a hard-copy questionnaire that was twice mailed from MPI to approximately 12,000 plant leaders. There were 798 valid surveys received (415 online respondents and 383 hard-copy mail respondents) from April through July 2006. Responses were received by MPI, and then entered into a database, edited, and cleansed to ensure answers were plausible, where necessary. All respondent answers to the survey are anonymous. As an incentive, respondents were offered one-time access to a database of this year’s findings and entered into a random drawing for monetary awards.

2006 Canada Manufacturing Study: This survey was conducted using an online questionnaire that was promoted by *Advanced Manufacturing* magazine to its readers (readers could also print a PDF of the survey and complete and mail their responses). There were 145 total valid respondents (all online respondents), with surveys received in June, July and August 2006. Responses were received by MPI, and then entered into a database, edited, and cleansed to ensure answers were plausible, where necessary. All respondent answers to the survey are anonymous. As an incentive, respondents were offered one-time access to a database of this year’s findings and entered into a random drawing for monetary awards.

Introduction

For a decade, the *IndustryWeek*/Manufacturing Performance Institute (MPI) Census of Manufacturers—one of the largest annual studies of U.S. manufacturing facilities—has been providing operations, financial performance and best practices data to U.S. manufacturing executives. This year MPI fielded a comparable survey in Canada—the Canada Manufacturing Study—with the assistance of *Advanced Manufacturing* magazine. Together these two research initiatives offer an intriguing look into 943 North American manufacturing plants—and, as seen in this *Manufacturing 2007 Executive Summary*, also identify differences between the two countries' manufacturing landscapes.

One thing that manufacturers in both countries face is an increasingly competitive manufacturing climate: Customers increasingly want more value, better service and support, and lower costs. Threats from foreign competitors (both perceived and real) are driving many manufacturers to invest in new technologies, implement best practices and become more productive. This *Executive Summary* also shows that despite these pressures, North American manufacturers continue to be bullish about their prospects.

The *Executive Summary* presents the combined data from this year's two surveys in tables and charts, as well as highlighting the research findings for plants within each country. MPI offers perspectives on the results, giving additional meaning to the metrics, and presents "MPI Alerts" where we believe the data illuminates critical decision points for North American manufacturers. Highlights and questions raised within this *Executive Summary* include:

- Employment levels and revenues are projected to keep growing through 2007. Yet growth without profit is folly, and there are many indicators that point to an inability of manufacturers in both countries to maintain or improve margins even as they improve revenues.
- Labor turnover at many facilities continues to drain expertise, resources and profits. And with so many plants expecting to increase hiring, all will face a competitive labor market—and will need to do more to retain experienced employees. Yet training efforts and adoption rates for human resource best practices have stagnated. Many plants are doing little to invest in their workforces.
- Lean improvement methods—Lean Manufacturing, Lean and Six Sigma, and the Toyota Production System—have become the de facto improvement standards for a majority of North American plants, with results proving that these efforts can deliver significant performance enhancements. Despite this, many plants have still made little or no effort to adopt or implement *any* improvement methodology.
- Manufacturers are paying more for materials—and are barely keeping their non-material manufacturing costs in check. And even those plants able to pass these expenses through to customers have to wonder: How long will customers put up with cost increases?

These and many other insights await inside *Manufacturing 2007 Executive Summary*. We hope you find the data from the IW/MPI Census and the Canada Manufacturing Study useful in meeting the challenges that face your organization.

John R. Brandt
CEO
Manufacturing Performance Institute

Plant Profile

A total of 943 combined manufacturing plants participated in the IW/MPI 2006 Census of Manufacturers (798 plants) and the 2006 Canada Manufacturing Study (145 plants). Profile characteristics of all these facilities are summarized here:

- 74% of plants are part of a private company,
- 38% of plants are from the Midwest U.S. region,
- 72% of plants use discrete manufacturing operations,
- 71% of plants have been operating for more than 20 years,
- 59% of plants have corporate parents with less than \$100 million in revenues,
- 20% of plants are machinery manufacturers,
- 21% of plants participate in an industrial equipment and machinery value chain, and
- 49% of plants are low volume/high mix.

Please indicate if this facility is part of a public or private company:

	All Plants	U.S.	Canada
(N)	941	796	145
Public	25.7%	25.0%	29.7%
Private	74.3%	75.0%	70.3%

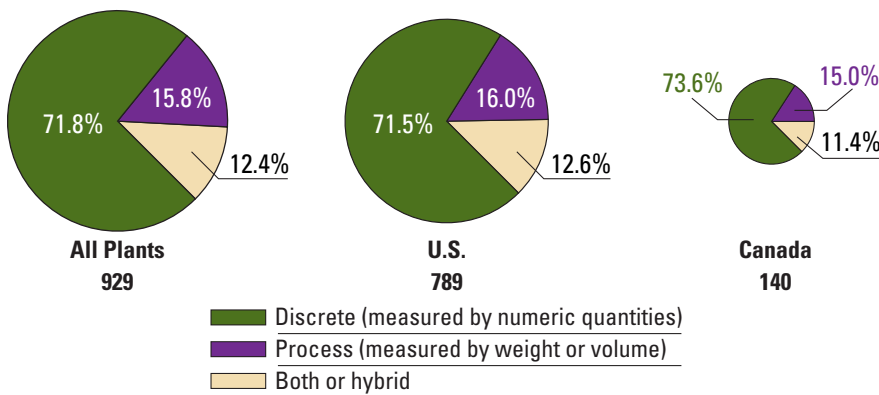
Region in which the plant is located:

	All Plants	U.S.	Canada
(N)	943	798	145
Northeast	13.0%	15.4%	0.0%
Midwest	37.8%	44.6%	0.0%
South	24.0%	28.3%	0.0%
West	9.3%	11.0%	0.0%
Canada	15.1%	0.0%	97.9%
Other or not indicated	0.9%	0.6%	2.1%

What is the approximate annual revenue of the plant's corporate parent?

	All Plants	U.S.	Canada
(N)	936	795	141
Less than \$100 million	58.6%	60.4%	48.2%
\$100 million – \$499 million	15.8%	15.6%	17.0%
\$500 million – \$999 million	5.9%	5.8%	6.4%
\$1 billion – \$5 billion	11.2%	10.7%	14.2%
\$6 billion – \$10 billion	4.1%	3.7%	6.4%
More than \$10 billion	4.5%	3.9%	7.8%

What is the nature of manufacturing operations for primary products at this plant?



How many years has it been since plant start-up?

	All Plants	U.S.	Canada
(N)	937	794	143
Less than 5 years	3.1%	3.4%	1.4%
5 – 10 years	8.0%	7.4%	11.2%
11 – 20 years	18.4%	16.8%	27.3%
More than 20 years	70.5%	72.4%	60.1%

What is the primary product* this plant produces?

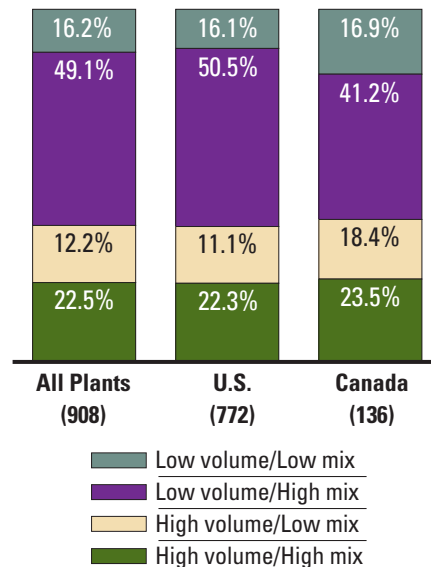
	All Plants	U.S.	Canada
(N)	943	798	145
Machinery manufacturing	20.4%	20.1%	22.1%
Fabricated metal product manufacturing	12.8%	13.2%	11.0%
Transportation equipment manufacturing	9.8%	8.3%	17.9%
Chemical manufacturing	7.2%	8.0%	2.8%
Computer and electronic product manufacturing	7.2%	7.6%	4.8%
Miscellaneous manufacturing	6.4%	7.1%	2.1%
Electrical equipment, appliance, and component manufacturing	5.3%	4.8%	8.3%
Plastics and rubber products manufacturing	5.2%	4.9%	6.9%
Primary metal manufacturing	5.2%	5.5%	3.5%
Food manufacturing	3.5%	3.8%	2.1%
Printing and related support activities	2.7%	2.9%	1.4%
Furniture and related product manufacturing	2.7%	2.8%	2.1%
Paper manufacturing	2.6%	2.3%	4.1%
Nonmetallic mineral product manufacturing	2.3%	2.8%	0.0%
Wood product manufacturing	2.2%	2.3%	2.1%
Beverage and tobacco product manufacturing	0.5%	0.4%	1.4%
Apparel manufacturing	0.5%	0.5%	0.7%
Textile mills	0.4%	0.4%	0.7%
Textile product mills	0.4%	0.4%	0.7%
Petroleum and coal products manufacturing	0.2%	0.3%	0.0%
Leather and allied product manufacturing	0.1%	0.0%	0.7%
Product description not available	2.4%	2.0%	4.8%

* Classified by North American Industry Classification System codes

In which of the following industry value chains does this plant primarily participate?

	All Plants	U.S.	Canada
(N)	921	777	144
Industrial equipment and machinery	20.9%	20.2%	24.3%
Automotive	14.7%	13.4%	21.5%
Construction	10.6%	11.2%	7.6%
Consumer packaged goods/nondurables	8.6%	9.7%	2.8%
Consumer product durables	7.5%	7.5%	7.6%
Pharmaceuticals, biotechnology, medical	5.7%	5.9%	4.2%
Aerospace	5.1%	4.6%	7.6%
Chemicals	4.2%	4.8%	1.4%
High tech	4.0%	4.1%	3.5%
Printing and publishing	3.4%	3.5%	2.8%
Defense industry	2.2%	2.5%	0.7%
None of the above	13.3%	12.7%	16.0%

Which criterion below best describes the volume and product mix of your plant's operations?



Human Resources

Employee populations

Approximately two of five plants (43%) participating in the two studies had fewer than 100 employees: 44% of U.S. plants and 42% of Canada plants. The U.S. figure is down substantially from past years when 58% and 53% of plants in 2004 and 2005, respectively, reported fewer than 100 employees. This trend may be explained by an increase in public companies participating in the U.S. study (see page 2). For the combined U.S. and Canada

studies, only 17% of plants that belong to public companies reported fewer than 100 employees; 53% of plants that belong to a private company reported fewer than 100 employees.

The majority of plants (80%) report no union employees in their facilities: 82% of U.S. plants and 67% of Canada plants.

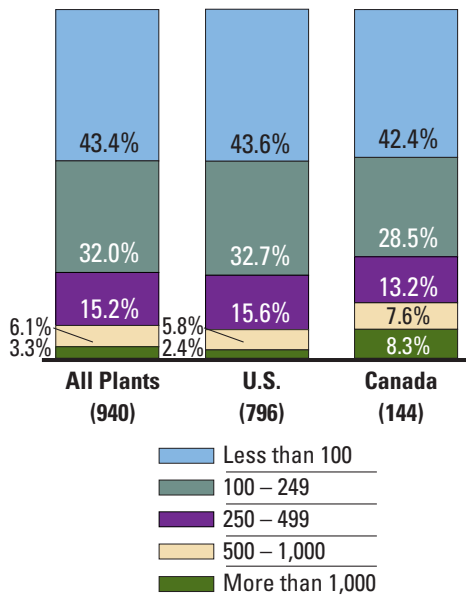
The Canada plants were more likely to have an all-union workforce, with 17% reporting that 100% of their workforce was represented by a union vs. 9% of U.S. plants. Among the U.S. plants, Midwest facilities were most likely to report an all-union presence, with 12% reporting all workers represented

by unions. U.S. plants in the South and West regions were the least likely to have union representation, with 4% of plants in both regions reporting all workers in unions and 87% and 90%, respectively, reporting no union workers.

Employment turnover and growth

The annual labor turnover rate among combined U.S. and Canada plants was median 8% in 2006, comparable to the 2005 IW/MPI U.S. Census rate—despite a modestly better median 6% performance for Canada plants. Plants that report decreasing employment levels in 2006 vs. 2005 (see next page) also report higher turnover rates: A median 10% among plants that report decreasing employment vs. 5% where employment levels remain the same and 8% where employment was increasing. Unlike past years' data, labor turnover varied little based on the number of employees in the plant, with all sizes reporting around median 8% turnover. In the U.S., labor turnover was highest in the South and West regions, with medians of 10% and 9%, respectively.

How many employees are at this plant location?



What is the plant's annual labor turnover rate for the most recent year?

	All Plants	U.S.	Canada
(N)	911	775	136
Median	8.0%	8.0%	6.0%
Average	13.1%	13.0%	13.7%
75th Percentile	3.0%	3.0%	3.3%
25th Percentile	15.0%	15.0%	12.1%

What percentage of plant production workers are represented by a union(s)?

	All Plants	U.S.	Canada
(N)	934	793	141
0%	80.0%	82.2%	67.4%
1 – 25%	1.4%	1.1%	2.8%
26 – 50%	1.9%	2.3%	0.0%
51 – 75%	2.3%	2.0%	3.6%
76 – 99%	4.6%	3.8%	9.2%
100%	9.9%	8.6%	17.0%

Employment was generally on the rise in 2006 vs. 2005, as were expectations for employment in 2007 vs. 2006: 58% of plants report increasing employment in 2006, and 22% report that employment levels remained the same; 61% of plants anticipate employment increases in 2007, and 24% anticipate no change in employment. The employment change based on grouped category data was a 2.5% increase for 2006 vs. 2005, and an anticipated 3.4% increase for 2007 vs. 2006.¹

Not surprisingly, of those plants that report an increase in 2006 employment, 82% expect to increase employment again in 2007; of those plants that report a decrease in 2006 employment, just 24% expect to increase employment in 2007 (51% of these latter plants expect decreased employment levels again in 2007). Additionally, 25% of the plants that report employment decreases in 2006 expect to either close (11%) or merge with another plant (14%) in the coming year (see page 24). Just 7% of plants that report an employment increase in 2006 anticipate either fate.

Please indicate the primary improvement methodology followed by the plant and the extent to which the methodology has been implemented:

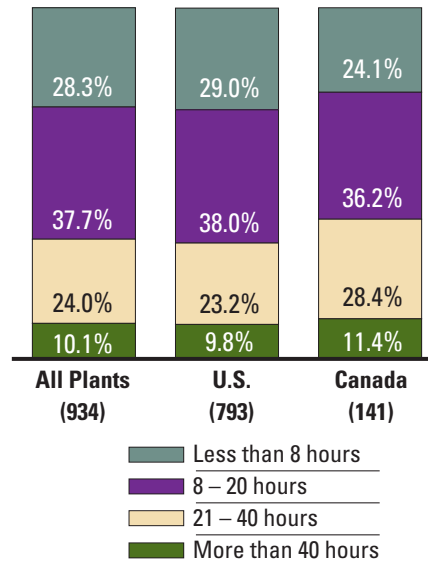
	2006 vs. 2005			2007 vs. 2006		
	All Plants	U.S.	Canada	All Plants	U.S.	Canada
(N)	928	788	140	881	751	130
Decrease 21% or more	2.7%	2.5%	3.6%	1.3%	1.3%	0.8%
Decrease 11 – 20%	4.3%	4.4%	3.6%	2.2%	2.3%	1.5%
Decrease 1 – 10%	12.8%	11.8%	18.6%	11.4%	10.7%	15.4%
0%	22.0%	22.1%	21.4%	24.3%	24.4%	23.9%
Increase 1 – 10%	46.2%	47.3%	40.0%	47.9%	48.5%	44.6%
Increase 11 – 20%	8.7%	8.5%	10.0%	10.4%	10.5%	10.0%
Increase 21% or more	3.2%	3.3%	2.9%	2.6%	2.4%	3.9%

Training and empowerment

Approximately 28% of plants train each employee less than eight hours annually, and 10% of plants train more than 40 hours per year. With more large plants participating in this year’s U.S. survey, MPI would have anticipated higher levels of training—in past years, the more employees in a plant, the more hours of training per employee—but the difference between years is negligible. For U.S. plants, 29% train less than eight hours in 2006 vs. 28% in 2005, and 10% train more than 40 hours in 2006 vs. 9% in 2005.

Plants with fewer employees continue to train less than their larger competitors. For example, 36% of plants with fewer than 100 employees train each employee less than eight hours per year vs. just 15% of plants with more than 500 employees. About half of the larger plants (49%) train 20 hours or more vs. 30% of plants with fewer than 100 employees. Larger plants do not, though, spend more on employee development, investing a median 2% of their labor budget on training—a percentage similar to that of smaller plants. Canada plants spend median 3% on training vs. the 2% spending by U.S. plants.

What are the average annual hours of formal training received by each plant employee?



¹ Employment change categories were assigned midpoints. Categories at the high end and low end of responses, “increase more than 21%” and “decrease more than 21%,” were assigned midpoints of +25% and –25%, respectively, to calculate averages.

What is the plant's approximate spending on training as a percentage of the total labor budget?

	All Plants	U.S.	Canada
(N)	825	715	110
Median	2.0%	2.0%	3.0%
Average	3.0%	2.9%	3.7%
75th Percentile	4.0%	3.5%	5.0%
25th Percentile	1.0%	1.0%	1.0%

Plants that train more tend to have a higher percentage of their production workforce participating in empowered or self-directed work teams. Nearly one-fourth of all plants (23%) have a majority of their production employees in empowered or self-directed work teams; 8% of plants have all employees empowered. One-third of plants (35%) that train 20 hours or more per employee report that a majority of their workforce is empowered or self-directed, and 12% report an all-empowered workforce. Only 13% of plants that train each employee less than eight hours report having a majority of their workforce empowered, and just 7% have an all-empowered workforce.

What percentage of production employees participate in empowered or self-directed work teams?

	All Plants	U.S.	Canada
(N)	920	787	133
0%	27.4%	27.5%	27.1%
1 – 25%	37.3%	37.4%	36.8%
26 – 50%	12.4%	12.3%	12.8%
51 – 75%	8.3%	7.9%	10.5%
76 – 99%	6.5%	6.1%	9.0%
100%	8.2%	8.9%	3.8%

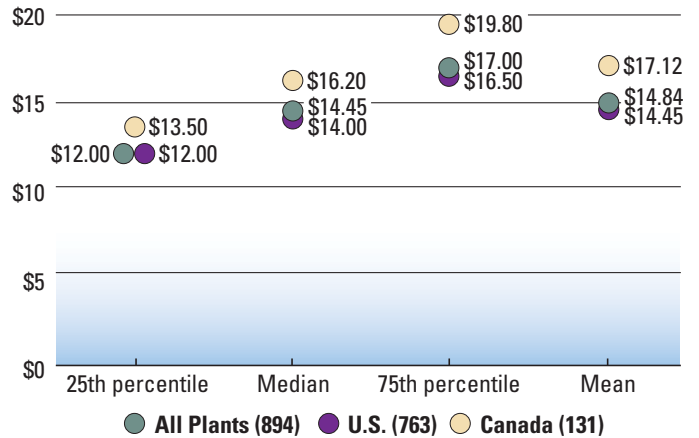
Wages

The median wage for Canada production employees is \$16.20 (hourly rate without overtime), which is 16% higher than the U.S. production worker wage of \$14.² Note, too, that the U.S. wage actually rose 50 cents this year from \$13.50 in 2005. Other wage trends include:

- Larger plants pay more—\$16 at plants with 500 or more employees vs. \$14 at plants with fewer than 100 employees.
- Older plants pay more—\$15 at plants that have been around for 20 or more years vs. \$12.50 at plants that are less than five years old.
- Non-union plants pay less than union plants—\$14 at plants with no union employees vs. \$17 at plants with 1 – 50% of the workforce in unions, \$18 at plants with 51 – 99% of the workforce in unions, and \$16.10 at plants with all workers in unions.

What is the approximate average wage for production employees?

(Hourly rate without overtime)



²\$0.90 Canada dollars per U.S. dollar, June 30, 2006.

Workforce development

Safety and health programs continue to be the most widely used human resource (HR) programs, with 96% of plants reporting the existence of these programs. The least-used HR program is teaming, in place at just 73% of plants. Safety and health programs were also identified as the most effective; where safety programs are in place, 96% of U.S. and Canada plants rate these programs as either “somewhat effective” (47%) or “highly effective” (49%). The two least effective HR programs are teaming and leadership training. Of those plants that use teaming programs, 22% report it as not effective; of those plants that use leadership training, 21% report it is not effective.

MPI Alert: Manufacturers in the U.S. and Canada continue to be rather optimistic when projecting their 2006 and 2007 employment levels. While economies in either country have shown modest growth at best, most executives continue to project more employees in their plants. When and if that takes place, expect only the savviest of HR departments to succeed as they locate, hire, grow and retain employees amid a more competitive workforce climate.

How effective are the following human resource/employee programs at your plant?

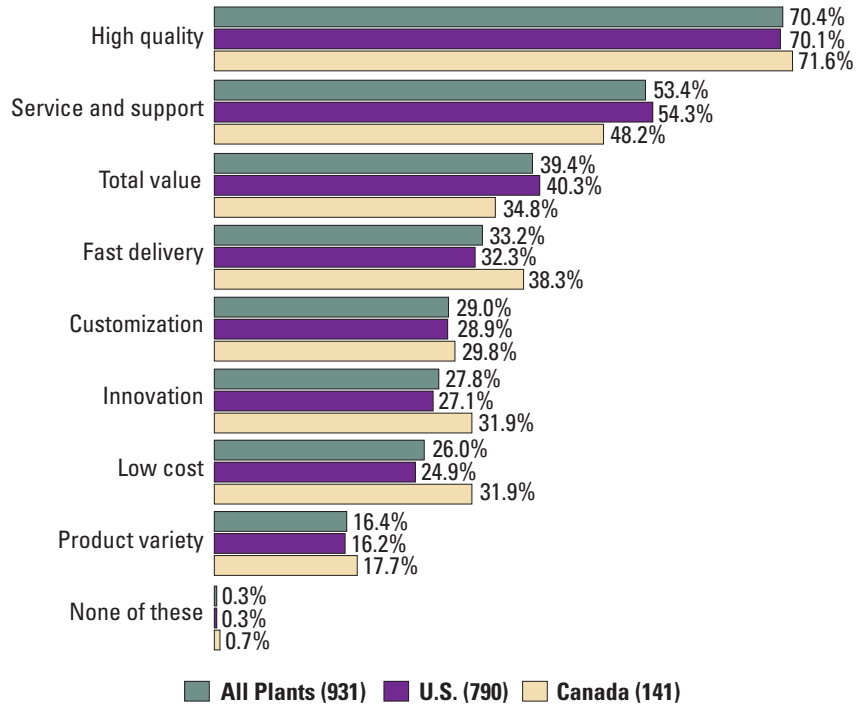
	All Plants	U.S.	Canada
Recruiting and hiring			
(N)	934	794	140
No program exists	19.2%	19.7%	16.4%
Not effective	7.5%	7.3%	8.6%
Somewhat effective	59.9%	60.1%	58.6%
Highly effective	13.5%	13.0%	16.4%
Performance management			
(N)	932	792	140
No program exists	14.2%	14.4%	12.9%
Not effective	13.3%	12.3%	19.3%
Somewhat effective	58.2%	58.3%	57.1%
Highly effective	14.4%	15.0%	10.7%
Employee development and training			
(N)	927	788	139
No program exists	12.5%	12.7%	11.5%
Not effective	15.1%	15.6%	12.2%
Somewhat effective	62.6%	62.4%	63.3%
Highly effective	9.8%	9.3%	13.0%
Leader/supervisor development and training			
(N)	926	785	141
No program exists	18.3%	18.7%	15.6%
Not effective	17.3%	17.2%	17.7%
Somewhat effective	53.9%	53.8%	54.6%
Highly effective	10.6%	10.3%	12.1%
Teaming			
(N)	926	787	139
No program exists	26.9%	27.3%	24.5%
Not effective	16.0%	14.4%	25.2%
Somewhat effective	44.5%	45.4%	39.6%
Highly effective	12.6%	13.0%	10.8%
Safety and health			
(N)	931	792	139
No program exists	3.7%	3.9%	2.2%
Not effective	3.9%	3.7%	5.0%
Somewhat effective	45.4%	46.1%	41.7%
Highly effective	47.1%	46.3%	51.1%

Operations

Market focus

Customers are looking for high quality, service and support, total value, and fast delivery. Fortunately, most manufacturers in the U.S. and Canada understand this, with these value attributes topping the list of plant objectives in 2006. Plants closest to world-class manufacturing status ("significant progress" or "fully achieved," see page 15), were more likely to emphasize high quality (76% of world-class plants vs. 69% that had made "some progress" and 68% of those that had made "no progress"), total value (45% vs. 40% and 28%), and innovation (33% vs. 29% and 18%). Plants that had made "no progress" toward world-class status were more likely to focus on customization (37% of "no progress" plants vs. 28% of "some progress" and 27% of world-class plants) and product variety (20% vs. 18% and 12%), possibly indicating an inability to recognize the merits of standardization processes or a job-shop operation.

Please select the top three objectives that best describe the focus of your market strategy:
(multiple responses allowed)



Improvement methods and best practices

Nearly one in four plants (39%) follow a Lean Manufacturing improvement methodology, with approximately 41% of U.S. plants and 28% of Canada plants adopting Lean Manufacturing. Yet this is only part of the Lean picture, as the percentage of plants following Lean and Six Sigma (12%) and the Toyota Production System (4%) is on the rise among U.S. plants from 2005 (12% and 3%); Canada boasts similar percentages (11% and 6%). Collectively, a majority of plants (54%) now are following some version of Lean. These Lean deployments appear to have been in place for some time:

- Lean Manufacturing – 50% significant implementation, and 3% complete implementation,
- Lean and Six Sigma – 61% significant implementation, and 3% complete implementation, and
- Toyota Production System (TPS) – 50% significant implementation, and 27% complete implementation.

Surprisingly, 19% of plants don't follow any methodology.

Please indicate the primary improvement methodology followed by the plant:

	All Plants	U.S.	Canada
(N)	876	745	131
Lean Manufacturing	38.7%	40.5%	28.2%
Lean and Six Sigma	12.1%	12.4%	10.7%
Total Quality Management	10.6%	9.9%	14.5%
Agile Manufacturing	4.0%	3.8%	5.3%
Toyota Production System	3.5%	3.1%	6.1%
Six Sigma	3.3%	3.1%	4.6%
Theory of Constraints	3.0%	3.0%	3.1%
Other	5.7%	5.2%	8.4%
No methodology	19.1%	19.1%	19.1%

Most manufacturers are deploying their improvement methodology in production (86% of plants). Functions adjacent to production also get considerable attention: 47% of plants are implementing their strategy in material management, while 43% are deploying in shipping and logistics. Not surprisingly, with Lean's emphasis on flow of materials into and out of plants, implementation rates in these three areas are even higher for plants following Lean Manufacturing, Lean and Six Sigma, or TPS: 99%, 55%, and 53%, respectively.

In which departments has your improvement methodology been implemented?

(multiple responses allowed)

	All Plants	U.S.	Canada
(N)	871	739	132
Production	86.1%	86.5%	84.1%
Materials management	46.8%	46.8%	47.0%
Shipping and logistics	43.1%	44.0%	37.9%
Purchasing	32.5%	31.9%	35.6%
Engineering	28.5%	27.9%	31.8%
Customer relations	20.6%	20.4%	21.2%
Administration	18.9%	18.3%	22.7%
Supplier relations	18.4%	18.5%	17.4%
Finance and accounting	15.5%	15.3%	16.7%
Research and development	9.8%	9.5%	11.4%
Other	1.6%	1.8%	0.8%
None of these	10.7%	10.6%	11.4%

A majority of plants are using continuous-improvement programs (73%) and quality certifications such as ISO (53%); quality certifications were more likely to be found in Canada plants than U.S. plants (64% vs. 51%), although the higher representation of transportation-product plants in the Canada Study may contribute to this difference. Many plants in both countries seem oblivious to improvement efforts, as 10% of plants pursue none of best practices listed. Among plants with no improvement methodology, 35% use *none* of the best practices.

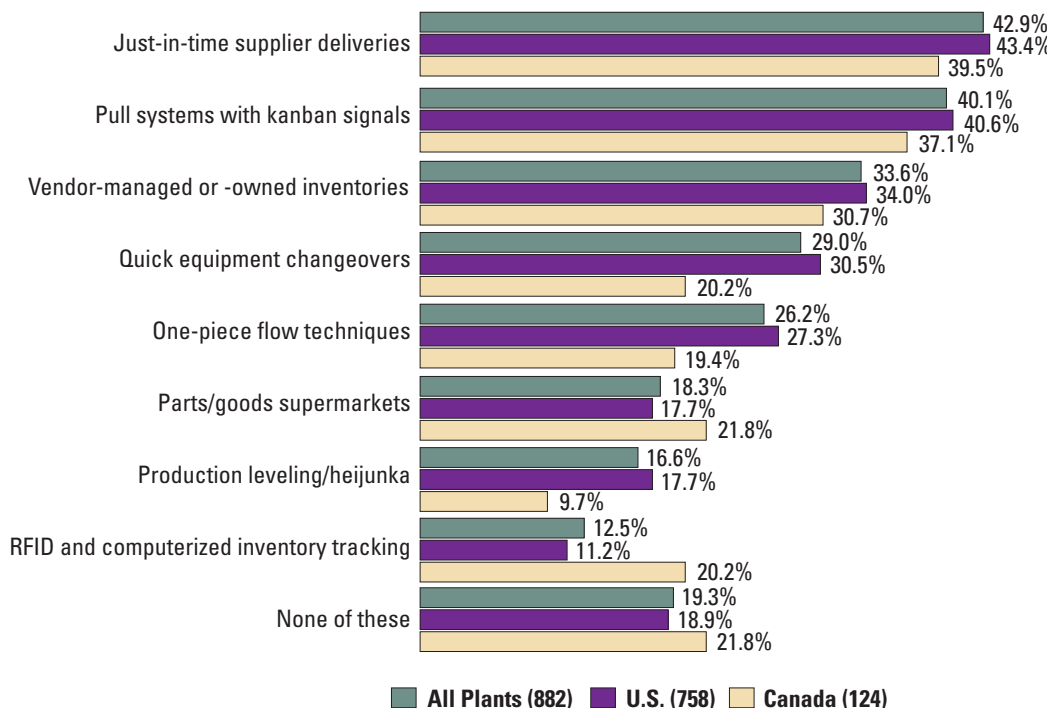
Which of the following strategic practices occur at this plant?

(multiple responses allowed)

	All Plants	U.S.	Canada
(N)	927	787	140
Continuous-improvement program	73.0%	72.9%	73.6%
Quality certifications (e.g. ISO)	52.5%	50.6%	63.6%
Customer-satisfaction surveys	45.3%	45.9%	42.1%
Benchmarking	34.8%	35.2%	32.9%
Environmental management	31.8%	32.4%	28.6%
Total productive maintenance	24.8%	24.5%	26.4%
Energy management	23.2%	23.4%	22.1%
Open-book management	17.5%	18.3%	12.9%
None of these	10.1%	10.3%	9.3%

Which of the following practices are used to manage inventory?

(multiple responses allowed)



One-third or more of plants were using just-in-time supplier deliveries (43%), pull systems with kanban signals (40%) and vendor-managed or -owned inventories (34%). Lean plants (those following Lean, Lean and Six Sigma, or TPS) are more likely to have adopted these inventory-management practices (47%, 57% and 41%, respectively), but many plants aligned with other methodologies or even no methodology are also applying inventory-management techniques.

Revenue expectations

Manufacturers were optimistic that revenues for 2006 would be higher than 2005 (75% expected an increase) and that 2007 revenues would top 2006 (79% expect an increase), but optimism is weighted toward U.S. plants: 77% expected a 2006 increase vs. 59% of Canada plants, and 81% expect a 2007 increase vs. 63% of Canada plants. The revenue change based on grouped category data was a 6% increase for 2006 vs. 2005, and an anticipated 6.5% increase for 2007 vs. 2006.³

Among all the plants in both surveys, the following industries are the most bullish on revenue growth in 2006: Electrical equipment, appliances and components (83% of plants expected revenues to increase in 2006 vs. 2005), computer and electronic products (83%), and nonmetallic mineral products. For 2007, the most bullish industries are electrical equipment, appliances and components (86% of plants expect revenues to increase in 2007 vs. 2006), food and beverages (86%), fabricated metal products (85%), and primary metals (85%).⁴

Please indicate the anticipated revenue change in:

	2006 vs. 2005			2007 vs. 2006		
	All Plants	U.S.	Canada	All Plants	U.S.	Canada
(N)	863	748	115	829	717	112
Decrease 21% or more	1.9%	1.6%	3.5%	1.1%	0.8%	2.7%
Decrease 11 – 20%	3.5%	3.2%	5.2%	2.2%	1.5%	6.3%
Decrease 1 – 10%	11.6%	9.8%	23.5%	8.1%	6.6%	17.9%
0%	8.3%	8.3%	8.7%	10.3%	10.2%	10.7%
Increase 1 – 10%	44.3%	44.9%	40.0%	48.5%	50.1%	38.4%
Increase 11 – 20%	22.8%	24.1%	14.8%	24.4%	25.1%	19.6%
Increase 21% or more	7.7%	8.2%	4.4%	5.6%	5.7%	4.5%

COGS and margins

The cost of goods sold (as a percent of plant revenue) was a median 68%, meaning that plant gross margins (inverse of costs of goods sold) are median 32%. Gross profit was considerably lower among Canada plants (26%) than U.S. plants (32.2%). COGS consisted of median 20% labor, 25% overhead, and 50% materials.

What are the plant's costs as a percentage of costs of goods sold?

	All Plants	U.S.	Canada
Labor			
(N)	826	718	108
Median	20.0%	19.9%	25.0%
Average	22.0%	21.5%	25.3%
75th Percentile	10.8%	10.1%	15.0%
25th Percentile	30.0%	30.0%	33.8%

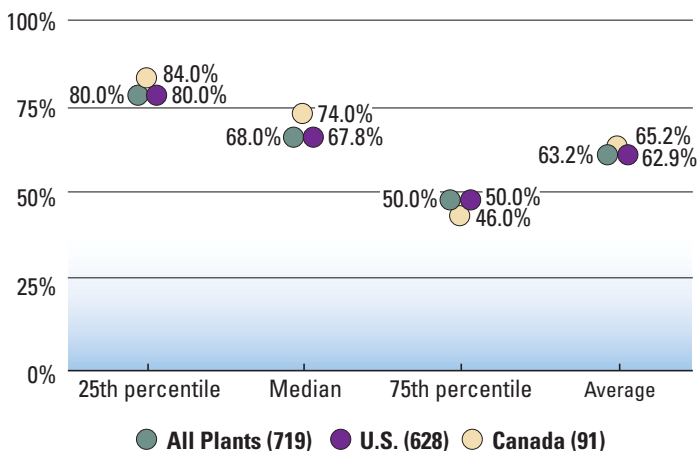
Overhead

	All Plants	U.S.	Canada
(N)	818	710	108
Median	25.0%	25.0%	25.0%
Average	27.0%	27.0%	27.1%
75th Percentile	17.0%	17.0%	16.0%
25th Percentile	35.0%	35.0%	35.0%

Materials

	All Plants	U.S.	Canada
(N)	828	720	108
Median	50.0%	50.0%	45.0%
Average	48.3%	48.4%	47.6%
75th Percentile	35.0%	35.0%	33.3%
25th Percentile	60.0%	60.0%	64.3%

What is the plant's cost of goods sold as a percent of plant revenue?



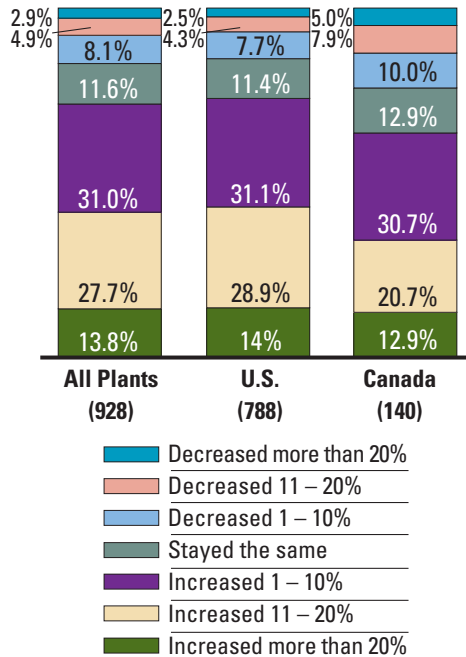
³ Revenue change categories were assigned midpoints. Categories at the high end and low end of responses, "increase more than 21%" and "decrease more than 21%," were assigned midpoints of +25% and -25%, respectively, to calculate averages.

⁴ Based on industries with 20 or more plants reporting data.

Output and productivity

Three-fourths of plants (73%) report production unit-volume output had increased in the past 12 months, while just 16% report a production-output decline; 74% of U.S. plants report increased output vs. 64% of Canada plants. Eighty-six percent of plants that have increased output in the last 12 months anticipate increased revenues in 2007 vs. 2006; surprisingly, 53% of those who had decreased output in the past 12 months still anticipate increased revenues in 2007.

How has total production output (unit volume) changed in the past 12 months?



Productivity among the plants (as measured by U.S. dollar⁵ sales per employee) was a median \$172,500. That figure is led by U.S. plants at median \$174,000, which surpasses the U.S. mark in 2005 of \$150,000 per employee. Productivity had increased in the past year at 69% of plants (71% of U.S. plants and 60% of Canada plants). Fifteen percent of plants report that productivity had decreased in the most recent fiscal year (16% of U.S. plants and 14% of Canada plants). Based on respondent data, MPI also computed productivity measures of gross profit per employee (median US\$56,000 per employee) and value-add per employee (median US\$114,070) per employee.⁶

What are the approximate sales per employee for the most recent fiscal year?

	All Plants	U.S.	Canada
(N)	790	687	103
Median	\$172,500	\$174,000	\$168,300
Average	\$241,606	\$243,291	\$230,366
75th Percentile	\$257,550	\$258,000	\$257,400
25th Percentile	\$108,000	\$109,000	\$96,300

Gross profit per employee:⁶

	All Plants	U.S.	Canada
(N)	687	604	83
Median	\$56,000	\$58,615	\$38,610
Average	\$87,357	\$90,900	\$61,570
75th Percentile	\$99,000	\$101,489	\$71,928
25th Percentile	\$26,700	\$28,125	\$18,630

Value-add per employee:⁶

	All Plants	U.S.	Canada
(N)	751	658	93
Median	\$114,070	\$116,250	\$93,561
Average	\$156,466	\$160,912	\$123,398
75th Percentile	\$175,000	\$177,504	\$154,462
25th Percentile	\$77,229	\$80,154	\$60,783

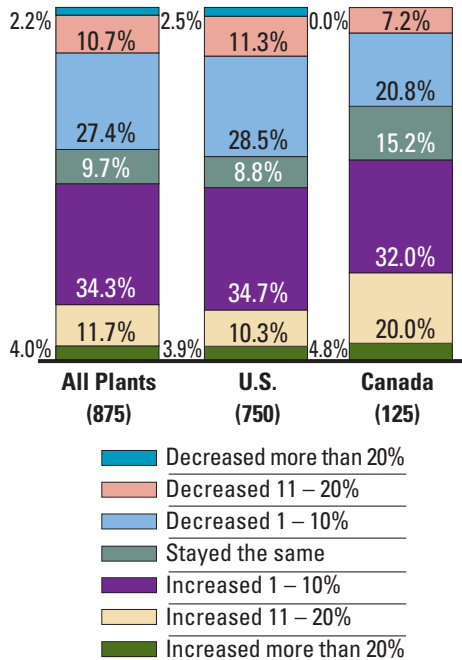
⁵ \$0.90 Canada dollars per U.S. dollar, June 30, 2006.

⁶ Gross profit per employee = sales per employee X gross profit margin;
Value-add per employee = sales per employee X (1 – material costs as a percentage of cost of goods sold).

Manufacturing costs and inventory

Despite increases in output and expectations for higher revenues, many plants won't see improved profitability. Just 40% of plants have been able to reduce their manufacturing costs (excluding purchased materials) over the last three years, and rising material costs also are trimming bottom lines. Only 28% of Canada plants have reduced manufacturing costs vs. 42% of U.S. plants. Then, too, just 41% of Canada plants have increased inventory turns in the last three years compared to 56% of U.S. plants (54% of plants in both countries combined). Overall turn rates were comparable for the two countries.

How have per-unit manufacturing costs, excluding purchased materials, changed in the last 3 years?



What are the plant's inventory turn rates⁷?

	All Plants	U.S.	Canada
Raw material turns			
(N)	606	538	68
Median	10.0	10.0	9.7
Average	21.9	21.3	26.3
75th Percentile	18.0	18.0	16.0
25th Percentile	5.0	5.3	5.0

	All Plants	U.S.	Canada
Work-in-process turns			
(N)	536	472	64
Median	15.6	15.6	15.5
Average	115.1	119.0	86.4
75th Percentile	40.3	40.9	39.4
25th Percentile	7.5	8.0	6.3

	All Plants	U.S.	Canada
Finished goods turns			
(N)	552	490	62
Median	12.0	12.0	11.4
Average	44.3	42.7	56.6
75th Percentile	24.0	24.0	40.0
25th Percentile	6.0	6.0	5.0

	All Plants	U.S.	Canada
Total inventory turns			
(N)	645	573	72
Median	7.0	7.0	7.0
Average	12.6	11.2	23.7
75th Percentile	13.1	13.0	15.0
25th Percentile	4.0	4.0	4.0

How has the total inventory turn rate changed in the last three years?

	All Plants	U.S.	Canada
(N)	802	706	96
Decreased more than 20%	3.1%	2.8%	5.2%
Decreased 11 – 20%	5.2%	5.0%	7.3%
Decreased 1 – 10%	12.2%	11.6%	16.7%
Stayed the same	25.1%	24.4%	30.2%
Increased 1 – 10%	30.7%	31.7%	22.9%
Increased 11 – 20%	14.8%	15.4%	10.4%
Increased more than 20%	8.9%	9.1%	7.3%

⁷ Inventory turns calculated as annual COGS divided by the average value on-hand of each inventory category: raw material, WIP, finished goods, and total inventory, respectively.

Production measures

The U.S. and Canada studies asked respondents to report current- and three-year metrics for manufacturing cycle time, customer order lead time, on-time delivery, finished-product first-pass yield, scrap and rework, and warranty costs:

Manufacturing cycle time

(start of plant production to completion of primary product)

	All Plants	U.S.	Canada
Current year (hours)			
(N)	623	546	77
Median	20	20	24
Average	140	144	108
75th Percentile	5	5	8
25th Percentile	60	60	73
Three years ago (hours)			
(N)	598	526	72
Median	24	24	24
Average	168	173	132
75th Percentile	7	7	8
25th Percentile	80	80	88
Three-year % change			
(N)	597	525	72
Median	-20%	-20%	-20%
Average	-16%	-15%	-22%
75th Percentile	-40%	-40%	-36%
25th Percentile	0%	0%	-6%

Customer order lead time

(order-entry through production to ship for specific product)

	All Plants	U.S.	Canada
Current year (days)			
(N)	735	648	87
Median	12	12	18
Average	31	29	47
75th Percentile	5	5	5
25th Percentile	30	30	36
Three years ago (days)			
(N)	707	625	82
Median	15	15	21
Average	34	33	41
75th Percentile	7	7	10
25th Percentile	36	36	45
Three-year % change			
(N)	706	625	81
Median	-20%	-23%	-14%
Average	-3%	-5%	10%
75th Percentile	-42%	-43%	-33%
25th Percentile	0%	0%	0%

On-time delivery rate (% of goods delivered on time)

	All Plants	U.S.	Canada
Current year			
(N)	799	701	98
Median	95.0%	95.0%	95.0%
Average	90.7%	90.9%	89.4%
75th Percentile	98.0%	98.0%	98.0%
25th Percentile	90.0%	90.0%	85.9%
Three years ago			
(N)	770	678	92
Median	90.0%	90.0%	90.0%
Average	86.0%	86.3%	84.4%
75th Percentile	96.0%	96.0%	95.0%
25th Percentile	80.0%	80.0%	80.0%
Three-year %-point change			
(N)	768	676	92
Median	2.5	2.0	3.5
Average	4.7	4.7	4.8
75th Percentile	10.0	9.0	10.0
25th Percentile	0.0	0.0	0.0

Finished-product first-pass quality yield

(% of product that passes final inspection)

	All Plants	U.S.	Canada
Current year			
(N)	733	642	91
Median	97.0%	97.0%	96.0%
Average	93.7%	93.8%	92.7%
75th Percentile	99.0%	99.0%	99.0%
25th Percentile	93.0%	93.0%	90.0%
Three years ago			
(N)	700	615	85
Median	95.0%	95.0%	92.0%
Average	89.3%	89.3%	89.4%
75th Percentile	98.0%	98.0%	96.5%
25th Percentile	86.0%	87.0%	85.0%
Three-year %-point change			
(N)	700	615	85
Median	2.0	2.0	2.0
Average	4.4	4.6	2.9
75th Percentile	5.0	5.0	5.0
25th Percentile	0.0	0.0	0.0

Scrap and rework (as % of plant sales)

	All Plants	U.S.	Canada
Current year			
(N)	733	642	91
Median	2.0%	2.0%	2.0%
Average	4.1%	4.1%	3.8%
75th Percentile	1.0%	1.0%	1.0%
25th Percentile	4.2%	4.1%	5.0%
Three years Ago			
(N)	699	617	82
Median	3.0%	3.0%	3.0%
Average	5.4%	5.4%	5.0%
75th Percentile	1.0%	1.0%	1.0%
25th Percentile	5.0%	5.0%	5.2%
Three-year %-point change			
(N)	699	617	82
Median	-0.3	-0.4	-0.1
Average	-1.2	-1.3	-1.0
75th Percentile	-2.0	-2.0	-1.6
25th Percentile	0.0	0.0	0.0

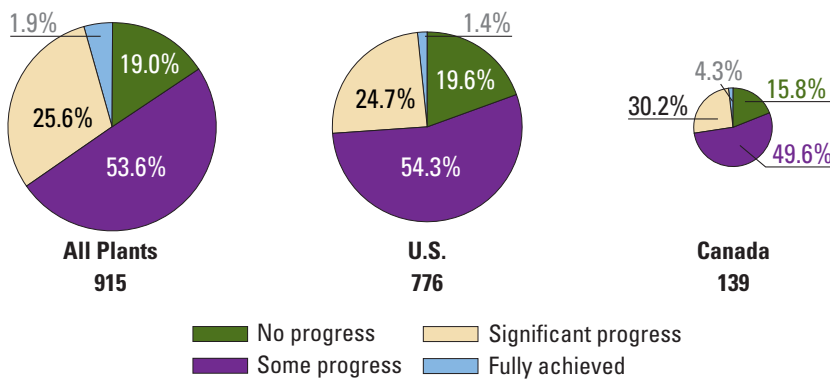
Warranty costs (as % of plant sales)

	All Plants	U.S.	Canada
Current year			
(N)	603	524	79
Median	1.0%	1.0%	0.9%
Average	1.6%	1.6%	1.8%
75th Percentile	0.0%	0.0%	0.0%
25th Percentile	2.0%	2.0%	2.0%
Three years ago			
(N)	580	506	74
Median	1.0%	1.0%	0.7%
Average	2.1%	2.2%	1.6%
75th Percentile	0.0%	0.0%	0.0%
25th Percentile	2.0%	2.6%	1.6%
Three-year %-point change			
(N)	580	506	74
Median	0.0	0.0	0.0
Average	-0.6	-0.7	-0.4
75th Percentile	-0.5	-0.7	-0.1
25th Percentile	0.0	0.0	0.0

World-class manufacturers

A proxy for performance excellence among the IW/MPI Census and Canada Study plants is a group of facilities that report having either made “significant progress” toward or “fully achieved” world-class manufacturing status: 28% of all plants (26% in the U.S. and 35% in Canada). Almost one in five plants report having made “no progress” toward world class (20% in the U.S. and 16% in Canada).

How much progress has the plant made toward achieving world-class manufacturing status?



Not surprisingly, 95% of those plants closest to world-class had an improvement methodology in place; just 52% of plants that report “no progress” toward world-class have an improvement methodology. Among the world-class plants, 62% are deploying one of the Lean methodologies (Lean, Lean

World-class progress correlated with improvement methodology:

	No progress	Some progress	Significant/Full
Lean Manufacturing	18.6%	48.2%	35.1%
Lean and Six Sigma	5.0%	10.9%	20.2%
Total Quality Management	7.5%	8.8%	16.2%
Toyota Production System	1.2%	2.8%	7.0%
Theory of Constraints	1.9%	3.0%	3.9%
Six Sigma	3.1%	3.4%	3.1%
Agile Manufacturing	5.0%	4.5%	2.6%
Other	5.6%	4.9%	7.0%
No methodology	52.2%	13.5%	4.8%

and Six Sigma, or TPS), while just 25% of plants that have made no progress have deployed Lean. Similarly, plants closest to world-class were more likely to be using practices such as continuous-improvement programs (94% of world-class vs. 31% of plants that have made no progress), quality certifications (71% vs. 24%), customer satisfaction surveys (57% vs. 23%), and benchmarking (56% vs. 15%).

Correlations of world-class status with use of improvement methodologies and best practices is striking. Understanding the practices in place at world-class plants offers insight into how others might achieve that status and the results that accompany it. For example, world-class plants were more likely to report:

- Lower median annual labor turnover rates (6% turnover at plants that made significant progress or fully achieved world-class vs. 10% at plants that have made no progress toward world-class);
- Higher median wages per production employee (\$15 at world-class vs. \$13.24 at no progress);
- More training annually per employee (53% of world-class train more than 20 hours vs. 16% of no progress);
- More empowered employees (39% of world-class have a majority of the workforce empowered vs. 9% of no progress);
- Higher median inventory turn rates (9 turns at world-class vs. 6 turns at no progress)
- Higher median sales per employee (\$204,000 at world-class vs. \$150,000 at no progress);
- Higher gross profit per employee (\$62,010 at world-class vs. \$55,000 at no progress);
- Higher median return on invested capital (18% at world-class vs. 12% at no progress); and
- Greater ability to reduce manufacturing costs (52% of world-class vs. 28% of no progress).

MPI Alert: The power of having a specified method to improve shows up annually in MPI manufacturing studies—those plants with an improvement approach, such as Lean, and deploying best practices typically have better performances. We believe that most facilities *determined* to improve but possibly struggling along the improvement path will ultimately prevail, but what of the countless plants that don’t see the need to even try? The days of price = cost + profit are over, and customers stuck with vendors who don’t seek improvement will soon find alternatives.

Supply Chain

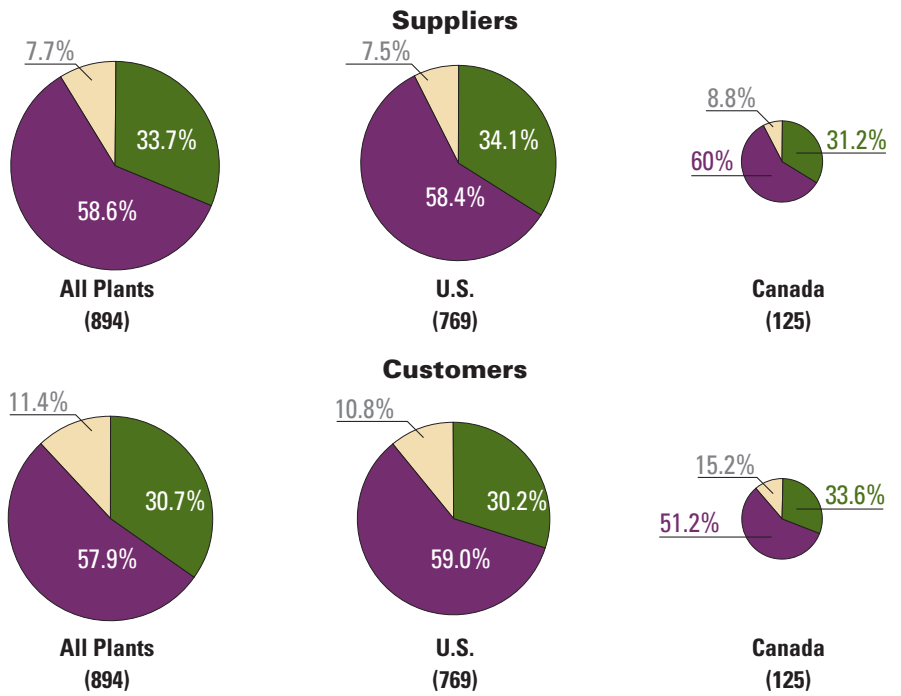
Integration

Supply chains are complex networks of integrated relationships, communications and dependencies. Roughly one-third of Canada and U.S. plants report no integration with upstream or downstream supply-chain partners, making these relationships difficult: 34% report no integration with suppliers (34% of U.S. plants and 31% of Canada plants), and 31% report no integration with customers (30% of U.S. plants and 34% of Canada plants). Only 8% and 11% of plants, respectively, report extensive integration with suppliers and customers.

Where no integration exists, relationships are likely based solely on transactions, which all but removes any ability to enhance value in the supply chain for both suppliers and customers. As manufacturers optimize their internal operations, they increasingly look to their supply-chain relationships as the next target for cycle-time improvements and savings. Yet those manufacturers without integration are missing their best chance for supply-chain improvements.

Indicate to what degree operations are integrated with:

■ No integration ■ Some integration ■ Extensive integration



Immediate customers

Most manufacturers are shipping products directly to end-customers (69% of plants), well above the next highest destinations of wholesaler/distributors (37%) and other manufacturer's plants (35%). Plants shipping directly to consumer end-customers, other manufacturers' plants, and other manufacturers' distribution centers were most likely to report some or extensive integration with their customers: 77% , 75%, and 73% of plants, respectively.

Where does this plant directly ship its products? (multiple responses allowed)

	All Plants	U.S.	Canada
(N)	908	780	128
Direct to end customer (business)	68.6%	68.1%	71.9%
Wholesaler/distributor(s)	37.4%	38.1%	33.6%
Other manufacturer's plant(s)	35.2%	36.4%	28.1%
Direct to end customer (consumer)	26.5%	25.6%	32.0%
Other manufacturer's distribution center(s)	23.4%	23.5%	22.7%
Your company's distribution center(s)	23.0%	22.2%	28.1%
Your company's plant(s)	18.5%	18.7%	17.2%
Government	14.7%	15.3%	10.9%
Retailer(s)	13.8%	13.7%	14.1%
Other	1.5%	1.4%	2.3%
None of these	0.1%	0.0%	0.8%

Supply-chain performances

The U.S. and Canada surveys asked respondents to report current- and three-year metrics for the following supply-chain metrics:

Customer reject rates

(parts per million)

	All Plants	U.S.	Canada
Current year (ppm)			
(N)	522	451	71
Median	90.0	100.0	14.0
Average	2,844.8	2,703.9	3,739.5
75th Percentile	2.0	2.3	0.0
25th Percentile	1,004.3	1,500.0	333.0
Three years ago (ppm)			
(N)	500	436	64
Median	150.0	200.0	23.5
Average	6,109.1	5,881.7	7,658.5
75th Percentile	5.0	6.3	1.0
25th Percentile	3,000.0	3,035.3	1,000.0
Three-year % change			
(N)	446	396	50
Median	-40.0%	-41.7%	-33.3%
Average	-36.9%	-37.6%	-31.3%
75th Percentile	-66.7%	-66.7%	-59.3%
25th Percentile	0.0%	-0.7%	0.0%

Customer retention rate

(% customers retained from previous year)

	All Plants	U.S.	Canada
Current year			
(N)	670	583	87
Median	97.0%	97.0%	95.0%
Average	93.2%	93.8%	89.4%
75th Percentile	100.0%	100.0%	100.0%
25th Percentile	90.0%	90.0%	90.0%
Three years ago			
(N)	632	555	77
Median	95.0%	95.0%	95.0%
Average	91.0%	91.4%	88.1%
75th Percentile	99.0%	99.0%	100.0%
25th Percentile	90.0%	90.0%	90.0%
Three-year %-point change			
(N)	632	555	77
Median	0.0	0.0	0.0
Average	2.1	2.4	0.5
75th Percentile	3.0	3.0	0.0
25th Percentile	0.0	0.0	0.0
Overseas sales (as % of total dollar volume)			
Current year			
(N)	699	614	85
Median	5.0%	5.0%	2.0%
Average	12.1%	12.0%	12.2%
75th Percentile	15.0%	15.0%	12.5%
25th Percentile	0.0%	0.0%	0.0%
Three years Ago			
(N)	665	591	74
Median	3.0%	4.0%	1.0%
Average	10.2%	10.1%	11.1%
75th Percentile	10.0%	10.0%	10.0%
25th Percentile	0.0%	0.0%	0.0%
Three-year %-point change			
(N)	665	591	74
Median	0.0	0.0	0.0
Average	1.7	1.7	1.8
75th Percentile	4.0	4.0	2.0
25th Percentile	0.0	0.0	0.0

Imported material/components

(% of dollar volume imported)

	All Plants	U.S.	Canada
Current year			
(N)	682	597	85
Median	5.0%	5.0%	13.0%
Average	14.9%	13.4%	25.5%
75th Percentile	20.0%	20.0%	37.5%
25th Percentile	0.0%	0.0%	4.5%
Three years ago			
(N)	652	577	75
Median	3.0%	3.0%	15.0%
Average	11.5%	9.8%	25.0%
75th Percentile	12.0%	10.0%	35.0%
25th Percentile	0.0%	0.0%	2.0%
Three-year %-point change			
(N)	652	577	75
Median	0.0	0.0	0.0
Average	3.5	3.7	1.8
75th Percentile	5.0	5.0	0.0
25th Percentile	0.0	0.0	0.0

Imported material/components from China

(% of dollar volume from China)

	All Plants	U.S.	Canada
Current year			
(N)	683	602	81
Median	0.0%	0.0%	0.0%
Average	6.1%	6.4%	3.9%
75th Percentile	5.0%	5.0%	5.0%
25th Percentile	0.0%	0.0%	0.0%
Three years ago			
(N)	652	580	72
Median	0.0%	0.0%	0.0%
Average	2.7%	2.8%	2.1%
75th Percentile	1.0%	1.0%	0.9%
25th Percentile	0.0%	0.0%	0.0%
Three-year %-point change			
(N)	652	580	72
Median	0.0	0.0	0.0
Average	3.3	3.5	1.8
75th Percentile	3.0	3.0	1.0
25th Percentile	0.0	0.0	0.0

MPI Alert: A median 5% of North American plant sales now occur overseas, and, similarly, a median 5% of materials and components are imported. But these figures don't tell the whole story of how globalization is impacting North American plants. Looking deeper at the numbers, 72% of manufacturers have at least some percentage of sales now occurring overseas (74% of U.S. plants and 60% of Canada plants); 74% import at least some percentage of materials and components (72% of U.S. plants and 83% of Canada plants); and 47% of plants import from China (48% of U.S. plants, up from 38% in 2005, and 44% of Canada plants). Supply-chain relationships now extend around the globe. The challenge for manufacturers is to make sure these relationships truly augment a plant's core competencies and are driven by "total cost" calculations, not merely low prices.

Outsourcing

Transportation activities are the function most likely to be outsourced (47% of plants), with Canada plants more likely to choose this option (59%) than U.S. plants (45%). Canada plants also were more likely to outsource fabrication and/or processing (44% vs. 33%). MPI believes that many top-performing organizations are compiling a portfolio of internal and external functions to optimize the value they offer customers, without regard to ownership of a particular process. For example, 36% of plants that have made significant progress toward or fully achieved world-class status now outsource fabrication, and 13% outsource assembly.

Which of the following production and support activities are outsourced by this plant?

(multiple responses allowed)

	All Plants	U.S.	Canada
(N)	892	767	125
Transportation	47.2%	45.2%	59.2%
Fabrication and/or processing	34.5%	33.0%	44.0%
Information technology	13.7%	13.0%	17.6%
Assembly	12.7%	12.1%	16.0%
Warehousing and/or distribution	11.2%	11.0%	12.8%
Design and/or R&D	10.7%	11.2%	7.2%
Maintenance/asset management	7.4%	7.4%	7.2%
Staging and/or packaging	6.2%	5.7%	8.8%
Purchasing	2.8%	2.4%	5.6%
Customer service	2.5%	2.0%	5.6%
None of these	27.0%	28.2%	20.0%

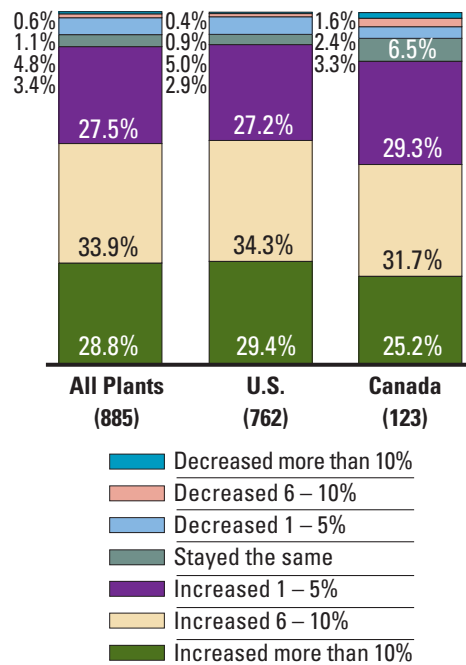
How has the price for primary products (per unit) charged to customers changed in the past year?

	All Plants	U.S.	Canada
(N)	888	767	121
Decreased more than 10%	1.9%	1.7%	3.3%
Decreased 6 – 10%	2.5%	1.6%	8.3%
Decreased 1 – 5%	10.3%	10.0%	11.6%
Stayed the same	13.4%	12.0%	22.3%
Increased 1 – 5%	40.5%	42.2%	29.8%
Increased 6 – 10%	20.6%	21.6%	14.1%
Increased more than 10%	10.8%	10.8%	10.7%

Prices and costs

Customers in every market are pressuring manufacturers to reduce costs—yet at the same time manufacturers report that material costs are rising, meaning that plants are being pinched at both ends. Nine of 10 plants (90%) report that costs of components and materials rose in the last year (91% of U.S. plants and 86% of Canada plants). More than one-fourth of plants were hit with cost increases that exceeded 10%. This situation leaves most manufacturers little to do but pass along higher costs to customers—72% of plants increased their price for primary products in the past year (75% of U.S. plants but only 55% of Canada plants). In both countries, though, 11% of plants increased costs to customers by more than 10%.

How has cost (per unit) of components and raw materials for primary product changed in the past year?

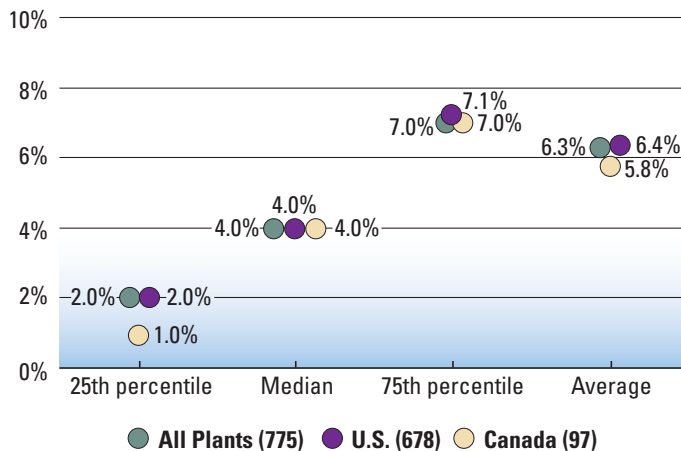


Capacity / Equipment/ Information Technology (IT)

Equipment and IT spending

Facilities participating in the IW/MPI Census and the Canada Study spent a median 4% of plant sales on capital equipment in 2006 (for U.S. plants, that is a full percentage point above the 2005 spending median). Almost half of plants (45%) will increase that level for 2007, though the figure is weighted by U.S. responses (46% of U.S. plants vs. 38% of Canada plants). Plants spent a median 1% of plant sales on IT in 2006, and 39% will increase that level for 2007. Here, too, U.S. plants were a bit more generous with their 2007 budgets (40% of U.S. plants plan to increase spending vs. 35% of Canada plants). Capital-equipment and IT spending did not vary much based on the size of plant (number of employees), with only the small sample of plants with more than 1,000 employees showing a discernible difference in 2006: a median 7% on capital equipment and a median 3% on IT.

Please indicate the level of capital-equipment spending (as a percentage of sales) for 2006:



What is the anticipated change in capital-equipment spending for 2007 vs. 2006?

	All Plants	U.S.	Canada
(N)	860	746	114
Decrease more than 20%	5.7%	5.1%	9.7%
Decrease 11 – 20%	4.1%	4.2%	3.5%
Decrease 1 – 10%	6.3%	6.0%	7.9%
Stay the same	38.7%	38.3%	41.2%
Increase 1 – 10%	26.3%	26.4%	25.4%
Increase 11 – 20%	11.9%	12.7%	6.1%
Increase more than 20%	7.1%	7.2%	6.1%

Please indicate the level of information- technology spending (as a percentage of sales) for 2006?

	All Plants	U.S.	Canada
(N)	722	629	93
Median	1.0%	1.0%	1.0%
Average	2.7%	2.7%	3.1%
75th Percentile	3.0%	3.0%	4.5%
25th Percentile	0.6%	0.5%	0.8%

What is the anticipated change in information- technology spending for 2007 vs. 2006?

	All Plants	U.S.	Canada
(N)	826	714	112
Decrease more than 20%	2.8%	2.2%	6.3%
Decrease 11 – 20%	1.5%	1.7%	0.0%
Decrease 1 – 10%	3.5%	3.6%	2.7%
Stay the same	53.0%	52.5%	56.3%
Increase 1 – 10%	28.2%	28.6%	25.9%
Increase 11 – 20%	6.2%	6.2%	6.3%
Increase more than 20%	4.8%	5.2%	2.7%

Manufacturers are most likely to target new capital equipment in 2007 toward material-handling activities (38% of plants), testing/inspection (34% of plants), and assembly (29% of plants). Welding/joining activities also received high mention among Canada plants (31% vs. 19% of U.S. plants).

For which of these production activities are you most likely to purchase equipment next year?

(multiple responses allowed)

	All Plants	U.S.	Canada
(N)	882	761	121
Material handling	38.2%	38.5%	36.4%
Testing/inspection	34.0%	34.7%	29.8%
Assembling	28.9%	27.9%	35.5%
Cutting	23.7%	24.3%	19.8%
Packaging	22.1%	23.1%	15.7%
Welding/joining	20.6%	19.1%	30.6%
Production control	18.3%	18.0%	19.8%
Bending/forming	17.2%	17.2%	17.4%
Painting/coating/laminating	14.1%	13.9%	14.9%
Molding	11.7%	12.6%	5.8%
Mixing	8.8%	9.6%	4.1%
Stamping	8.4%	8.5%	7.4%
Sensing	8.3%	8.0%	9.9%
Extruding	6.6%	7.0%	4.1%
Heat treating	6.1%	6.3%	5.0%
Sorting	3.2%	3.3%	2.5%
Power generation	2.8%	2.9%	2.5%
Refining	0.8%	0.7%	1.7%
Other	11.8%	12.5%	7.4%
No purchases	5.4%	3.9%	14.9%

Capital measurements

Facilities reported the following metrics related to capital equipment and capacity:

Production volume

(as % of designed plant capacity)

	All Plants	U.S.	Canada
Current year			
(N)	744	657	87
Median	80.0%	78.0%	80.0%
Average	73.6%	73.4%	75.2%
75th Percentile	88.0%	87.0%	90.0%
25th Percentile	62.3%	63.0%	60.0%

Three years ago

(N)	711	630	81
Median	70.0%	70.0%	75.0%
Average	68.9%	68.4%	72.9%
75th Percentile	80.0%	80.0%	85.0%
25th Percentile	60.0%	58.0%	60.0%

Three-year %-point change

(N)	711	630	81
Median	5.0	6.0	5.0
Average	4.6	4.9	2.3
75th Percentile	15.0	15.0	10.0
25th Percentile	-4.0	-4.0	-5.5

Machine availability

(as % of scheduled uptime)

	All Plants	U.S.	Canada
Current year			
(N)	688	607	81
Median	90.0%	90.0%	85.0%
Average	79.8%	80.5%	74.2%
75th Percentile	95.0%	95.0%	91.5%
25th Percentile	75.0%	75.0%	67.5%
Three years ago			
(N)	658	583	75
Median	80.0%	80.0%	80.0%
Average	74.6%	74.9%	72.4%
75th Percentile	90.0%	90.0%	92.0%
25th Percentile	65.8%	68.0%	65.0%
Three-year %-point change			
(N)	655	580	75
Median	2.0	3.0	0.0
Average	4.8	5.1	1.9
75th Percentile	10.0	10.0	5.0
25th Percentile	0.0	0.0	0.0

Operating equipment efficiency

(% machine availability X % quality yield X % of optimal rate that equipment operates)

	All Plants	U.S.	Canada
Current year			
(N)	539	471	68
Median	80.0%	80.0%	76.5%
Average	76.6%	77.2%	71.8%
75th Percentile	90.0%	90.0%	85.0%
25th Percentile	70.0%	70.0%	61.0%
Three years ago			
(N)	505	442	63
Median	75.0%	75.0%	70.0%
Average	69.6%	69.6%	69.6%
75th Percentile	85.0%	85.0%	80.0%
25th Percentile	60.0%	60.0%	60.0%
Three-year %-point change			
(N)	504	441	63
Median	5.0	5.0	0.0
Average	7.0	7.6	2.8
75th Percentile	10.0	10.5	10.0
25th Percentile	0.0	0.0	0.0

Return on invested capital

(net operating profit after taxes ÷ by capital invested)

	All Plants	U.S.	Canada
Current year			
(N)	477	417	60
Median	15.0%	16.0%	15.0%
Average	38.6%	40.4%	26.5%
75th Percentile	33.5%	35.0%	29.0%
25th Percentile	7.8%	8.0%	5.0%
Three years ago			
(N)	447	394	53
Median	12.0%	11.5%	15.0%
Average	34.0%	35.2%	25.2%
75th Percentile	25.0%	25.0%	30.0%
25th Percentile	5.0%	5.0%	5.5%
Three-year %-point change			
(N)	446	393	53
Median	1.8	2.0	0.0
Average	5.2	5.7	1.4
75th Percentile	7.0	8.0	2.5
25th Percentile	0.0	0.0	-2.3

IT usage and needs

Design systems topped the list of IT usage—50% of plants (48% of U.S. plants and 60% of Canada plants). In use by a third or more of plants were material requirements planning systems (44%), financial management systems (41%), electronic data interchange (36%), and enterprise resource planning (ERP) (33%). ERP systems were the application most likely to be purchased next, cited by 17% of plants (18% of U.S. plants and 10% of Canada plants).

Which of the following information technology applications are currently in use at your plant?
(multiple responses allowed)

	All Plants	U.S.	Canada
(N)	893	766	127
Design systems (e.g., CAD, CAE)	49.8%	48.2%	59.8%
Material requirements planning (MRP)	43.9%	44.4%	40.9%
Financial management systems (FMS)	40.7%	40.5%	41.7%
Electronic data interchange (EDI)	35.8%	35.6%	37.0%
Enterprise Resource Planning (ERP)	32.5%	33.0%	29.1%
Manufacturing resource planning (MRP II)	31.8%	33.4%	22.1%
Online purchasing	31.5%	31.2%	33.1%
Demand-planning/forecasting systems	27.2%	28.1%	22.1%
Customer relationship management (CRM)	20.5%	19.8%	24.4%
Product data management (PDM)	20.4%	19.7%	24.4%
Mobile management (wireless systems)	17.4%	17.0%	19.7%
Online selling	17.1%	17.4%	15.8%
Asset management (e.g., CMMS)	16.8%	15.4%	25.2%
Warehouse management systems (WMS)	15.2%	15.0%	16.5%
Supply-chain management (SCM)	11.5%	11.4%	12.6%
Transportation management systems (TMS)	10.3%	10.3%	10.2%
Manufacturing execution systems (MES)	9.3%	8.9%	11.8%
RFID systems	6.3%	6.5%	4.7%
ERP II	4.8%	4.3%	7.9%
Product lifecycle management (PLM)	4.4%	4.3%	4.7%
None of these	6.7%	6.8%	6.3%

Which type of IT application will your plant most likely purchase next?⁸

	All Plants	U.S.	Canada
(N)	485	417	68
ERP	16.7%	17.7%	10.3%
Design systems	7.0%	5.8%	14.7%
RFID	6.4%	7.2%	1.5%
MRP	6.2%	6.0%	7.4%
WMS	5.6%	5.5%	5.9%
CRM	4.5%	4.3%	5.9%
Demand-planning/forecasting	3.7%	4.1%	1.5%
MES	3.7%	4.3%	0.0%
ERP II	3.5%	3.1%	5.9%
EDI	3.3%	3.4%	2.9%
PDM	3.1%	2.9%	4.4%
FMS	2.9%	3.1%	1.5%
Mobile management/wireless	2.9%	2.6%	4.4%
Online selling	2.7%	3.1%	0.0%
TMS	2.5%	2.6%	1.5%
Asset management/CMMS	2.5%	2.4%	2.9%
MRP II	2.3%	2.4%	1.5%
PLM	2.1%	2.4%	0.0%
SCM	2.1%	2.2%	1.5%
Online purchasing	1.0%	1.2%	0.0%
Other	8.0%	7.4%	11.8%
None	7.4%	6.2%	14.7%

MPI Alert: Considerable resources, both capital and human, are being poured into equipment and information technology upgrades. But manufacturers must remember that there are no silver bullets, and that automating bad processes on the plantfloor or in the office will only speed inefficiencies and compound root problems. Savvy managers improve their processes and then apply the right equipment and IT investments.

⁸ Response may indicate a new purchase of software or application or an upgrade to existing systems/software.

Manufacturing Issues Today

Half of the plants in the two studies (50%) expect no major corporate events—expansion, merger, or sale—to occur in the coming year. The most likely event will be an expansion, cited by 39% of plants. Approximately 44% of plants expecting revenues to rise in 2007 say expansion will occur, while just 18% of plants projecting 2007 revenue decreases expect expansion (12% of the decreasing revenue plants expect to be sold).

What is most likely to occur with this plant in the coming year?

	All Plants	U.S.	Canada
(N)	910	777	133
Expanded	38.7%	39.1%	36.1%
Merged with another plant	6.0%	5.7%	8.3%
Be sold	5.4%	4.8%	9.0%
None of these	49.9%	50.5%	46.6%

The large majority of plants see foreign competition as a threat (74% of plants), while 15% see foreign competition as a significant threat (13% of U.S. plants and 21% of Canada plants). Canada plants were less likely to want government involvement to protect manufacturing plants from foreign competition: 59% of Canada plants vs. 63% of U.S. plants. The perception of foreign threats may be influenced by industry; for example, 83% of plastics and rubber product manufacturers, as well as primary metal producers, see foreign competition as a threat, while just 62% of wood product manufacturers and only 50% of food manufacturers see a foreign threat.

To what extent has foreign competition threatened the existence of this plant?

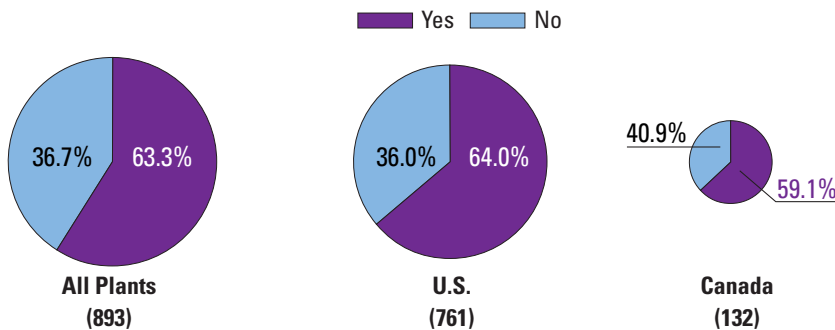
	All Plants	U.S.	Canada
(N)	915	782	133
Significant threat	14.5%	13.4%	21.1%
Moderate threat	24.5%	24.3%	25.6%
Slight threat	35.1%	36.1%	29.3%
No threat	25.9%	26.2%	24.1%

Which of the following power-supply options are in place at your plant?

(multiple responses allowed)

	All Plants	U.S.	Canada
(N)	886	760	126
Traditional grid-supplied power	86.7%	85.5%	93.7%
Back-up power generators	20.3%	21.1%	15.9%
Distributed power (e.g., oil, gas, coal engines)	12.9%	13.3%	10.3%
Renewable energy sources (e.g., solar, wind)	0.8%	0.9%	0.0%
Fuel cells	0.5%	0.5%	0.0%
None of these	8.4%	9.0%	4.8%

Should the government do more to protect manufacturing plants against foreign competition?



About MPI

The Manufacturing Performance Institute is a Cleveland, Ohio-based research organization specializing in research development, analysis, and communications. MPI services include:

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The Manufacturing Performance Institute
2835 Sedgewick Road
Shaker Heights, OH 44120
Phone: 216-991-8390
Fax: 216-991-8205
www.mpi-group.net

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Advanced Manufacturing
240 Edward Street
Aurora, Ontario, Canada
L4G 3S9
Phone: (905) 727-0077
www.advancedmanufacturing.com

Manufacturing 2007 Executive Summary

based on findings from

the *IndustryWeek* / Manufacturing Performance Institute 2006 Census of Manufacturers conducted in the U.S. and the 2006 Canada Manufacturing Study, conducted by *Advanced Manufacturing* and the Manufacturing Performance Institute

