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McKinsey on

Industrials

A Phoenix Ready to Rise Again?

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Preface

Industrials is a large and diverse sector encompassing a broad array of companies that power the global economy. The sector's sweeping impact is demonstrated by the breadth of its subsectors, ranging from industrial machinery and mechanical power transmission to electronic components and test and measurement equipment.

This report provides a comprehensive assessment of the sector's historical performance and outlook. It begins with an analysis of the overall sector's performance over the past 15 years, including the three distinct economic profit creation cycles that characterize this period. The analysis then de-averages performance across the different subsectors and companies to shed light on four key levers that leading Industrials companies have employed to outperform their peers. The report closes with the McKinsey perspective on the sector going forward and the strategies Industrials companies can deploy to reignite value creation.

Readers are welcome to contact the authors of the report with questions or requests for additional information.

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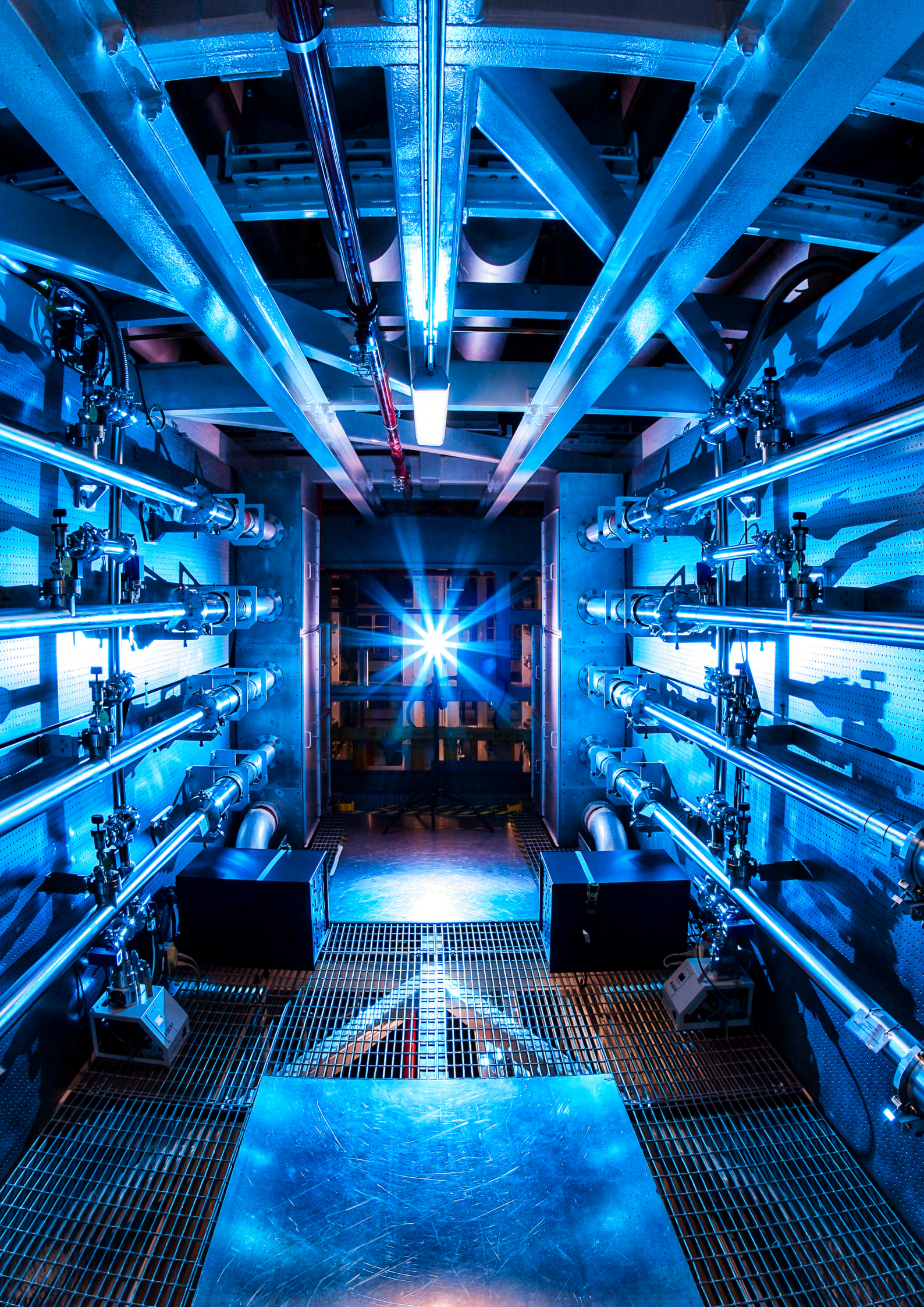
Contents



Executive summary

Over the past 15 years, the Industrials sector quietly ranked third among all sectors by economic profit creation. During this period, the sector also outperformed the S&P 500 on margin improvement and total return to shareholders (TRS).

The past 15 years were not, however, a single period but were instead characterized by three distinct economic profit creation cycles: Rapid growth (2001–07), slump and recovery (2008–10), and flatlining (2011–15).

De-averaging economic profit creation to revenue across subsectors and companies during these cycles revealed significant performance variance within and across cycles. While three subsectors (test and measurement, building technologies, and multi-application components) excelled, every subsector had companies that consistently created economic profit and far outperformed their peers.

Four distinct company profiles emerged based on economic profit creation through time—Leading, Rising, Declining, and Trailing. Leading and Rising companies held or extended their lead based on the management choices they made rather than their starting point. In particular, four factors separated Leading and Rising companies from their Declining and Trailing peers—the quality of revenue growth they sought, their ability to maximize margins, the soundness of the M&A strategies they pursued, and their ability to optimize resource allocation.

As the sector looks to the future, several macroeconomic trends (demographic, geographic, social, regulatory, technology, and end market) will create tailwinds for the sector. However, the willingness to make the bold management choices that differentiated performance in recent cycles and the ability to get the three “Ns” right—new offerings/business models, new capabilities, new operating models—will determine which companies profit from these tailwinds.

Introduction

The Industrials sector encompasses a broad array of companies that power the global economy through the components, products, solutions, and services they provide. The sector's sweeping impact is demonstrated both by the breadth of its subsectors (Exhibit 1) and its role in powering the global economy.

Exhibit 1 Results of this study are based on the performance analysis of ~400 Industrial companies across 12 subsectors from 2001 to 2015

Subsector	Description	Example companies
Multi-application components	Components in a range of different technologies (filters, tools, cameras) that are used in a variety of applications	FLIR, Esco Technologies, Makita, PALL
Test and measurement	Sensors and equipment for testing, analyzing, and measuring	AMETEK, ThermoFisher Scientific, Trimble
Electrical equipment	Equipment for low-voltage distribution, switching, automation, and control	Schneider Electric, TECO, EATON
Flow control	Pumps, valves, seals, hydraulics, and heat exchangers	Parker, FLOWSERVE, PENTAIR
Industrial machinery	Stationary machinery and robots	SANDVIK, FANUC, KENNAMETAL, pitney bowes
Building technologies	HVAC, lighting, building security, elevators and escalators, food processing	LENNOX, NORTEK, AcuityBrands, Schindler
Diversified	<50% of revenues from a single subsector	Honeywell, DANAHER, EMERSON
Mechanical power transmission	Bearings, couplings, gearboxes	REXNORD, TIMKEN, THK
Distribution	Distribution, wholesale trade of components	ANIXTER, watsco, WESCO
Power equipment	Equipment for generating, transmitting, distributing, and storing electricity	Vestas, SUNTECH, EnerSys
Electronic components	Active (excl. semiconductors), passive, and electromechanical components, display technologies	KYOCERA, TE connectivity, muRata
Cables and wires	Power and telecom cables and wires	General Cable, ENCORE WIRE, PRYSMIAN

This report provides a comprehensive assessment of the sector's historical performance and outlook. It examines 387 Industrials companies globally (with 2014 revenues greater than $1 billion) across 12 subsectors from 2001 to 2015, evaluating the companies' value creation: both economic profit (EP)[1] creation and its components as well as shareholder returns. Economic profit divided by revenue (EP/R) is used as the primary metric in this report to describe performance (weighted by revenue for the sector, subsector, and product segment analyses).

The following sections include:

- A look at the overall performance of the Industrials sector and key subsectors from 2001 to 2015, broken into three distinct cycles, as measured by selected financial indicators;
- An analysis of core drivers of performance in the Industrials sector;
- The path forward for the sector as well as individual companies in the sector; and
- A series of subsector deep dives to shed light on Leading and Trailing companies across key product segments in the subsectors.

1 Economic profit = net operating profit less adjusted taxes – weighted average cost of capital x invested capital.

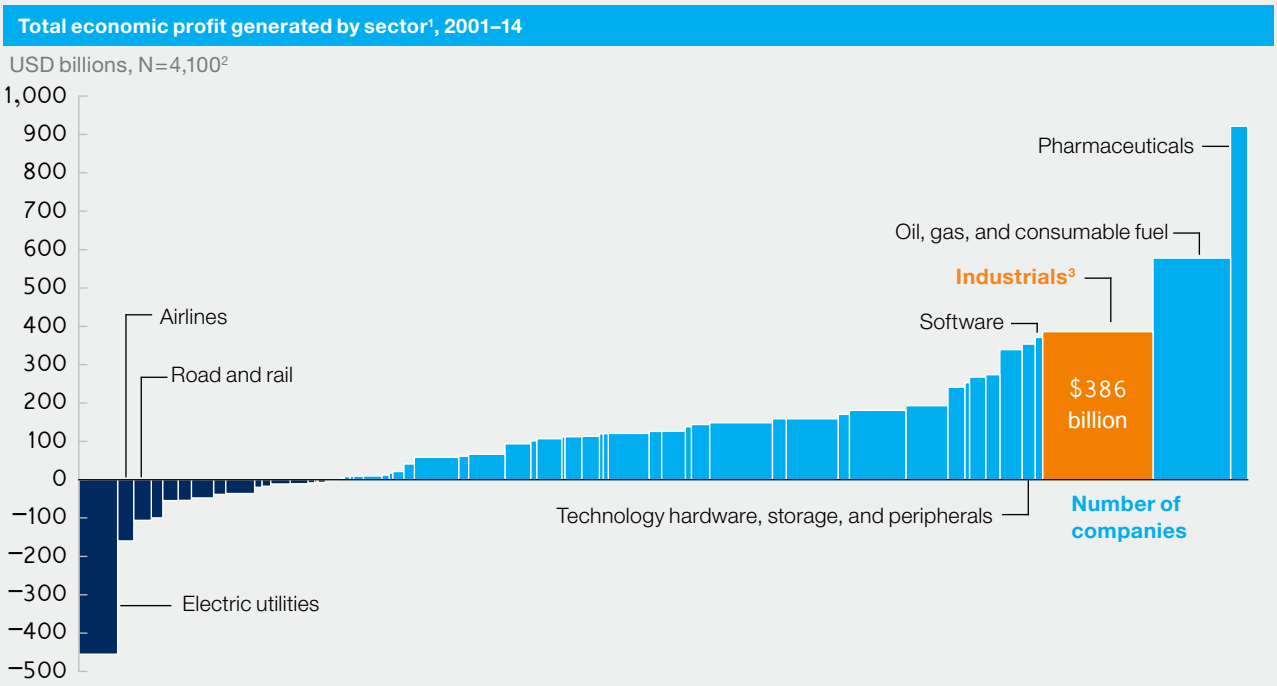
Value creation in Industrials

Four metrics served as the basis of our analysis of the Industrials sector—economic profit, total return to shareholders (TRS),[1] margin,[2] and valuation multiples.[3] Economic profit was used as the core measure of value creation as it provides insight into the underlying operating results and incorporates the cost of the capital employed to achieve these results. Margin, TRS, and multiples provided additional lenses to evaluate a company's performance.

Overall sector performance

Industrials notched superior performance at the aggregate level, ranked 3rd among 60 sectors by economic profit creation (behind only pharmaceuticals and oil and gas), and generated $386 billion in economic profit (Exhibit 2), outperforming both software and technology.

Exhibit 2 Industrials ranked 3rd among 60 sectors by economic profit creation



1 Total economic profit generated by sector within the sample of 4,100 companies.
2 Top 4,100 companies by revenues (revenue above $1 billion in 2014) , excluding companies with insufficient data to calculate economic profit.
3 Represents the top 387 publicly traded companies in revenue in the Industrials space globally.

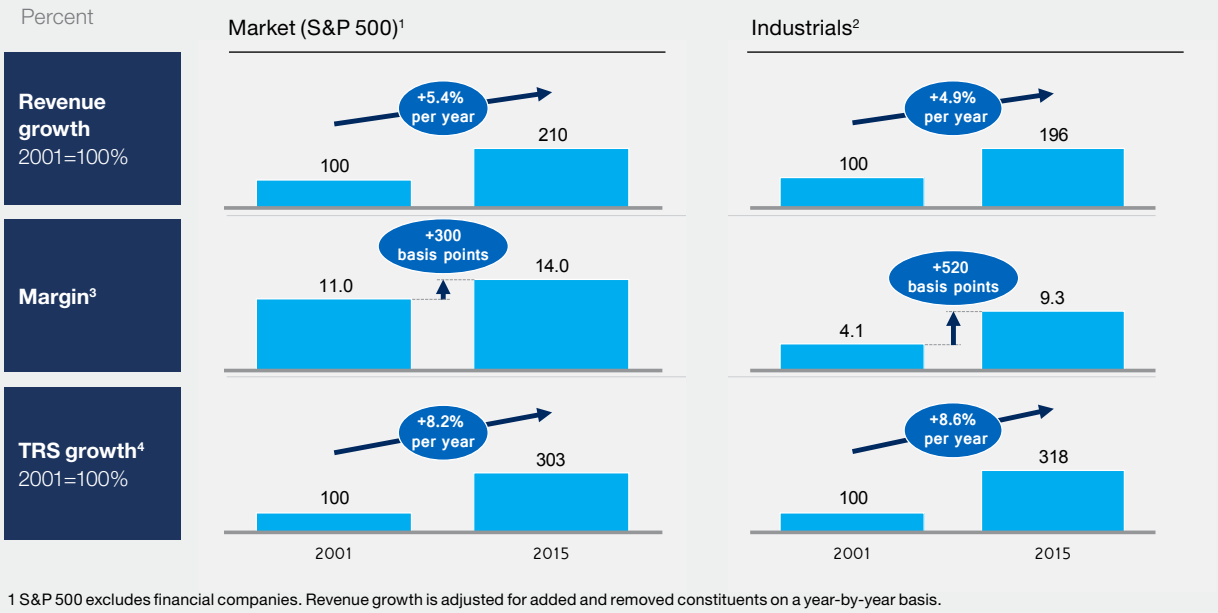
From 2001 to 2015, Industrials recorded revenue growth of 4.9 percent a year, trailing the S&P 500's rate of 5.4 percent (Exhibit 3). The sector's EBITA margins[2] grew by 520 basis points during the same time frame, exceeding the S&P 500's gain of 300 basis points. Industrials shareholders benefited as TRS outperformed the S&P 500 at 8.6 percent to 8.2 percent, respectively.

The past 15 years were not, however, a single period of uninterrupted Industrials performance but were characterized by three distinct economic profit creation cycles (Exhibit 4).

1 TRS: Return including capital gains and dividends
2 Margin = Earnings Before Interest, Taxes, and Amortization (EBITA)/revenue
3 Earnings multiple = Net Enterprise Value/EBITA

Exhibit 3 Industrials has also outperformed the market on margin improvement and TRS since 2001

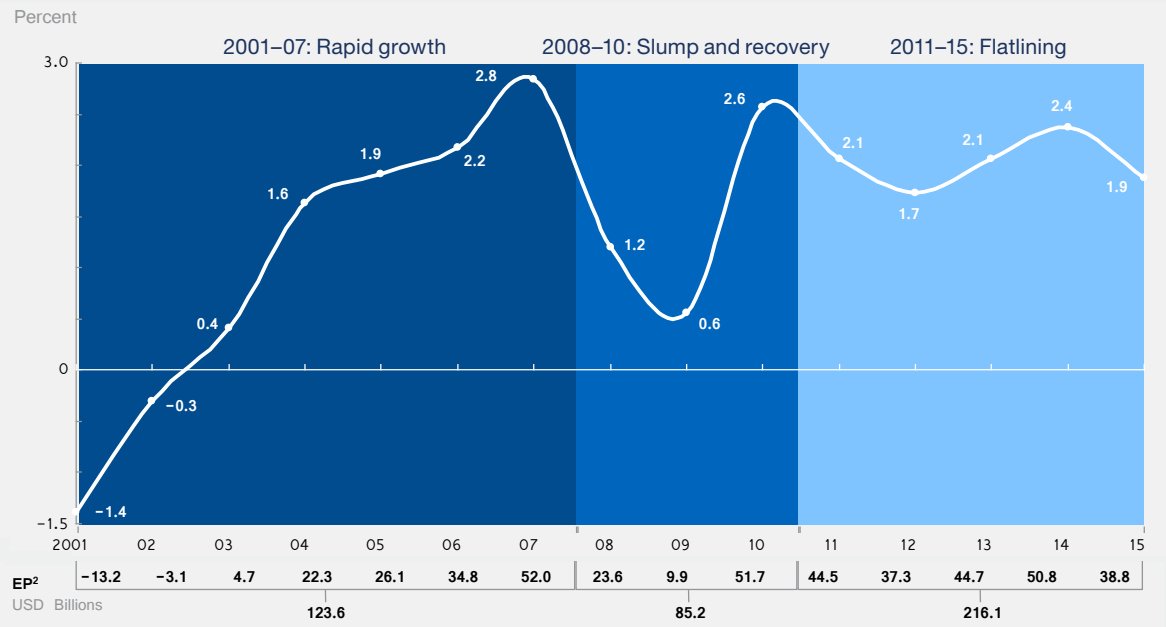
Relative performance from 2001 to 2015



1 S&P 500 excludes financial companies. Revenue growth is adjusted for added and removed constituents on a year-by-year basis.
2 387 companies in Industrials with revenue of more than $1 billion in 2014.
3 EBITA/revenue weighted by revenue.
4 Total Return to Shareholders weighted by market capitalization at the beginning of fiscal years.

Exhibit 4 The past 15 years were not a single period but were characterized by three distinct economic profit creation cycles

Economic profit/revenue for Industrials[1]



1 387 companies in Industrials with revenues of more than $1 billion.
2 Total economic profit generated by 387 companies, excluding companies with insufficient data to calculate EP at a given year.

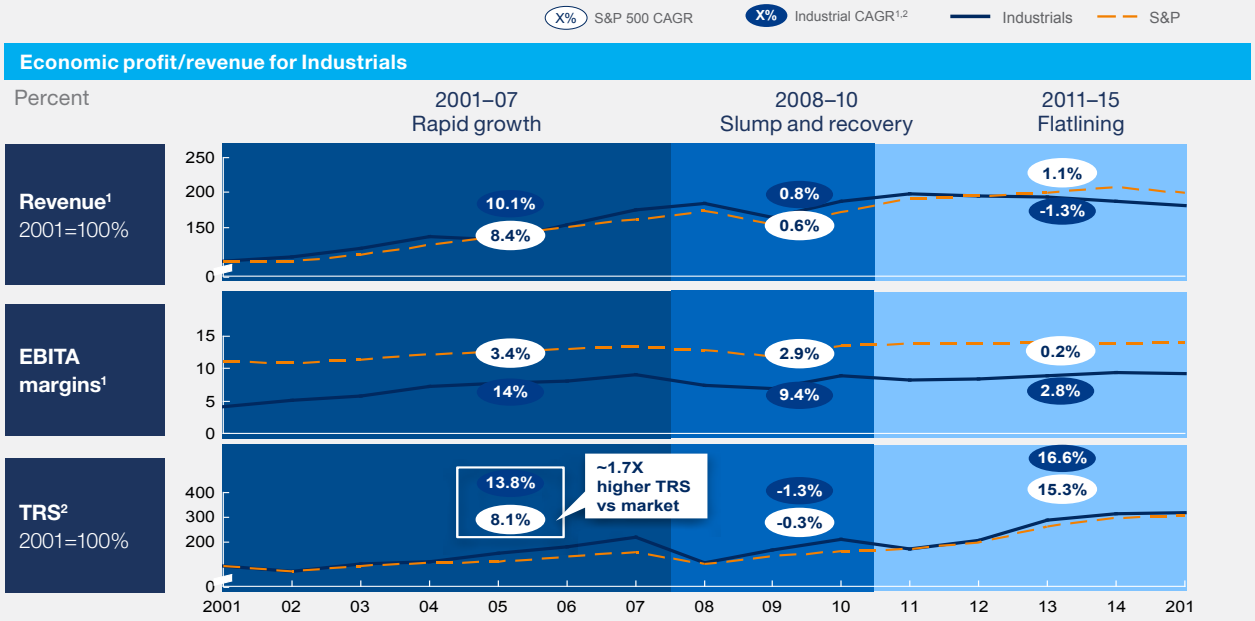
Rapid growth (2001–07). Industrials rebounded from economic losses of $13.2 billion at the end of the tech bubble in 2001 to economic profit of $52 billion in 2007, right before entering the global financial crisis. Economic profit as a share of revenue (EP/R) rose to 2.8 percent, from -1.4 percent.

Slump and recovery (2008–10). As with other sectors, Industrials saw its economic profit creation fall due to the crisis. Total economic profit dropped to $9.9 billion in 2009 at 0.6 percent of revenue, less than a quarter of the sector's performance just two years earlier. Critically, EP/R never dropped below zero during this cycle despite difficult market conditions, and by 2010, Industrials had recovered to nearly pre-crisis levels with $51.7 billion in economic profit at 2.6 percent EP/R.

Flatlining (2011–15). The post-crisis cycle saw Industrials' economic profit remain largely flat with pre-crisis peaks: in 2014, total economic profit hit $50.8 billion before dipping slightly in 2015. During this cycle, EP/R did not resume its pre-crisis growth, ultimately netting out flat.

While Industrials outpaced the S&P 500 on EBITA margin expansion and TRS across the whole period, relative performance through time varied. For example, from 2001 to 2007 Industrials had an annual TRS of 13.8 percent, 1.7 times higher than the S&P 500. From the end of 2007 to 2010, annual TRS was both negative and lower than the S&P 500 (-1.3 versus -0.3 percent), recovering in the later 2011–15 cycle—during which TRS increased to 16.6 percent, again outpacing the S&P 500 (Exhibit 5).

Exhibit 5 Across all cycles, Industrials outpaced the S&P 500 on the EBITA margin and TRS



1 Revenue CAGR and percentage point change in margin for 2001–07, 2008–10, and 2011–15.
2 TRS weighted by market capitalization at beginning of fiscal year. TRS for 2001–07, 2007–10, 2011–15.

Economic profit creation in the first cycle was driven primarily by margin expansion, which accounted for $165 million of the growth in average annual economic profit per company from 2001 to 2007 (three times the amount from improvements in capital productivity at $50 million). As the sector entered the flatlining cycle, the average company saw annual economic profit decline due to an inability to further expand margin or improve capital productivity (Exhibit 6).

Subsector performance

De-averaging Industrials' 12 subsectors shows a significant variance in performance across subsectors and through time (Exhibit 7). For example, in the 2001–07 cycle, EP/R ranged from -0.9 percent for bottom-performing cables and wires subsector to 3.9 percent for top-performing electrical equipment subsector (a spread of 480 basis points). In the 2011–15 cycle, the range increased to 680 basis points, with power equipment at -0.5 percent and test and measurement at 6.3 percent. The subsector performance reveals several subsectors that were consistently either at the top or at the bottom, while others saw their fortunes rise or fall (Exhibit 8).

Exhibit 6 Economic profit (EP) growth originally came from margin

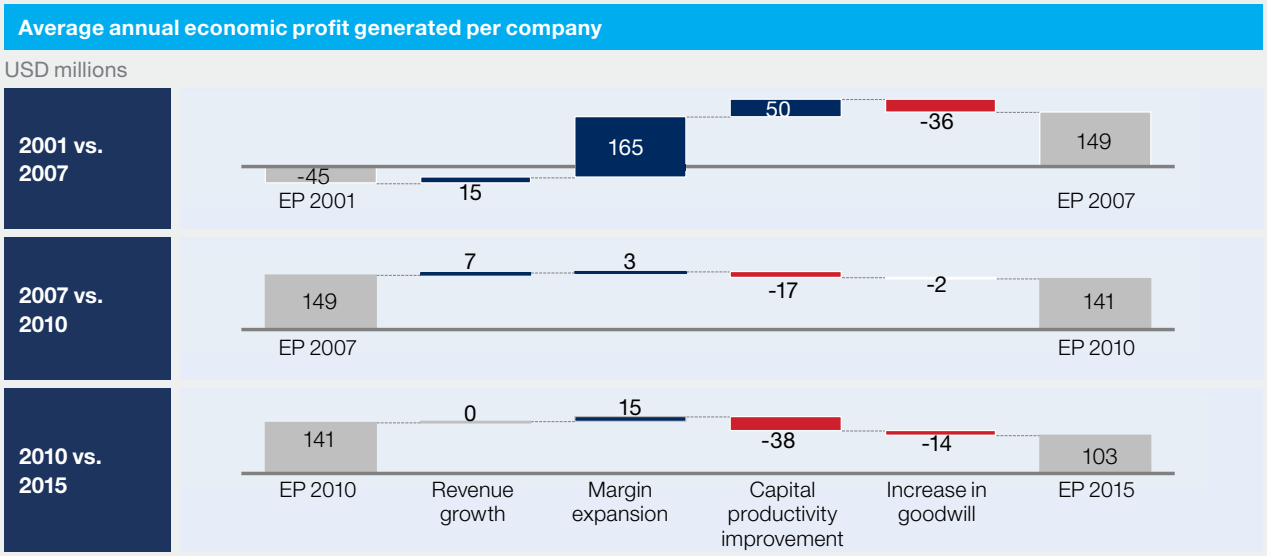
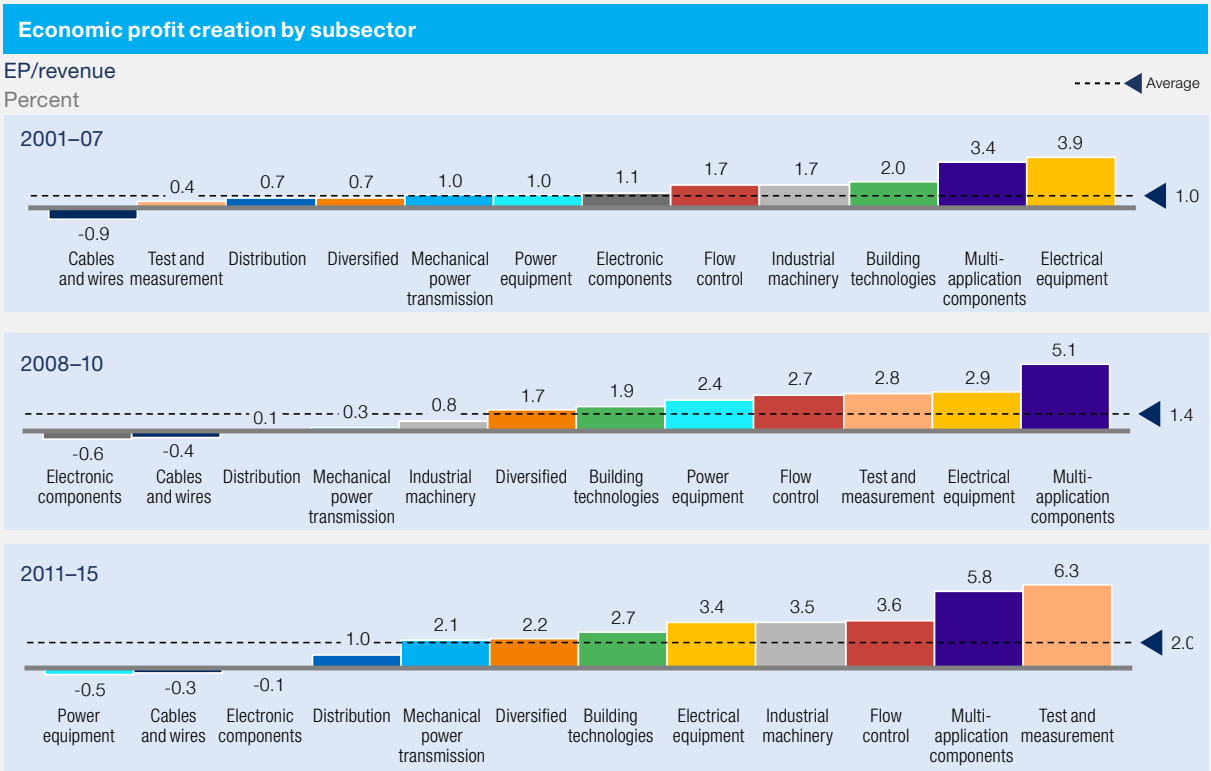
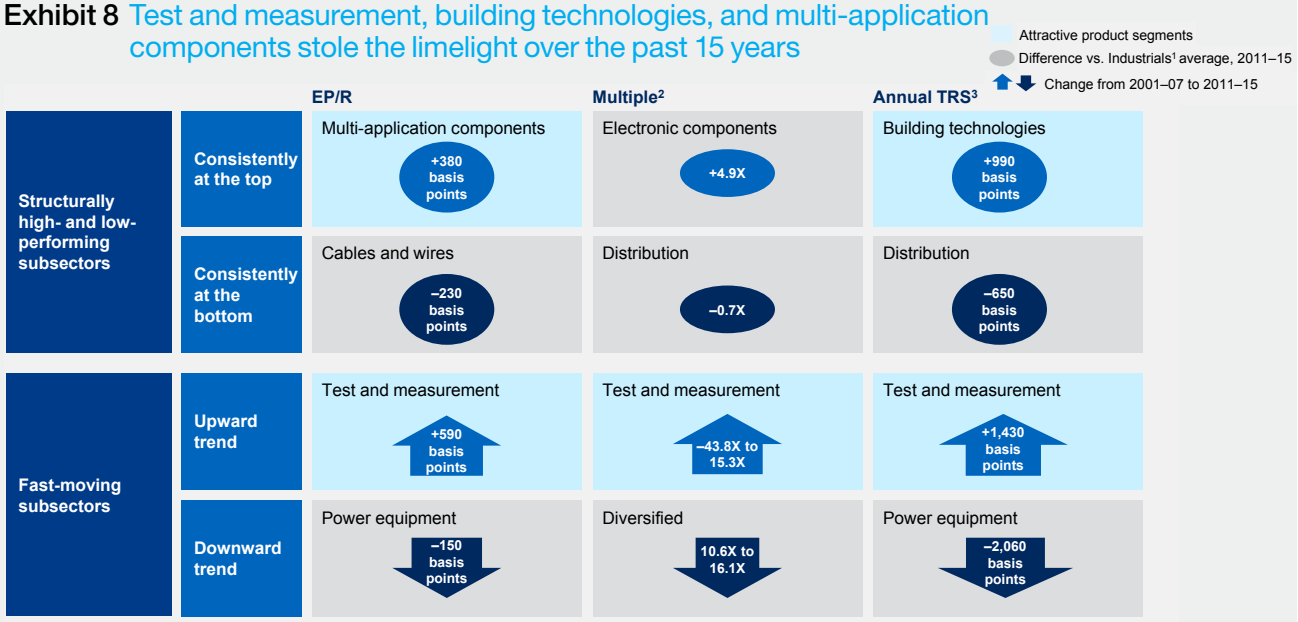


Exhibit 7 "De-averaging" EP/R shows significant variation in performance



Three subsectors in particular—test and measurement, building technologies, and multi-application components—outperformed other subsectors. Multi-application components consistently performed in the top two by EP/R, ending 380 basis points above the Industrials sector average in 2011–15. Test and measurement demonstrated the strongest upward trend, adding 590 basis points in EP/R improvement. Meanwhile, power equipment moved in the opposite direction in terms of EP/R performance, decreasing 150 basis points from the 2001–07 cycle to the 2011–15 cycle. Other performance metrics showed similar patterns within and across cycles. For example, building technologies outperformed Industrials' sector average annual TRS by 990 basis points from 2011 to 2015. All subsectors generated

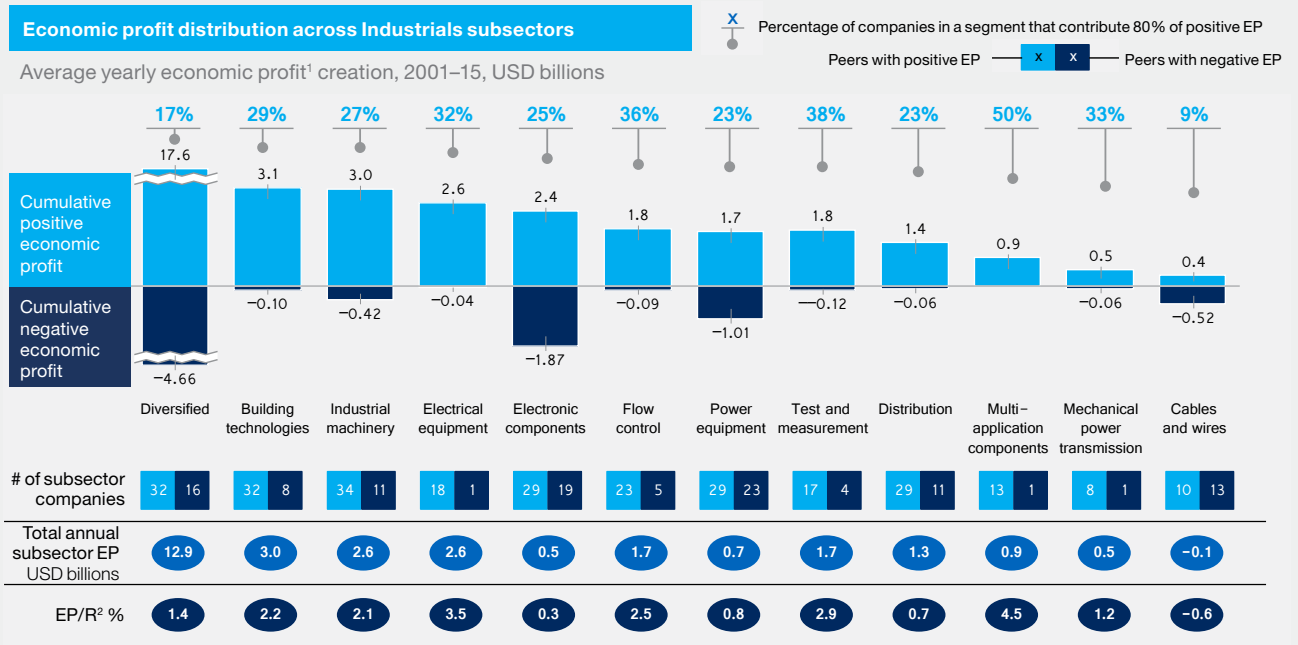
Exhibit 8 Test and measurement, building technologies, and multi-application components stole the limelight over the past 15 years



1 387 companies in Industrials with revenues of more than $1 billion.
2 Defined as Net Enterprise Value/EBITA.
3 Total Return to Shareholders weighted by market capitalization at beginning of fiscal years.

a positive economic profit (more average annual economic profit creation than loss) with the exception of cables and wires (Exhibit 9). When examining economic profit generation at a more detailed level, companies in each subsector created positive economic profit, and in almost all subsectors more companies created economic profit than did not. However, in most subsectors, economic profit generation was not concentrated with a few companies. For example, in the multi-application components subsector, 50 percent of companies in aggregate generated 80 percent of positive economic profit. In contrast, cables and wires, the only subsector that did not create economic profit, saw only 9 percent of companies contribute 80 percent of positive economic profit.

Exhibit 9 In every subsector, multiple companies were able to create value



1 Economic profit is calculated excluding companies with insufficient data in 2001–15.
2 Weighted average EP/revenue by company revenue.

Overall, Industrials had a flatter economic profit distribution than "winner-take-all" sectors such as semiconductors, where a similar study showed that just 8 percent of companies generated 80 percent of positive economic profit.

In summary, Industrials companies across subsectors had the potential to generate economic profit even if their subsector overall performed differently. In addition, Industrials companies do not appear to have been disadvantaged by the structural concentration of profits and resources in the hands of a few companies.

Further de-aggregating the 12 subsectors at the product segment level shows the underlying performance variance (Exhibit 10 shows six subsectors and 33 product segments). Some product segments had negative economic profit generation even when the overall subsector was positive. For example, robotics (a top-three performer) and printing machines (a bottom-three performer) were separated by ~1,500 basis points of EP/R within industrial machinery (11.7 percent EP/R versus -3.1 percent, respectively). This disparity revealed the need to dig deeper to the company level.

Exhibit 10 Overview of Industrials performance, 2001–15

Performance by subsector and product segment

Top 3[2] Bottom 3[2]

Subsector	Product segment[2]	Number of companies evaluated	Revenue, USD Billion, 2015	EBITA, USD Billion, 2015	EP/R,[4] %	Multiple[5]	TRS,[6] % CAGR
Overall Industrials sector performance		387	2085	194	1.4	13.1	8.6
Multi-application components[1]		14	25.8	4.4	4.5	11.8	14.4
	Spatial	4	9.1	2.5	8.7	16.6	13.6
	Nondestructive	1	2.4	0.5	6.3	14.8	14.4
Test & measurement		21	61.6	12.5	2.9	15.6	9.9
	Life science and analytical	8	31.9	6.4	1.8	6.1	10.4
	General purpose and electronics	8	18.2	3.1	0.9	12.8	4.3
Electrical equipment		19	99.4	13.1	3.5	12.3	10.9
	Multi-application electrical equipment	1	1.1	0.2	11.1	14.8	16.3
	Automation	4	40.8	5.5	4.2	10.9	9.5
	Low-voltage switchgear	7	36.5	5.2	2.9	12.8	10.3
	Motors and controls	7	20.9	2.3	2.9	17.8	12.6
Flow control		28	74.9	10.4	2.5	11.8	9.6
	Diversified flow control	8	34.6	5.5	3.5	13.2	10.3
	Specialty flow treatment	4	7.7	1.0	3.0	11.7	6.1
	Flow management (pumps, valves, etc.)	16	32.6	4.0	1.7	12.0	9.5
Industrial machinery		45	120.8	13.4	2.1	12.0	9.6
	Robotics	2	8.4	2.0	11.7	15.5	11.6
	Customer-facing machinery	7	22.5	3.6	4.2	11.4	6.8
	Textiles	2	2.4	0.5	3.1	8.9	6.8
	Machining	15	34.9	3.2	1.7	8.4	8.7
	Food packaging/specialized machinery	8	20.7	2.0	1.5	13.0	13.7
	Material-handling equipment	3	9.2	0.6	1.2	12.4	13.5
	Diversified machinery	6	18.9	1.3	-0.2	30.8	9.6
	Printing machines	2	3.9	0.1	-3.1	20.4	-9.3
Building technologies		40	176.6	17.8	2.2	11.4	13.2
	Building electric blinds, doors	1	1.2	0.2	8.3	10.3	18.1
	Elevators and escalators	4	21.5	2.7	5.2	11.4	20.8
	Building security	7	29.2	4.6	4.0	13.6	11.3
	HVAC	12	49.9	5.4	1.6	12.1	13.0
	Food processing	7	46.1	3.4	1.5	9.7	11.5
	Building facility service	1	6.7	0.3	1.0	8.9	11.1
	Lighting	8	22.0	1.2	0.7	16.1	5.9
Diversified		48	822.7	75.8	1.4	12.1	7.5
Mechanical power transmission		9	38.2	4.2	1.2	12.6	9.0
Distribution		40	264.9	12.6	0.7	10.6	9.7
Power equipment		52	143.8	9.4	0.8	13.6	11.0
	Fossil fuel and reciprocal engines	11	49.7	2.0	1.5	12.9	17.5
	Wind power generation equipment	7	25.1	2.3	1.0	17.8	6.2
	Power transmission and distribution equipment	9	16.0	1.2	0.7	19.8	16.9
	Energy storage	10	23.9	1.8	0.3	15.1	10.6
	Nuclear power generation equipment	2	2.4	0.2	-0.5	5.2	4.9
Electronic components		48	192.3	17.0	0.3	13.1	5.0
	Diversified power equipment	1	1.5	0.1	-0.7	28.8	12.7
	Solar	12	25.3	1.8	-1.0	24.3	-1.7
Cables and wires		23	64.4	3	-0.6	14.9	5.1

1 Multi-application components: components in a range of different technologies (for example, filters, tools, cameras) that are used in a variety of applications.
2 Sorted by EP/R within each subsector; segments with only one company analyzed in product segment not included.
3 2015
4 EP/R = Economic Profit/Revenue, weighted by revenue, 2001–15. EP = Net Operating Profit less adjusted taxes – Weighted Average Cost of Capital * Invested Capital.
5 Multiples = Net Enterprise Value/EBITA, weighted by Earnings Before Interest, Taxes, and Amortization (EBITA), average, 2001–15, end of year (LTM).
6 Compound Annual Growth Rate (CAGR) of cumulative Total Return to Shareholders (TRS) for the time period, weighted by market cap, average, 2001–15.

Performance of individual companies by subsector

Analysis of companies in each subsector shows a large variance in company performance within each subsector across each cycle (Exhibit 11). EP/R was typically distributed over a wide range, with some companies straying far from the pack in either direction, particularly in diversified, building technologies, electronic components, and test and measurement.

Exhibit 11 However, company performance varied significantly across every subsector

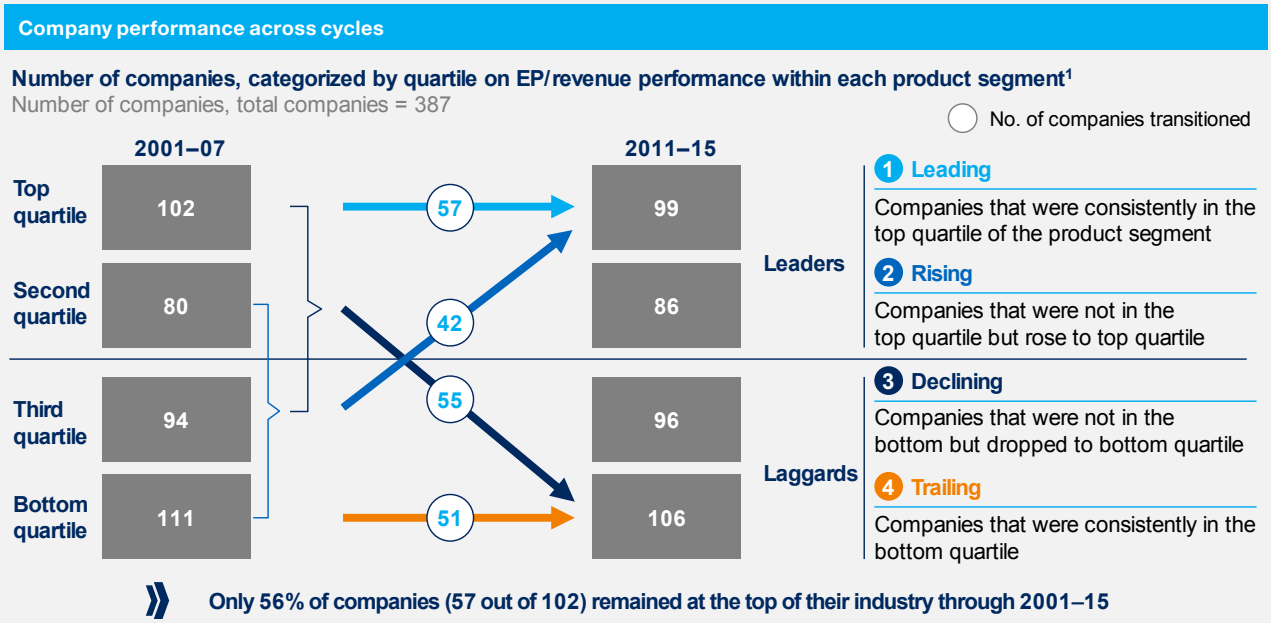
1 Economic profit is calculated excluding companies with insufficient data in 2001–15.

In addition, each subsector saw disparities between top and low performers that persisted through time. For example, electronic components had the greatest disparity between top- and low-performing companies across the first and last cycle at 5,060 (2001–07) and 5,290 (2011–15) basis points, respectively. Test and measurement had the largest disparity for 2008–10 at 6,430 basis points.

Mechanical power transmission displayed much less of a range in performance, with 580 basis points in the first cycle and 790 basis points in the last cycle. During 2008–10, cables and wires had the lowest disparity at 868 basis points.

To explain the distribution of performance within and across subsectors, Industrials companies were segmented based on their EP/R performance within their subsector (and product segments) through all three cycles. Four types of companies worth evaluating emerged based on the segmentation (Exhibit 12):

Exhibit 12 Four company profiles emerged over the past 15 years



1 Quartile ranking determined by main product segments within each subsector (for example, within power equipment, quartiles are determined separately for wind companies, fossil fuel companies, etc.).

1. Leading: Companies that were consistently in the top quartile of the product segment.
2. Rising: Companies that began the 15-year period in a lower quartile but rose to the top quartile.
3. Declining: Companies that were not in the bottom quartile in the first cycle but dropped to bottom quartile.
4. Trailing: Companies that were consistently in the bottom quartile.

The Leading segment includes 57 companies that stayed in the top quartile the entire 15 years, while the Trailing segment includes 51 companies that stayed in the bottom quartile during this time. The Rising segment includes 42 companies that began the 15-year cycle in the bottom three quartiles but managed to improve their performance enough to climb into the top quartile in the 2011–15 cycle. Moving in the other direction were 55 Declining companies, which started the cycle in the top three quartiles but fell into the bottom quartile by the last cycle.

Key drivers of performance

The size and consistency of performance differences between Leading and Trailing companies raised the question of whether a company's position was inherent or driven by its management's actions. To understand this, the 387 Industrials companies were evaluated based on their starting attributes—that is, "who you are." Three company attributes—size (annual revenues and invested capital), capital-expenditure investments, and R&D spend—were assessed to determine if a company's scale, existing infrastructure and capital spend, or prior investments in technology created advantage.

In addition, 111 Leading and Trailing companies were further assessed with deep dives into the management choices they made—that is, "what you did." Four management choices—quality of revenue growth, margin management, M&A strategy, and resource allocation—were examined to understand if Leading companies followed different strategies than Trailing companies (Exhibit 13).

Exhibit 13 Companies were evaluated on starting attributes and management choices to identify performance drivers

Starting attributes: Who you are

1. Company size
2. Capital expenditures (capex)
3. R&D spend

Analyzed 387 companies with revenues >$1 billion

Management choices: What you did

4. Quality of revenue growth
5. Margin management (gross margin, operating expenditures)
6. M&A strategy (number and size of deals)
7. Resource allocation (R&D productivity, employee productivity)

Dove deep into 111 companies grouped in 12 product segments[2]

1 Average revenues, Invested Capital, capex spend, and R&D spend from 2001–07 (versus economic performance from 2011 to 2015).
2 Automation, diversified flow control, flow management, food packaging/specialized, food processing, general purpose (test and measurement), HVAC, life science (test and measurement), lighting, machining, motors and controls, energy storage.

Our analysis shows that Leading companies were exclusively differentiated by the management choices they made rather than any of their starting attributes (Exhibit 14).

There was no correlation between a company's size or level of capex or R&D spend and its ability to generate economic profit in the same cycle (for example, 2001–07 versus 2001–07) or subsequent cycles (for example, 2001–07 versus 2011–15). Small companies were as likely to generate economic profit as large companies or companies that had limited capex or R&D budgets. This result stands in stark contrast to other sectors in which a company's endowment often plays a critical role in determining future success. For example, the largest players in the semiconductors sector enjoy significant scale benefits, consistently generating greater economic profit as their size allows them to fund expensive R&D and build-out of the fabs required to deliver the next generation of chips to market sooner.

Exhibit 14 "Who you are" did not matter… "What you did" mattered and drove performance

Driver	Impact	Leaders vs. Laggards[1] difference
Starting attributes:[1] Who you are		
1. Company size 2. Capital expenditures (capex) 3. R&D spend	No impact	
Management choices: What you did (2001-15)		
4. Quality of revenue growth (ΔEP/ΔR)	High	+300 basis points (+700 basis points vs. +400 basis points)
5. Margin management – Gross margin change – Operating expenditures change	 High No impact	 +600 basis points (+580 basis points vs. -20 basis points) -50 basis points (+180 basis points vs. +230 basis points)
6. M&A strategy (number and size of deals)	High	2X more deals (18 vs. 9) with smaller absolute ($69 million vs. $190 million) and relative deal size (deals 2.7% vs. 7.4% of acquirer's market cap)
7. Resource allocation – R&D productivity	 High	 Stronger IP[2] (40 vs. 26) and 2X more patents per $ million of spend (4.7 vs. 2.4)
– Employee productivity (2015)	High	1.8X higher productivity ($42,000 vs. $23,000 EBITA per employee)

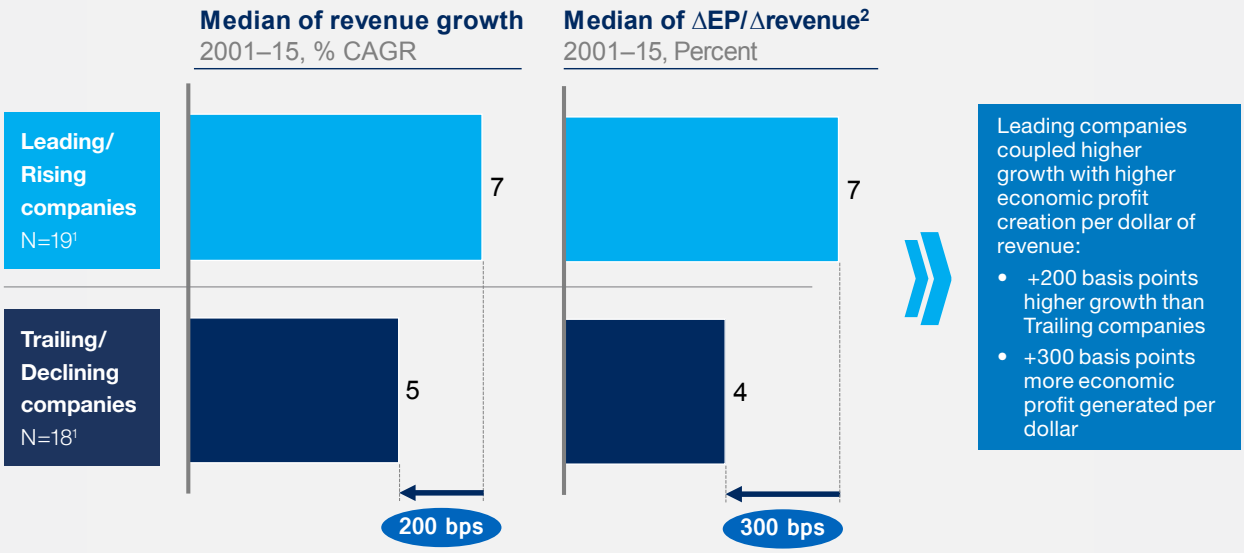
1 Leaders includes Leading and Rising companies, while Laggards includes Declining and Trailing companies.
2 Intellectual-property strength is based on impact of the patent on its field using 12 factors including citations, breadth, and litigation (higher number implies stronger patent).

Instead, Leading companies across all subsectors and deep-dive product segments consistently made different choices across each of the four selected management choices. Together, these choices provide a retrospective playbook on drivers of value creation in Industrials.

Quality of revenue growth

All revenue is not created equal. Some growth may actually be "empty calories," bulking up a company without generating additional economic profit. Quality of revenue growth is an indicator of a company's ability to extract economic profit from incremental revenue, measured as Δeconomic profit/Δrevenue (Exhibit 15). Empty-calorie growth diverts critical resources and management attention away from pursuing "healthy-calorie revenue," where there is a greater potential for economic profit. Leading companies are bulking up with "high-quality calories," focusing their resources and management attention on the best revenue. Over a 15-year period, Leading companies' higher-quality revenue growth translated to a 75 percent greater increase in economic profit, excluding the difference in revenue growth, and 185 percent greater increase in economic profit when the difference in revenue growth is included. The difference is equivalent to a Leading company adding more than the entire economic profit of a Trailing company after 15 years of growth.

Exhibit 15 Growth and economic profit creation for Leading and Trailing companies



1 Includes companies with positive revenue growth.
2 Measures the ratio of change in economic profit relative to change in revenue from 2001 to 2015.

Margin management

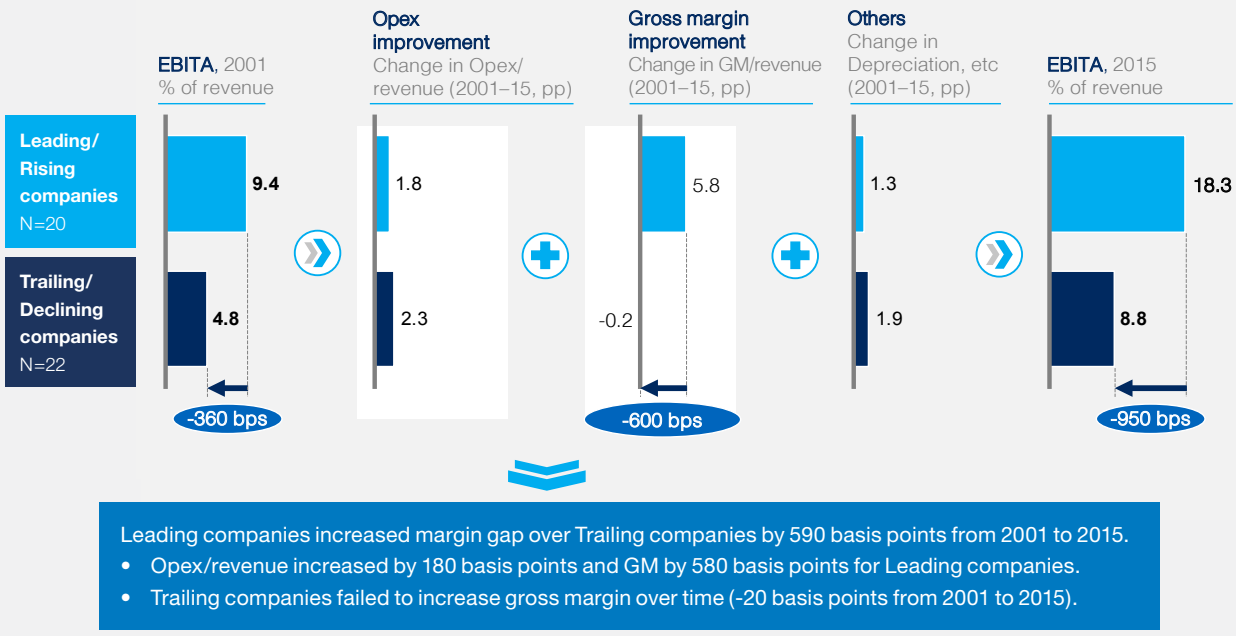
Margin (EBITA/revenue) management can be separated into gross margin management, opex margin management, and other economic changes such as depreciation (Exhibit 16). Leading and Rising companies differentiated themselves by proactively managing margin, particularly gross margin. Leading and Rising companies nearly doubled their profit margins (as measured by EBITA/revenue) to 18.3 percent in 2015, from 9.4 percent in 2001, an increase of 890 basis points. In contrast, Trailing and Declining companies began the same cycle with profit margins of 4.8 percent but were only able to expand those by 400 basis points to reach 8.8 percent by 2015. Leading companies differentiated themselves by delivering more gross margin (580 basis points increase for Leading and Rising companies compared with a 20 basis points decline for Trailing and Declining companies), increasing overall profitability by 600 basis points.

M&A strategy

Acquisition strategies typically vary in frequency, type, and size of acquisitions. Each deal's strategic rationale covers a range from accelerating market access to building scale through acquisitions. In Industrials, Leading companies used "programmatic M&A" (Exhibit 17) to reshape their portfolios by acquiring new technologies, capabilities, or customers with smaller deals (averaging $69 million or just 2.7 percent of their market cap) and more frequent deals (18 deals from 2001 to 2015).

Programmatic acquirers typically build their M&A muscles by establishing disciplined processes that link their overall strategy directly to the deal rationale and operationalize this strategy with dedicated and experienced teams.

Exhibit 16 Margin management: Decomposition of profit generation for Leading vs. Trailing companies



Leading companies increased margin gap over Trailing companies by 590 basis points from 2001 to 2015.
- Opex/revenue increased by 180 basis points and GM by 580 basis points for Leading companies.
- Trailing companies failed to increase gross margin over time (-20 basis points from 2001 to 2015).

NOTE: Only showing Leading /Rising and Trailing/Declining companies out of 111 companies analyzed across the 12 subsectors.

Conversely, Trailing and Declining companies used M&A more tactically, doing less than one deal per year (nine total deals from 2001 to 2015) and favoring larger deals both in absolute terms ($190 million per deal) and relative to their own size (7.4 percent of their market cap). In contrast to their programmatic peers, many Trailing or Declining companies pursued acquisitions mainly to build scale within their existing segments.

Exhibit 17 M&A program: Number and size of M&A deals for Leading vs. Trailing companies

	Average number of deals per company[1] 2001–15	Average deal value $ million	Average deal size % of acquirer's market cap
Leading/Rising companies N=18	18	69	2.7
Trailing/Declining companies N=21	9	190	7.4

Compared with Trailing companies, Leading players did:
- **2X** as many deals (18 vs. 9)
- Significantly **smaller deals** ($69 million average deal value vs. $190 million)

NOTE: Only showing Leading /Rising and Trailing/Declining companies out of 111 companies analyzed across the 12 subsectors.
1 Average total number of acquisitions per company from 2001 to 2015.

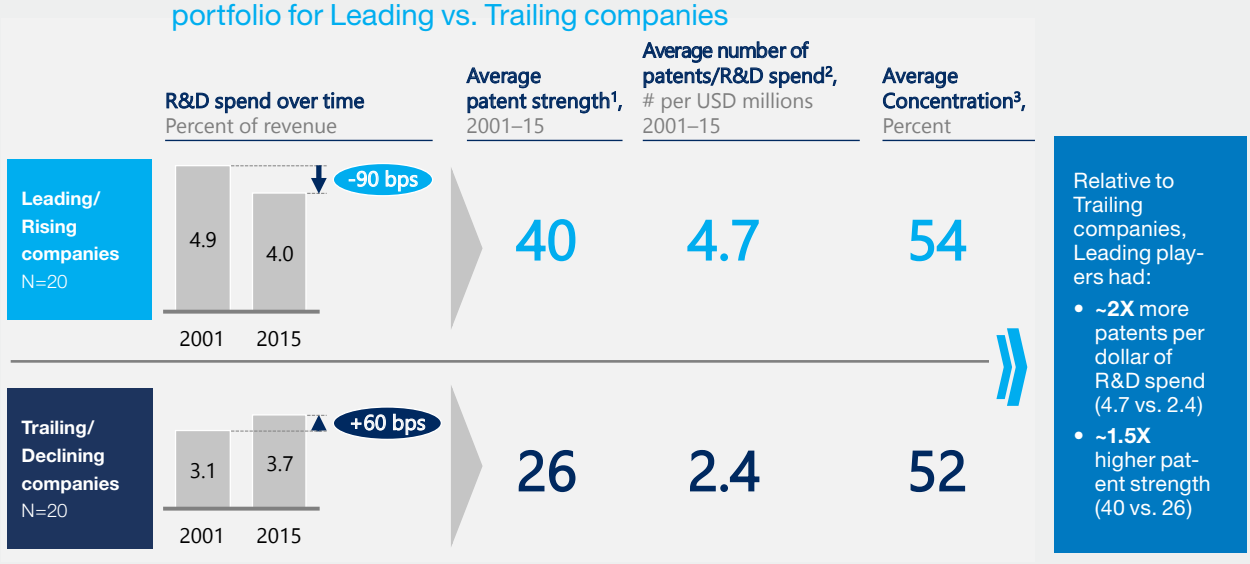
Resource allocation

The assignment and management of investment dollars and human resources are critical to execute a company's business strategy. Leading and Rising companies were more disciplined in their allocation of resources and created more value from their investments in R&D and human capital. Leading companies brought the same cost, productivity, and execution rigor to the lab, back office, and sales force that they deployed in their operations.

In R&D, Leading and Trailing companies took different paths over the past 15 years. Leading companies reduced spend from 4.9 percent of revenue in 2001 to 4.0 percent in 2015. By 2015, Leading companies were only slightly outspending their Trailing counterparts on a proportional basis (4.0 percent versus 3.7 percent of revenue). However, the Leading companies achieved greater returns on their investment, generating both more and stronger intellectual property. For example, Leading companies generated nearly twice as many patents per million dollars of R&D spend (4.7 versus 2.4).

Moreover, Leading companies' patents were 50 percent stronger than those created by Trailing companies, delivering patent strength scores of 40 versus 26 (Exhibit 18).

Exhibit 18 R&D resource allocation: Productivity, strength, and concentration of patent portfolio for Leading vs. Trailing companies

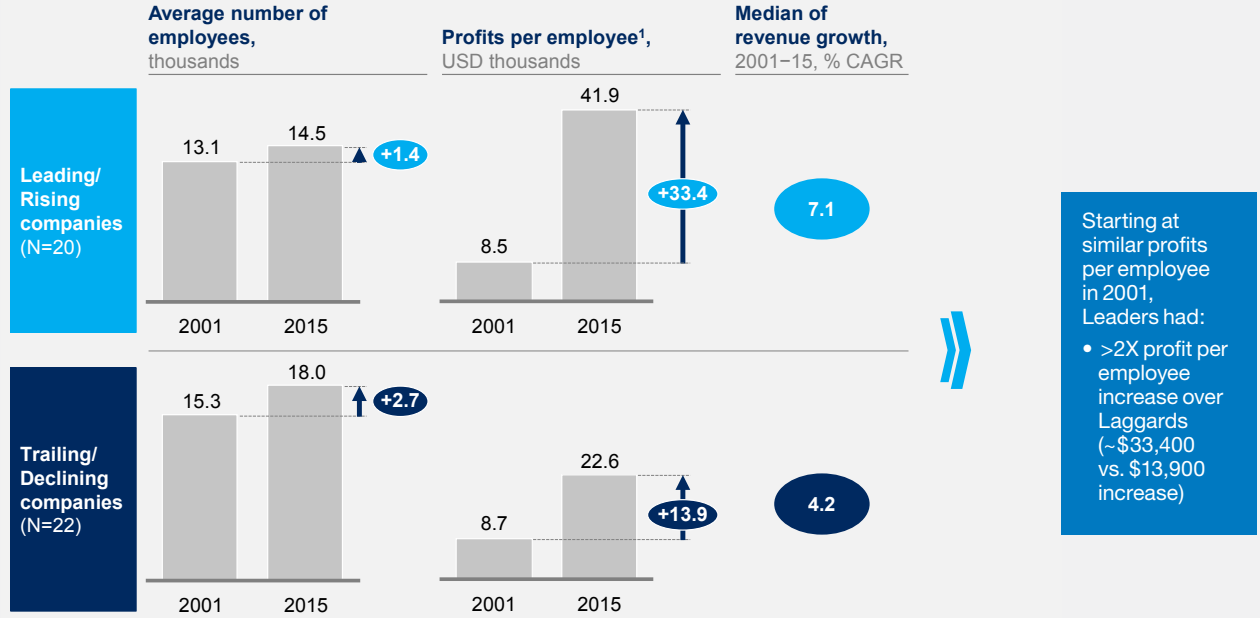


NOTE: Only showing Leading/Rising and Trailing/Declining companies out of 111 companies analyzed across the 12 subsectors.
1 Patent strength is a measure of impact of the patent on its field, using 12 factors including number of times cited, breadth, litigation, etc. (higher number is better).
2 Average number of patents per company per million dollars of R&D spend.
3 Percent of company patents within the top two CPC patent classification codes.

SOURCE: Innography

Similarly, Leading and Trailing companies had similar levels of employee productivity in 2001 ($8,500 versus $8,700 in EBITA per employee). However, by 2015, Leading companies had achieved an 85 percent employee productivity advantage ($41,900 versus $22,600 EBITA per employee) compared with Trailing companies (Exhibit 19).

Exhibit 19 Employee productivity: Profit generation per employee for Leading vs. Trailing companies



NOTE: Only showing Leading/Rising and Trailing/Declining companies out of 111 companies analyzed across the 12 subsectors.

1 Profits per employee is calculated by dividing EBITA by average number of employees. Employee productivity defined as average EBITA per average number of employees.

The path forward

The breadth and diversity of the Industrials sector mean that the specifics of go-forward value creation paths will differ by company. However, in our view, execution will continue to be critical for Leading companies. To that end, companies should proactively identify gaps in their current strategy, operations, and business model versus best practices and invest in closing those gaps. In particular, we believe there are five areas where they should double down:

- ***Margin management and productivity improvements,*** both to position companies to weather market fluctuations and to provide the resources for the next wave of investment. Best-practice companies pull price and cost levers simultaneously, regularly examine their cost structure, restructure, and fine-tune the ability to respond to internal and external challenges.
  - In pricing, best practices balance strategic (for example, customer segmentation, key account management, value-added pricing versus cost-plus) and tactical pricing (for example, order-level pricing and discounts), particularly when dealing with the channel and distribution.
  - On the cost side, best-practice companies deploy a whole suite of cost-reduction tools and drive improvement across all cost buckets: product, manufacturing, and overhead. Best practice on the cost side begins with managing manufacturing and overhead costs and institutionalizing lean management programs to reduce waste and enhance quality. Best-practice companies manage their manufacturing footprint and capacity while employing flexible workforce structures to deliver high levels of overall equipment efficiency, reducing capital expenditures, and delivering lower product cost. Success requires continuously rethinking global supply chains while balancing low-cost footprint with customer intimacy requirements. Best practice requires further reduction of product cost by delivering table-stakes supply chain optimization (for example, vendor consolidation) and fundamentally rethinking product management (for example, design to value) and engineering (for example, design to cost) to build products that cost less but still deliver the value for which customers are willing to pay.
- ***Programmatic M&A*** (that is, multiple small deals per year) to drive portfolio renewal, react to market trends quickly, significantly expand capabilities, and find opportunities across product segments and subsectors.
  - Beyond performing multiple small deals per year, M&A best practices start with anchoring M&A in themes that support the overall corporate strategy and ensure a "better owner mind-set" by asking, "Can we create more value with the target than the current owner?" Programmatic M&A requires proactive deal sourcing, utilizes company resources, and goes to market with a clear value proposition to attract the best targets rather than reacting to deal flow. Beginning in due diligence and continuing post-acquisition, programmatic acquirers have a relentless focus on delivering the strategic and financial goals of the acquisition, including the realization of value creation targets and speed to value. Programmatic acquirers begin integration planning prior to close and link it directly to the overall corporate strategy and the deal thesis including critical decisions (for example, organization and operating model, ERP consolidation, go-to-market). This includes "named" diligence and integration leaders in key functions aligned to a successful integration and the M&A themes (for example, HR, Finance, IT, key functions required by the value-creation thesis and integration). Finally, doing programmatic M&A well requires strong governance with appropriate accountability, clear roles and responsibilities, and incentives to succeed.
- ***Proactive financial management including cost restructuring, footprint consolidation, and capital productivity*** to limit operating and capital expenses and maintain cost competitiveness.
  - Best practices start with a clear target financial envelope and cost structure, and a granular cost and activity baseline (for example, on a project basis) to provide visibility across all stakeholders. Based on the financial envelope and baselines, corporate strategies have to be translated into product and service roadmaps that create an optimal product portfolio.

To achieve this goal, execution and capital allocation plans have to be built around the strategy with accompanying budget and timing requirements. Strategic attractiveness and risk effects have to be evaluated on a per-project basis balancing purely financial metrics and strategic considerations. Winners in this area will be well prepared and establish organizational capabilities that allow quick execution when required (for example, during the onset of an economic downturn).

- ***Rigorous investments in R&D*** to produce better intellectual property at lower cost, ensuring that products, services, and solutions remain differentiated.
  - As best practice, companies need to redesign the way they invest in and run their R&D. This effort begins with a rigorous portfolio management process to make explicit risk/reward trade-offs through time, cutting off projects with a low likelihood of delivering a positive risk-adjusted return across all stages of the funnel, and borrowing techniques from operations to bring "lean," automation, outsourcing of selected low-value added tasks, and other techniques to "industrialize" R&D departments. For example, value-stream mapping and project deconstruction help to identify and resolve key organizational, process, and tool-related bottlenecks that cause delay or rework in development efforts. Performance management of common engineering tasks is driven by granular, bottom-up, standard work processes supported by continuously updated quantitative models based on actual experience. These models also improve estimates of resource requirements for specific product, platform, and technology roadmaps. Leading practices utilize standard work across the entire value stream to find opportunities that allow outsourcing of specific tasks to lower-cost service providers or low-cost countries. In total, R&D can be managed with the same rigor and discipline as operations.

- ***Quality revenue growth*** that is within product/customer segments or subsectors where there is a competitive advantage and each dollar enhances the overall value creation position.
  - Revenue growth needs to be scrutinized for profit generation capacity. Winners select the most profitable (and preferably fastest-growing) segments for future growth, while avoiding or taking a hard look at unprofitable segments to ensure that there is a clear, time-bound path to value creation. A comprehensive brand strategy needs to be in place to deliver price premiums. Product roadmaps and development need to focus on building new products to complement existing ones in a profitable, self-reinforcing product portfolio that helps to fuel market execution—for example, through cross-selling opportunities. Internal development should be complemented by M&A to enhance positioning in the most attractive segments. Finally, pricing conflicts need to be evaluated and managed across channels and promotions to avoid the erosion of both near- and long-term value creation.

Trailing companies have a different challenge: to close a sometimes significant gap with Leaders by addressing strategic and operational issues while also finding ways to jump-start growth. To that end, executing the basics—cost discipline, productivity focus, capital effectiveness, and R&D efficiency—is a top priority. Executives should train their sights on reevaluating underperforming businesses and divesting where performance cannot be turned around or the rationale for "better ownership" is no longer present. Trailing companies should resist the temptation to pursue scale for scale's sake; this "zero-calorie" growth will only distract from more critical restructuring.

Perspective on new value-creation levers

Although necessary, executing on the playbook of the past 15 years alone is unlikely to be sufficient to retain a Leading position in the next cycle. Instead, Leaders will need to navigate a macroeconomic environment where the pace of disruption is accelerating. Industrials companies will need a structured approach to understand where their subsector or product segment is headed and what strategies are required to succeed there.

Companies should adopt a Map, Identify, Prioritize, and Act (MIPA) approach (Exhibit 20) to gain a detailed understanding of the broader macroeconomic trends that could affect their position and then develop effective strategies and a plan on where and how to play in the market.

Exhibit 20 Reigniting growth and enhancing value creation requires a MIPA approach: Map, Identify, Prioritize, Act

Map

The Map step focuses on identifying and understanding key megatrends that have the potential to affect Industrials. As we look to the future, we believe there are six megatrends that will shape the next Industrials value creation phase (Exhibit 21). These megatrends will affect every facet of the Industrials sector, altering existing value pools and creating new opportunities. To chart a value creation course, companies need to account for their influence and interplay, down to the trend and subtrend at the subsector, product segment, and company levels.

Identify

The Identify step focuses on examining the impact of global trends on headwinds and tailwinds at the sector, subsector, and product segment levels. Looking at the trends outlined in the previous section, Economists expect that, on balance, the trends will create tailwinds for global gross domestic product (GDP) growth going forward. Historically, Industrials growth correlated strongly with GDP growth (Exhibit 22).

If historical patterns hold true, Industrials' growth is likely to reignite as GDP recovers. Although the overall impact on the sector is likely to be positive, the opportunity is likely to vary by subsector and product segment. Therefore, it will be important for companies to understand specifically how their core markets will be affected.

Exhibit 21 Six megatrends (with underlying trends and subtrends) will shape growth in the next decade

Megatrend	Trend	Subtrend
Demographics	Aging population	▪ Rapidly aging global population as demographic deficit spreads to China and Latin America ▪ Younger population in emerging economies (e.g., Nigeria, Egypt)
	Globalizing workforce	▪ Continued expansion of the consumer class (e.g., additional 3 billion people to join by 2025) ▪ Increasingly global market for labor and talent
	Increasing income inequality	▪ Persistent youth unemployment and underemployment
Geography and regions	Maturing of Chinese economy	▪ Slowing of hyper growth in China ▪ Evolution of China's economy to value-added services
	Growth in urban population	▪ Growth of new 'middleweight' cities in emerging markets
	Uncertainty in EMEA[1] & Latin America; India rebounding	▪ Continued uncertainty in Europe (e.g., UK) and Latin America (e.g., Argentina, Brazil) ▪ Indian economy starting to rebound
Social	Accessibility of personal information	▪ High willingness to share personal information/forgo privacy ▪ 24/7 global connectivity speeds information flows
	Growth of sharing economy	▪ Increased sharing of goods/services, driven by continued rise of sharing services (e.g., Uber) ▪ Increase in open source and IP sharing ▪ Increasing demand for unskilled labor in developed economies
	Rising literacy levels	▪ Adult literacy levels rising rapidly in emerging markets
Geopolitical/ regulatory	Increase in environmental awareness and regulation	▪ Expansion of renewable-energy generation and storage ▪ Higher environmental and ethical standards
	Increasing protectionism	▪ Increasing skepticism of free trade
	Tensions between superpowers	▪ Widening tensions between United States and Russia (e.g., Syria, Ukraine) ▪ Increasing tensions between China and neighbors (e.g., South China Sea)
Technology	Explosion of smart devices and data	▪ Infrastructure (connectivity, storage, computing) becoming free ▪ Proliferation of connected end points, driven by free infrastructure ▪ Exponential growth in data from connected end points ▪ Rapid advancements in analytical techniques (e.g., machine learning)
	Disruption of traditional ways of working	▪ Greater 3D printing availability and speed ▪ Increased adoption of automation and robotics technologies ▪ Emergence of autonomous vehicles (e.g., cars, drones)
End markets	Oil and gas	▪ Increasing renewable-energy investment ▪ Decreasing influence of OPEC derisking global energy supply ▪ Rise of United States as a global oil superpower
	Agriculture and food	▪ Decline in commodity prices (prices expected to stabilize below recent peaks by 2017) ▪ Infusion of technology reshaping agricultural practices (from production to storage and distribution) ▪ Increasing use of biologicals to combat pests and disease
	Travel, transport, and logistics	▪ Traditional transportation (cars, trains) increasingly running on electricity ▪ Escalation in demand for new and replacement transportation infrastructure globally
	Construction	▪ Continued demand for transportation, power/water/telecom, and social infrastructure in emerging markets ▪ Weight of global construction market shifting from developed markets to emerging markets
	Other	▪ Growth of e-commerce and peer-to-peer transactions ▪ Stagnating global military expenditures ▪ Rising cost of exploration in mining ▪ Increasing demand for power in emerging markets

1 Europe, the Middle East, and Africa.

GLOBAL TRENDS AND DISRUPTIONS SHAPING INDUSTRIALS AND CREATING NEW OPPORTUNITIES

Demographics: The continued globalization of the workforce, aging populations in developed economies, and younger populations in emerging economies (such as Egypt, Kenya, Nigeria, and Pakistan) are likely to spur growth in some markets while causing stagnation in others. Further, income inequality continues to increase, both within countries and across regions—a subtrend that is likely to affect policy and in turn influence economic growth.

Geography and regions: The maturation of the Chinese economy after years of supercharged growth; continued uncertainty in Africa, Latin America, and the Middle East; and acceleration of growth in India is likely to reshape the opportunity landscape in emerging markets in the coming years.

Social: Across industries, the rise of social media, consumers' willingness to share personal information, and the growth of the sharing economy (for example, Airbnb and Uber) are creating new business models and services that directly target end users. Consumers' information exchange enables companies to deliver mass customization, tailoring products to specific pain points and consumer needs. At the same time, 24/7 connectivity and latency approaching zero accelerate the flow of information, allowing companies to use real-time connectivity to develop more services such as on-demand asset sharing.

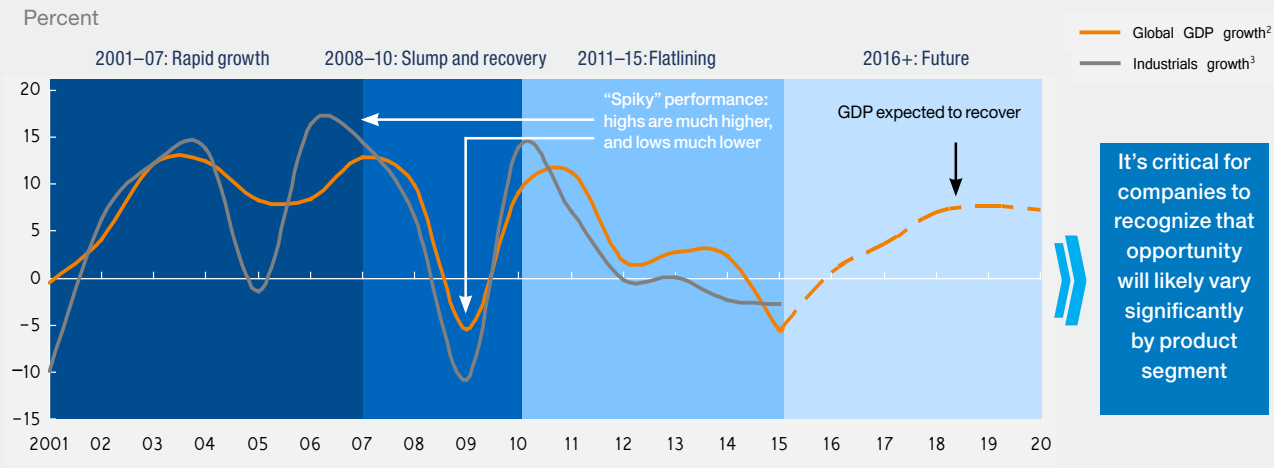
Geopolitical/regulatory: Increasing protectionism across the globe, rising tensions among super powers, and increasingly stringent environmental regulation increase the challenge of navigating the global economy in the years ahead. The expansion of renewable and distributed energy generation, storage, and smart-grid technology matched with higher environmental and ethical standards have sparked a growing market for sustainable and "green" equipment and infrastructure.

Technology: Traditional ways of working (such as the virtual workforce and contingent labor) are being disrupted as investments in new services, solutions, and business models built on a new generation of digital technology are changing the way companies and governments run. Connected mobile devices, appliances, and sensors proliferate, driven by almost free infrastructure, creating the potential to reach 30 billion to 50 billion connected end points by 2020. The ever-denser Internet of Things will continue to unleash further opportunities for innovation and new business and operating models. Extraordinary advances in computing capacity, power, and speed are fueling the rise of artificial intelligence and machine learning, driving innovation with software, solutions, and more custom products.

End markets: In the medium term (two to five years), forecasts predict that some markets (agriculture, mining, and construction) will bounce back. However, declining oil and gas prices may hinder investments in exploration and production. National governments and companies are increasing their focus on renewable energy sources, creating the need to make infrastructure and equipment more environmentally friendly.

Exhibit 22 Identify: Economists expect that, on balance, these trends will create tailwinds for global growth

Year-over-year growth rate[1]



1 Growth rates based on US dollar (USD). 2005 contraction given by stronger USD exchange rate against other foreign currencies, adversely affecting non-US companies.
2 Nominal growth.
3 Based on the analysis of 387 Industrials companies with revenues larger than $1 billion in 2014.

SOURCE: IHS Market Insight & Forecast for GDP growth, 2016

Prioritize

The Prioritize step aims to help companies narrow the opportunity set to areas that are most attractive. Faced with this multitude of trends and variables, Industrials companies must choose where to play and make investments. Since opportunities will vary by product segment, companies need to develop a coherent growth strategy that addresses four questions for each product segment (Exhibit 23).

Exhibit 23 Prioritize: Four questions are the key to prioritizing where to play

1 Multiplier effect of trends on different product segments?

- How will trends affect different product segments?
- How are both incumbents and challengers affected?
- How will marketplace dynamics be changed (for example, suppliers, competitors, customers, regulators, investors)?

2 Structure and conduct of players in the segment?

- What are current and expected future industry structures (for example, supply/demand cost curve, fragmentation, regional dependence)?
- What is the current and expected future conduct of the industry (for example, nature/level of competition, pricing models, level of collaboration)?

3 Financial performance?

- What has been aggregate and individual-segment performance in the past 15 years?
  - Revenue and margin
  - Economic profit
  - Multiples
  - TRS
- What is the expected future performance and rationale?

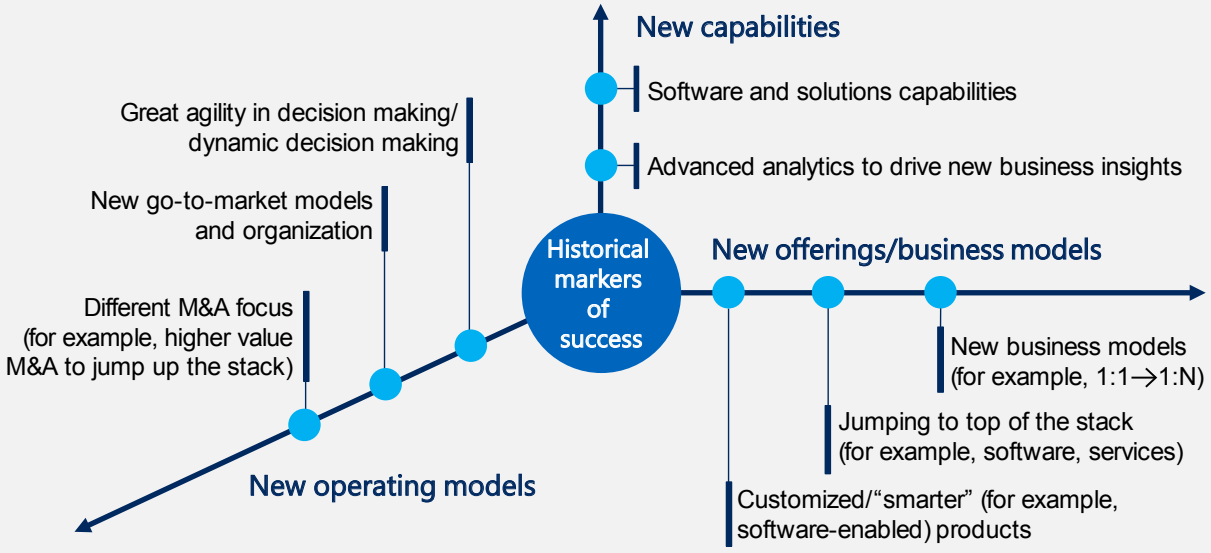
4 Value creation?

- What is the full value/multiplier effect from inflection point?▪
- Has the market overestimated headwinds? If so, by how much?▪
- Does a turnaround candidate exist to build on?▪
- What roll-up opportunities exist?▪
- What is the operational/margin improvement potential?

Act

The Act step helps companies develop a tactical action plan to capture the prioritized opportunities. Translating broad objectives into concrete actions that can create value will require companies to rethink how to play. In particular, three key "Ns"—new offerings and business models, new capabilities, and new operating models—will be key to succeed going forward (Exhibit 24).

Exhibit 24 Act: Capturing opportunity will require companies to rethink how to play



New offerings and business models

Expanded product offerings—with a particular focus on creating smarter, more sophisticated, connected devices; software- and cloud-enabled technology; and advanced sensors—will be a key driver of growth. As companies innovate, new, pioneering business models have emerged in the Industrials sector, and will continue to do so.

- *Smarter products*—From smart grid to smart home to smart watch, smarter products allow the capture of unprecedented insights into customer preferences, business and manufacturing processes, and human behavior, enabled by the proliferation of cellular and wireless networks coupled with economic ways to analyze data. Smarter, more sophisticated, and customized products provide access to real-time insights by incorporating advanced sensor technology, connectivity, and born-in-the-cloud infrastructure and software capability. As smarter products offer differentiation and margin opportunities for Industrials, companies will need to move beyond traditional products toward more innovative, "up-the-stack," and customized products and services that match the pace of today's technology.
  - **Connected products** use cellular or Wi-Fi connectivity to transmit and analyze data in real time. For example, companies offered sensors, cameras, and video monitored over traditional data connections in the past; today, mobile applications connect to network video recorders and cameras, providing real-time remote access.
  - **Cloud-enabled products** are software solutions created, deployed, and operated on cloud-based platforms. Past products consisted of industrial machinery with data ports and local performance indicators; companies now offer continuous data acquisition via platform-as-a-service for developing, deploying, operating, and monetizing industrial internet applications.
  - **Software-enabled and advanced sensor products** represent the full suite of industrial solutions that include software and hardware. In lighting, for instance, traditional lighting fixtures have been replaced with much more sophisticated, connected lighting solutions. Advanced sensors combine traditional sensors (for example, pressure, vibration, light) with data-processing capability—for example, a small external clamp-on liquid flow sensor using ultrasound with internal computation.

Enhancing product portfolios with smarter products enables Industrials to capture and share data across a product's connected ecosystem and provide customers with unprecedented services and insights.

NEW BUSINESS MODELS

Innovative business models are emerging in the Industrials sector as companies find new ways to generate revenue and attract and retain customers. Six traditional and new models are present in Industrials:

- **One-time transaction.** The traditional way for Industrials to sell goods and services: purchase when needed. Purchases are typically conducted through one-to-one relationships with large customers and through distributors for smaller customers.
- **Subscription.** Fee-based access to a product or service, such as a subscription-based analytics cloud platform, which focuses on connected equipment data analytics and delivery of real-time insights.
- **Service contract.** A fee-based servicing agreement for equipment over a specified time period. In this model, usually combined with leasing, customers use systems owned and maintained by another company for a set amount of time.
- **Rent/lease.** A model used jointly with service-contract models in which companies lease systems and goods. For example, companies are able to "lease light," including fixtures and installations, and equipment maintenance service contracts for a given period of time.
- **"Freemium."** The provision of a free product or service with the option to purchase premium features. For example, Industrials companies collect performance data of installed equipment and transmit the data to the cloud for free but offer advanced data analysis at a cost. Customer data is transmitted automatically through proprietary smart sensors.
- **Profit sharing.** Products and services are provided at no direct charge, but companies earn a share of profit. A different approach to the customer-supplier relationship is often referred to as "power by the hour" in aerospace industries, where commercial airlines pay a fee per hour of engine use, combining the benefits of rent/lease with a service contract on demand.

New capabilities

The integration of software into product design is increasingly table-stakes as software-enabled solutions become the default. These solutions are increasingly focused on advanced analytics to harness the value of and derive new business insights from the vast amounts of data generated by the sensors in machinery and products.

- ***Software and solutions capabilities*** — Extending hardware-development capabilities to include software and solutions requires talent with a different DNA. Executives will need to build capabilities both in software at the application level (versus machine-level firmware) and in modern software-development techniques such as rapid application and agile development methodologies. In addition, companies will need to deliver cloud applications with different designs, including the fulfillment of cyber-security requirements. These applications and systems will need to be both highly optimized and reliable to meet the mission-critical needs of customers requiring mastery of middleware and operating systems.

- ***Advanced analytics*** — "Smarter" products with embedded sensors will generate vast amounts of data, unlocking opportunities to obtain new business insights with advanced analytics. Capturing the value of data begins with the ability to collect, aggregate, normalize, and process large quantities of data from multiple sources into a single data lake. Companies need to build expertise in areas such as machine learning and artificial intelligence to derive actionable insights from their stores of data.

To bridge the gap between analysis and execution, the ability to integrate analytics into key business processes will be paramount to improve decision making. In parallel, companies will need to invest in data and analytics architecture and tools that enable that integration. This investment includes distributed storage, and computing and data-visualization tools that are plugged into existing workflow tools and provide actionable insights. Close monitoring of the data lake and its data quality is critical. Exhibit 25 details seven areas where data analytics capabilities can have significant impact and help companies answer key questions.

Exhibit 25 Analytics capabilities: Seven areas where analytics can have significant impact

Areas where analytics can "move the needle"

A. Revenue management

1. Where to compete
   - Which micro-markets?
   - Which customers?
2. How to compete
   - Which products to sell?
   - How to increase sales conversion?
   - How to increase share of wallet?
   - Which channels to use?
   - How to tailor offerings?
   - How to value price?

B. R&D

3. Where to target R&D investments
   - Which sponsored projects?
   - Which products?
   - Which attributes?

C. Operations

4. How to optimize time to market
5. How to optimize manufacturing costs
6. How to optimize supply chain
   - How much capex?
   - How to improve supply chain efficiency?
   - How to reduce cycle time?

D. Other

7. How to improve talent management
   - How to reduce top employee attrition?
   - How to improve the screening and recruiting process?

To build analytics capability (Exhibit 26), companies should start small to prove the value of their investment and prioritize business problems to demonstrate how their analytics capability can support their main business drivers (Exhibit 27). By first running pilot use cases to create pull and proving the return on investment, companies can subsequently create a well-founded business case to scale and a blueprint for an end-to-end roadmap.

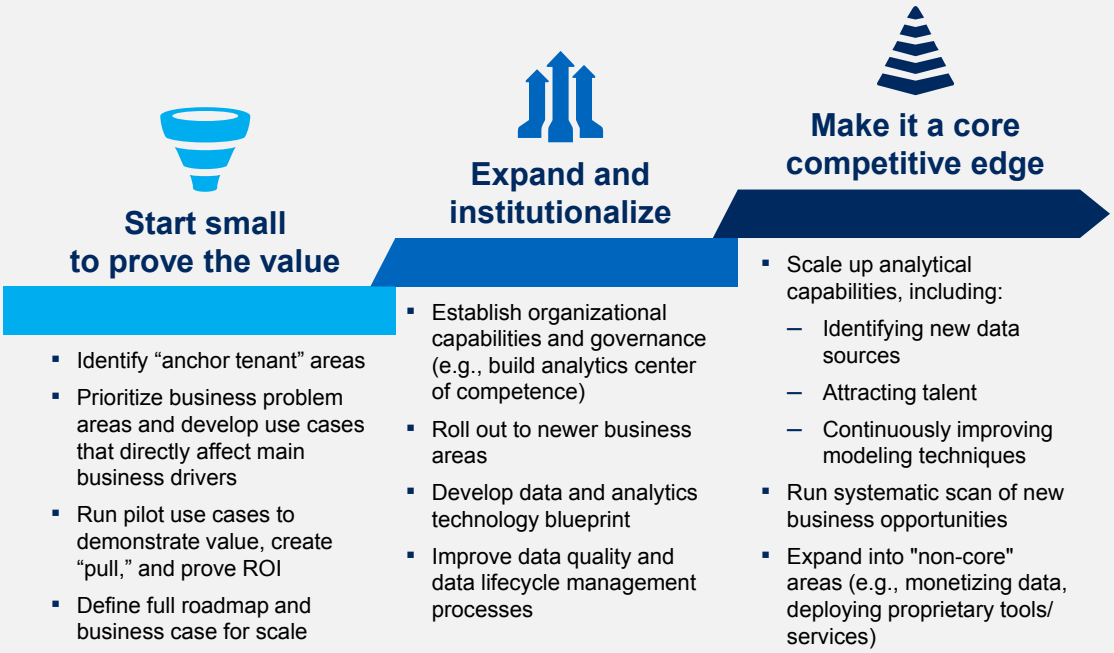
Exhibit 26 New capabilities

	Example capabilities required
Software and solutions capabilities	▪ Expertise in latest software-development techniques (e.g., knowledge of rapid application and agile development methodologies) ▪ Cloud platform design and architecture capabilities (e.g., distributed applications vs. service-oriented architectures) ▪ Cyber security/secure gateway capabilities (e.g., URL filtering, malicious-code detection and filtering, and application controls) ▪ Middleware/OS capabilities (e.g., knowledge of emerging middleware platforms like QNX, Android N) ▪ System integration expertise (e.g., integrating sensors and actuators)
Advanced analytics to drive new business insights	▪ Ability to collect, aggregate, normalize, and process large quantities of data from multiple sources (e.g., advanced merging operations techniques) ▪ Expertise in advanced analyses (e.g., machine learning, artificial intelligence) ▪ Ability to integrate analytics into key business processes to drive better decision making ▪ Enabling data and analytics architecture and tools (e.g., distributed storage and computing, data visualization tools)

In the next stage, companies should expand and institutionalize their analytics capability, establishing organizational capabilities and governance, rolling out to new business areas, and improving data quality and lifecycle management processes. Performance management of assets should occur sequentially—from single machines to systems to the entire production chain.

Once these elements have been established, companies can make their analytics capability a core competitive edge. In this stage, the focus is on scaling upward, acquiring new data sources and talent, and continuously improving modeling techniques. In doing so, companies will be able to run systematic scans of new business opportunities and expand into non-core areas, including monetizing data and deploying proprietary tools and services.

Exhibit 27 Analytics capabilities: Typically, companies start small and build capabilities step by step



New operating models

Investments in building new offerings and capabilities cannot succeed unless companies also take a hard look at how they operate. For instance, the operating model required to design, develop, and sell software-based products is fundamentally different from the model for traditional hardware. Software development is more iterative and requires a more consultative selling motion compared to hardware.

As we look to the future, there are three areas that we believe will require particular attention—how companies make decisions, how they go to market, and how they utilize M&A to support their overall strategy.

- *Greater agility in decision making*—Traditional decision-making practices are static and susceptible to common decision-making biases. For instance, most companies have an annual strategic-planning calendar that serves as the foundation for major decisions. However, this model is less effective in an era in which disruptions are becoming more frequent and static business projections quickly become outdated. Dealing with this uncertainty will require greater flexibility and agility in decision making. An agile strategic-planning process has two key components:
  - **Scenario-based strategy development,** which articulates future outcomes for the organization in the face of uncertainty, considers disruptions and discontinuities, and more actively engages stakeholders across the company to identify and address future business scenarios and ensures organizational buy-in.
  - **Managing strategic planning as a journey** rather than an annual exercise encourages companies to reexamine critical assumptions embedded in their business models for resilience to unthinkable events; do more shorter and quicker loops between setting the strategy, driving the strategic planning, and moving to annual operating plans and budgeting; and then go back to reassess their strategy.

Along similar lines, companies often are unaware of or do not pay enough attention to traditional biases in decision making (Exhibit 28). Embedding de-biasing techniques, such as post-mortem analysis, in decision-making processes and corporate culture is key to driving robust decision making.

Exhibit 28 Biases can affect an organization's ability to remain agile

	Description
Confirmation biases 	Decision makers give too much weight to information that **supports their predisposition** and too little to contrary data, **rely too much on averages,** and selectively choose data in **hindsight** to support their position
Optimism biases 	An expectation that the **best possible outcome** will emerge from a decision
Anchoring biases 	Includes the **sunk-cost fallacy**, which is a bias to honor sunk costs despite new information, and **framing**, which is a bias to interpret data dependent on the way **information is presented**
Social biases 	**Preferential or prejudicial attitudes** toward other groups or individuals that lead to **groupthink**, the **halo effect,** and **"sunflower management"** of leaders
Interest biases 	Arise in the **presence of conflicting or misaligned incentives**, including nonmonetary and even purely emotional ones

- *New go-to-market models and organization*—As noted earlier, new go-to-market models will be required to support the rapid transition to software and solutions and emergence of e-commerce as an important channel for Industrials companies.
  - **E-commerce** introduces a number of challenges into traditional business-to-business distribution. Across markets, traditional distributors are facing declines in operating margin stemming from share loss to e-commerce. E-commerce portals can also serve as a platform for resellers to list their own prices, shipping charges, and product content. This has the potential to create brand dilution from counterfeit goods, poor customer experience, or extreme discounts from unauthorized dealers. Addressing these challenges will require companies to rethink their entire go-to-market model, from pricing and discounting strategy to channel partnerships and the role of traditional distribution partners.
  - **Investments in software-based products and integrated solutions** by Industrials companies is placing new demands on traditional go-to-market organizations. Sales cycles for software and solutions are typically longer and require a different set of sales practices. For instance, software and solution selling require new pricing and commercial approaches (for example, subscription-based pricing models), increased collaboration and coordination across business units to mirror a customer's buying behavior, and new routes to markets (for example, partnerships with system integrators).
- *Different M&A focus*—Historically, most companies focused their M&A on horizontal expansion, remaining in parts of the stack where they played (for example, hardware product companies acquired other hardware players). M&A was seen as a way to increase market share, gain scale, and enter adjacent product categories and geographies. Going forward, however, M&A will become an increasingly important lever to "jump vertically up the stack"—that is, expand into newer layers of the stack (for example, software and services) or build new capabilities. Some companies are already headed down this path; General Electric has used M&A extensively to build its IoT platform and capabilities (Exhibit 29).

Exhibit 29 Different M&A focus: Leveraging M&A to "jump up the stack"—General Electric digital example

	Capability	Partner/M&A	Details of capabilities
Investment	Data analytics	Pivotal	▪ New analytic services and solutions
	Manage/deploy application	Pivotal	▪ Solutions leveraging Cloud Foundry to manage and deploy applications across public and on-premise cloud services
Acquisition	Data analytics	Austin Digital	▪ Supplier of flight operations data analysis to strengthen GE's services offerings in aviation
	Security	wurldtech	▪ Security solution to protect sensor network and critical infrastructure
	Software solution	meridium	▪ Provider of asset performance management software for asset-intensive industries
	Cloud-based application	servicemax	▪ Provider of cloud-based field service management solutions
Partnership	Cloud and network infrastructure	amazon web services	▪ Partnership that offers scalable, low-cost cloud platform and infrastructure
		verizon at&t vodafone	▪ Strategic partnership with telcos for secure and easy connection of machines and devices to the Predix platform from different locations worldwide
	Gateway devices	intel cisco	▪ Partnership that offers integrated gateway devices that seamlessly connect devices to GE's Predix cloud regardless of manufacturer
	Operations services	taleris accenture	▪ Joint venture with Accenture offering operations services to predict, prevent, and recover from operational disruptions
	Cloud-based infrastructure	Microsoft Azure	▪ Partnership that offers Microsoft's enterprise cloud applications for industrial assets

Conclusion

Overall, the Industrials sector has performed well over the past 15 years, growing at a CAGR of 4.9 percent from 2001 to 2015 and outpacing the S&P 500 in margin and TRS growth. However, performance varied significantly across subsectors and companies. Leading companies performed well consistently by making better choices in the pursuit of revenue growth, margin and cost management, M&A, and in their resource allocation and productivity. These historical drivers of success will remain critical going forward, both for Leading companies to remain at the top and for Trailing companies to rise. However, acting on the same playbook of the past 15 years is unlikely to suffice. Global trends and disruptions are reshaping traditional markets and creating new opportunities for companies in the sector. Capturing these opportunities will require companies to pursue the 3 Ns—new capabilities, new offerings and business models, and new operating models. Companies that can both deliver on the existing playbook and quickly figure out how to move forward in each of the 3 Ns and make the right investments will be best positioned to achieve sustained value creation.

Subsector deep dives

This section of the report features the analysis of 205 companies with deep dives on 111 companies across 6 subsectors and 12 product segments (Exhibit D1).

Exhibit D1 Subsector analysis

Deep dive # Number of companies analyzed in subsector

Subsector	Product segment	Number of companies	
1. Building technologies	Food processing	7	40
	Lighting	8	
	HVAC	12	
	Building security	7	
	Elevators and escalators	4	
	Building facility service	1	
	Building electric blinds, doors	1	
2. Test and measurement	General purpose and electronics	8	21
	Life science and analytical	8	
	Spatial	4	
	Non-destructive	1	
3. Electrical equipment	Automation	4	19
	Motors and controls	7	
	Low-voltage equipment	7	
	Multi-application electrical equipment	1	
4. Power equipment	Wind power generation equipment	7	52
	Solar	12	
	Energy storage	10	
	Fossil fuel and reciprocal engines	11	
	Nuclear power generation equipment	2	
	Power transmission and distribution equipment	9	
	Diversified power equipment	1	
5. Flow control	Flow management (pumps, valves, etc.)	16	28
	Diversified flow control	8	
	Specialty flow treatment	4	
6. Industrial machinery	Machining	15	45
	Food packaging/specialized machinery	8	
	Customer-facing machinery	7	
	Diversified machinery	6	
	Robotics	2	
	Printing machines	2	
	Textiles	2	
	Material handling equipment	3	

For each of the six subsectors analyzed in depth, the individual section begins with an overview of the subsector's performance relative to overall Industrials (that is, if the subsector out- or underperformed the overall sector), followed by a comparison of various product segments in the subsector on economic profit performance, and a synthesis of how Leading companies in each product segment outperformed their peers.

Our findings were remarkably consistent across subsectors and product segments. In every subsector and product segment, the analysis indicated that "what you did" mattered more than "who you are."

In other words, Leading companies in every product segment were exclusively differentiated by the management choices they made rather than any of their starting attributes. As noted earlier, this analysis served as the foundation for our findings in the previous section on drivers of value creation in Industrials.

1. BUILDING TECHNOLOGIES

Subsector snapshot

Companies analyzed: 40

Economic profit/revenue (2001–15 average): 2.2%

2015 EBITA margin: 10%

Overview

The building technologies subsector (Exhibit D2) spans the equipment and services used in residential, commercial, institutional, and government spaces. Our analysis of the subsector focused on 40 companies that collectively generated $177 billion in revenues in 2015.

Subsector performance, 2001–15

Building technologies outperformed the Industrials sector in all three cycles on EP/R and TRS (Exhibit D3), while also growing faster than Industrials during the last two phases. Building technologies saw performance improvements in both

Exhibit D2 Building technologies consists of major players in five main segments

# of companies[1]	Revenue[2] $Bn	EBITA $Bn
EP/R %	Multiples	Cumulative TRS, %

Product segments	Description	Example companies	Segment performance
Food processing	Commercial kitchen equipment, residential appliances, and systems for industrial processing, packaging, and baking	The Middleby Corporation, Manitowoc	7 / 46.1 / 3.4 1.5 / 11.1 / 11.5
Lighting	Industrial and residential lighting and control products and solutions	AcuityBrands, CREE, USHIO	8 / 22.0 / 1.2 0.7 / 17.5 / 5.9
HVAC	Commercial and residential heating, ventilation, air-conditioning equipment	LENNOX, Ingersoll Rand, DAIKIN	12 / 49.9 / 5.4 1.6 / 12.5 / 13.0
Building security	Video surveillance, mechanical and digital lock systems, access management products	HIKVISION, ALLEGION	7 / 29.2 / 4.6 4.0 / 18.0 / 11.3
Elevators and escalators	Elevators, escalators, auto-walks and related maintenance service, and replacement	KONE, FUJITEC, Schindler	4 / 21.5 / 2.7 5.2 / 13.8 / 20.8
Others	Building facility services Building electric blinds, doors	EMCOR, somfy	2 / 7.9 / 0.5 4.6 / 9.6 / 14.6

1 Companies with more than $1 billion in revenue in 2014.
2 Total 2015 revenue of the companies addressed in analysis.

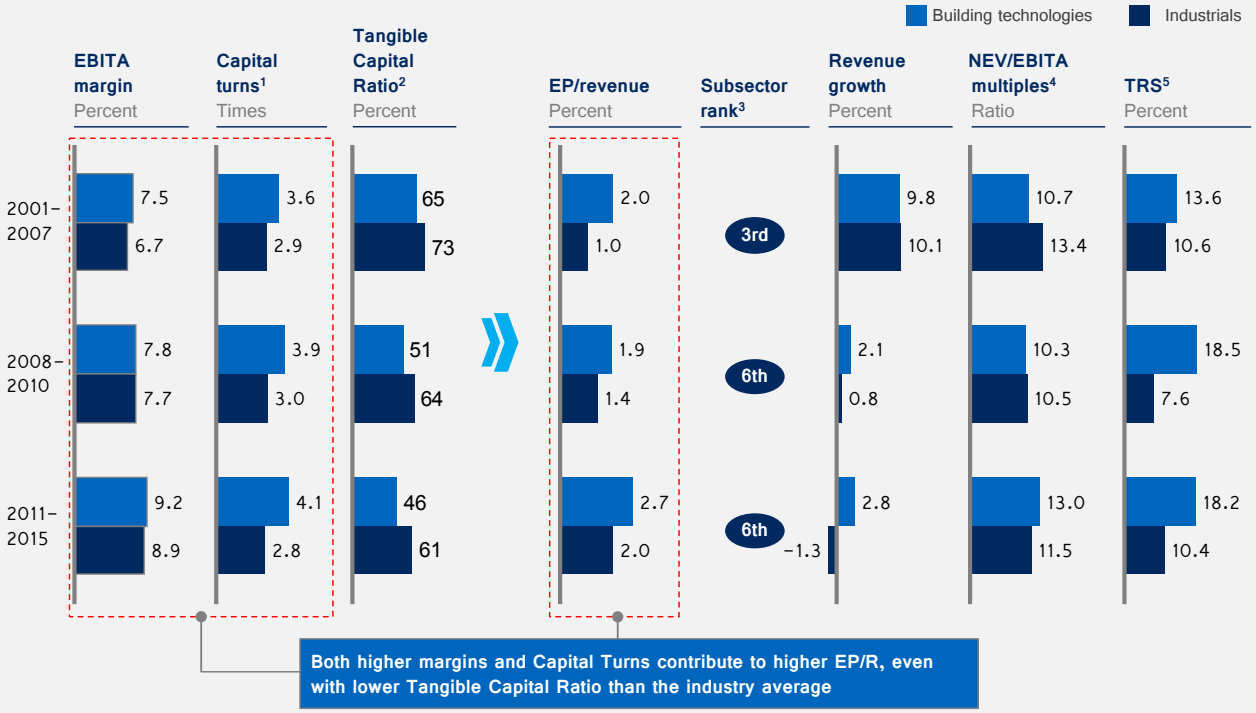
margin (170 basis points increase from 7.5 to 9.2 percent) and capital turnover (0.5 increase from 3.6 to 4.1), allowing it to increase EP/R by 70 basis points from 2.0 to 2.7 percent.

Building technologies' higher EP/R was driven by higher margins and capital turns, even with consistently lower tangible capital ratios. In lockstep, TRS was higher than the sector average during this time frame. Following 2001–07, building technologies companies were able to increase revenue at a higher rate than the Industrials sector while maintaining higher EP/R. Despite this outperformance, the gap has begun to narrow as building technologies' margin expansion has lagged behind Industrials (170 basis points versus 220 basis points from 2001–07 to 2011–15) and a greater pace of intangible-assets additions have reduced the gap from 100 basis points to 70 basis points. Because of this, building technologies fell from the third-highest subsector by EP/R to the sixth.

Performance by product segment, 2001–15

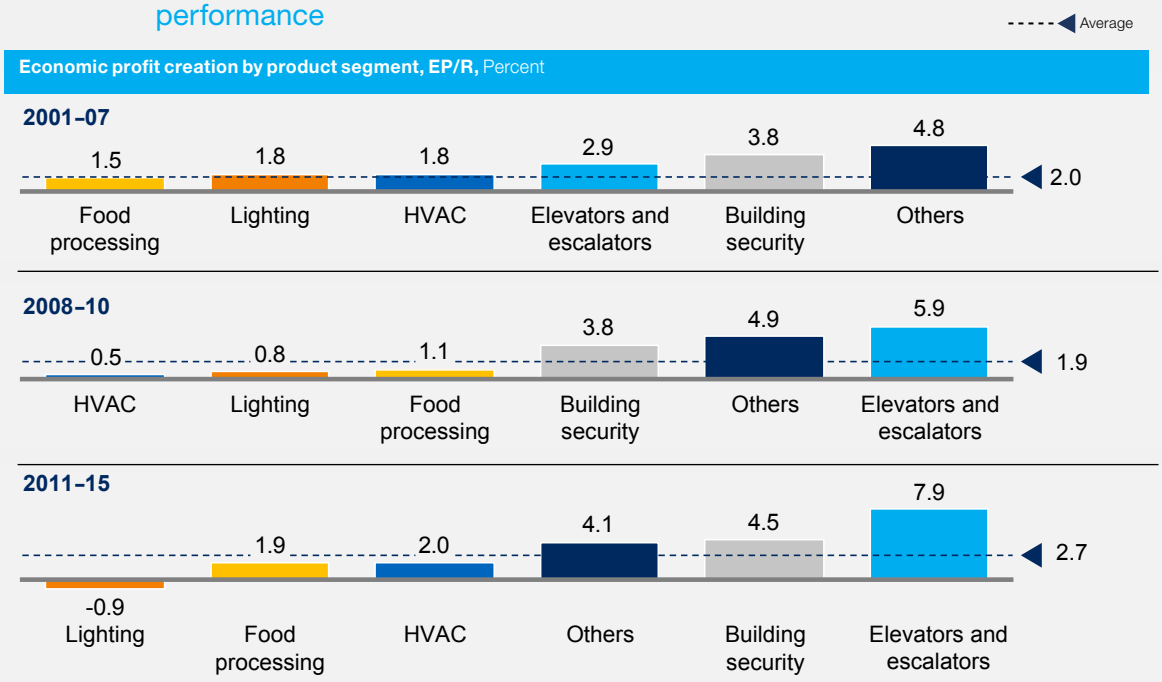
De-averaging building technologies' performance across its product segments shows significant variance in performance (Exhibit D4). The 2011–15 cycle had the largest range of EP/R performance, from -0.9 percent for lighting to 7.9 percent for elevators and escalators—a 880-basis-point gap, up from 330 basis points during 2001–07. In addition, 2011–15 was the first period that had a product segment with negative EP/R.

Exhibit D3 Building technologies outperforms the overall Industrials sector with higher economic profit generation and higher TRS compared with the sector average



1 Revenue/Average Invested Capital excluding goodwill over two years.
2 Tangible Capital Ratio defined as Operating Invested Capital/Total Invested Capital. Lower ratio Indicates higher amount of goodwill.
3 Ranked out of 12 subsectors.
4 Net Enterprise Value (NEV)/Earning Before Interest, Tax, and Amortization multiple.
5 Weighted average Total Return to Shareholders (TRS) by market capitalization for the time period.

Exhibit D4 "De-averaging" building technologies' EP/R shows significant variation in performance

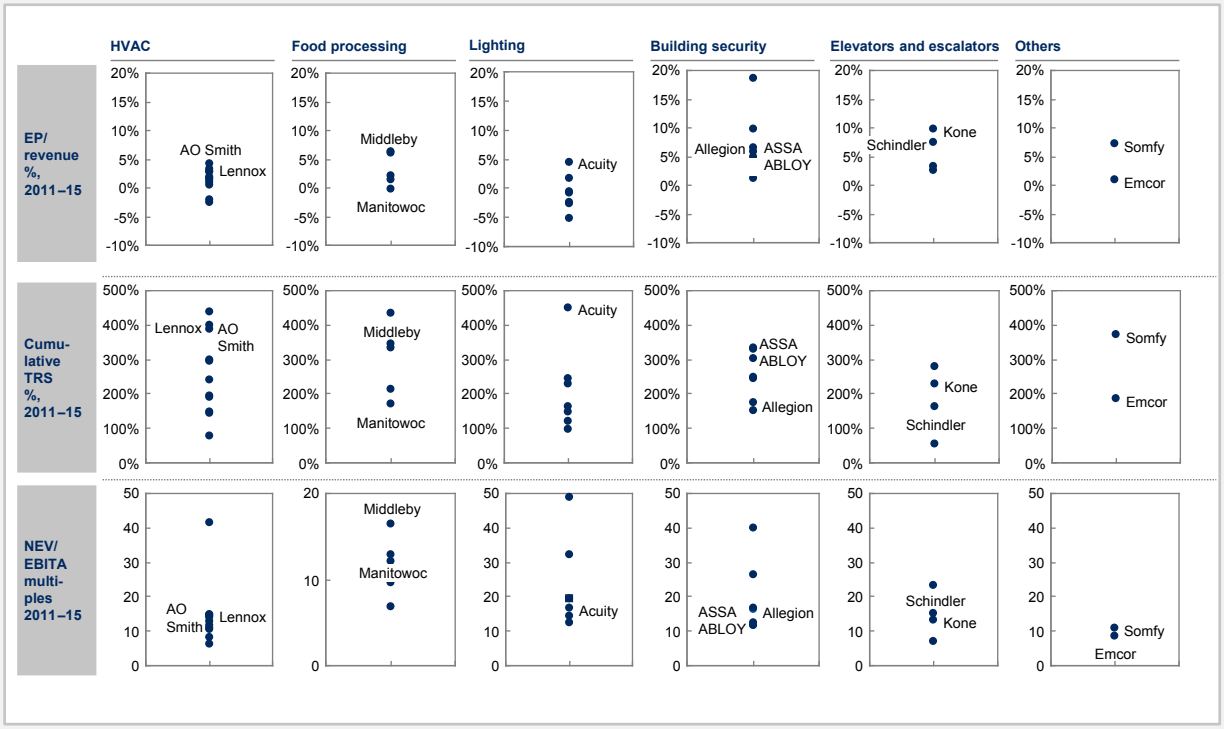


Across the cycles, product segments largely stayed in either the top three (elevators and escalators, building security, others) or bottom three (food processing, lighting, HVAC) with no product segment consistently being top or bottom. Food processing and HVAC increased their performance from 2001–07 to 2011–15 slightly by 40 and 20 basis points, respectively. Lighting declined by 270 basis points during the same time frame and is the only segment to generate negative EP/R from 2011 to 2015.

Performance by company within product segments, 2001–15

Analysis of EP/R, cumulative TRS, and EBITA multiples across companies in the building technologies subsector shows a large variance in performance (Exhibit D5). Elevators and escalators had the top average company EP/R performance—7.9 percent from 2011 to 2015—and building security had the greatest disparity between top- and bottom-performing companies. The highest TRS was observed in the HVAC segment and the highest multiple in lighting.

Exhibit D5 There is significant variation in performance for companies within each segment of building technologies



1.1 FOOD PROCESSING

Segment snapshot
Companies analyzed: 7
Economic profit/revenue (2001–15 average): 1.5%
2015 EBITA margin: 7.4%

Drivers of performance—Food processing

The food processing product segment covers commercial and residential kitchen equipment and systems for food processing, storage, and cooking. From 2001 to 2015, it generated an EP/R of 1.5 percent, outperforming Industrials as a whole while falling short of the building technologies average of 2.2 percent.

In recent years, food processing has benefited primarily from three of the six megatrends: demographics, geographic, and regulatory. Demographic subtrends such as the continued expansion of the consumer class and changes in preferences have led more people to eat away from home (for example, millennials eat outside the home more than baby boomers, and Generation Z is expected to be the most voracious generation for dining out yet). Rising food-preparation costs caused by increases in labor and energy costs combined with greater focus on energy efficiency have accelerated the move to more advanced food-processing equipment that minimizes cooking times and energy.

Leading companies positioned themselves to benefit from the trends driving differentiation by focusing on the right customer segments, technological innovation, high-volume M&A, and both profitability and productivity improvements (Exhibit D6).

Leading companies used technological advancements to bring products to market that enabled time and energy savings (for example, rapid-cook and low-energy ovens, atmospheric steamers that use less water, oil-less fryers) and better quality (for example, hybrid broiling technology that combines broiling with convection).

Leading companies also differentiated themselves from their Trailing peers by more effectively penetrating customer segments that valued technological innovation (for example, commercial, or premium residential), yielding higher margins.

Exhibit D6 Food processing: "What you did" mattered significantly and affected performance

Driver	Impact	Leaders vs. Laggards[1] difference
Management choices: What you did (2001-15)		
1. Quality of revenue growth (ΔEP/ΔR)	Low	-100 basis points (+600 basis points vs. +700 basis points)
2. Margin management		
– Gross margin change	High	+1,290 basis points (+790 basis points vs. -500 basis points)
– Operating expenditures change	Low	-60 basis points (+300 basis points vs. +360 basis points)
3. M&A strategy (number and size of deals)	High	4X more deals (40 vs. 10) with smaller absolute ($35 million vs. $500 million) and relative deal size (deals <2% vs. 10% of acquirer's market cap)
4. Resource allocation		
– R&D productivity	High	Stronger IP[2] (50 vs. 38) and larger number of patents per $ million of spend (0.75 vs. 0.50)
– Employee productivity (2015)	High	3.3X higher productivity ($46,500 vs. $14,200 EBITA per employee)

1 Leaders includes Leading and Rising companies, while Laggards includes Declining and Trailing companies.
2 Intellectual property strength is based on impact of the patent on its field using 12 factors including number of times cited, breadth, and litigation (higher number implies stronger patent).

Leading companies used programmatic M&A as the backbone of their differentiation strategy, completing a high volume of smaller deals aligned to technology and high-end brand acquisitions themes. From 2001 to 2015, the Leading companies acquired four times more targets than Trailing companies (40 compared with 10) with a smaller average deal size ($35 million compared with $500 million). Trailing companies instead focused largely on acquisitions to expand markets geographically or build scale in an attempt to change their cost structures instead of focusing on product differentiation.

Underpinning the technological differentiation, Leading companies had more effective R&D, generating stronger IP (50 versus 38) and a larger number of patents per million dollars of R&D spend (0.75 versus 0.50). This allowed Leaders to market products with higher gross margins and increase profitability per employee.

Leading companies further increased productivity by consolidating manufacturing footprint and capacity proactively and streamlining the SG&A organization. In contrast, Trailing companies did not proactively manage and reduce capacity but expanded, only consolidating facilities when the economy deteriorated in 2008–09. As a result, the Leading companies finished the last cycle with nearly three and a half times the employee productivity ($46,500 EBITA per employee versus $14,200).

1.2 LIGHTING

Segment snapshot
Companies analyzed: 8
Economic profit/revenue (2001–15 average): 0.7%
2015 EBITA margin: 5.5%

Drivers of performance—Lighting

The lighting product segment covers products across the lighting value chain from LED wafers, over lamps, and luminaires to connected lighting infrastructure and solutions. Over the past 15 years, the lighting product segment generated an EP/R of 0.7 percent and annual TRS of 5.9 percent, underperforming the Industrials sector overall.

The 2001–15 period was one of great change for the lighting product segment as regulatory and technology disruption altered the landscape. LED lighting carved out a niche. Bulbs (even new, energy efficient technologies like LED) have been further commoditized as a once hardware-focused market has transitioned to systems and solutions. Propelling this change were changing government regulations and consumer interest in environmentally friendly products. Companies chose different strategic paths to solidify their position with markedly different outcomes.

For lighting, quality of revenue growth and margin management were the key management choice differentiators even as the M&A strategy and resource allocation choices were consistent with overall Industrials findings (Exhibit D7). Where a company chose to play in the value chain was a key differentiator. The Leading company added 24 cents in economic profit per dollar of growth, held gross margin largely constant, and improved operating expenditure margin by 600 basis points. In contrast, Trailing companies lost 7 cents in economic profit for each dollar of revenue growth, saw gross margins collapse, and experienced an increase in operating expenditures.

Focus on quality revenue growth and margin management was complemented by strong resource productivity. The Leading company approached productivity and capacity management much more effectively—avoiding overinvestment in production capacity, balancing the use of external contract manufacturing with captive capacity, and driving employee productivity and efficiency. By contrast, Trailing companies were slow to reduce capacity during price downturns. As a result, Trailing companies had significantly lower margins and EBITA. The Leading company achieved approximately four times higher employee productivity ($52,100 EBITA per employee compared with $12,300 for Trailing companies) consistent with the broader set of Leading Industrials companies.

Finally, the Leading company used programmatic M&A—19 deals over the 15-year cycle compared with an average of 8 deals for Trailing companies—to augment their margin management and resource allocation to move deeper into more differentiated downstream areas such as automation and lighting controls. Relative to the overall Industrials sector, the Leading company pursued larger targets with an average deal size of $124 million (4 percent of acquirer's market cap) compared with an average of $69 million per deal for the Industrials sector overall (2.7 percent of acquirer's market cap)—though hardly large-scale transactions. Meanwhile, Trailing companies utilized M&A to try to achieve scale upstream in semiconductors, LEDs, and lighting fixtures, where overcapacity and commoditization created intense margin pressure and the benefits of scale failed to materialize.

Exhibit D7 Lighting: "What you did" mattered significantly and affected performance

Driver	Impact	Leaders vs. Laggards[1] difference
Management choices: What you did (2001–15)		
1. Quality of revenue growth (ΔEP/ΔR)	High	+3,100 basis points (2,400 basis points vs. -700 basis points)
2. Margin management		
– Gross margin change	High	+3,070 basis points (-70 basis points vs. -3,140 basis points)
– Operating expenditures change	High	+1,260 basis points (+600 basis points vs. -660 basis points)
3. M&A strategy (number and size of deals)	High	2X more deals (19 vs. 8) with larger absolute deal size ($124 million vs. $76 million) and 2% smaller relative deal size (4% vs. 6% of acquirer's market cap)
4. Resource allocation		
– R&D productivity	Medium	Stronger IP[2] (52 vs. 39) but similar number of patents per $ million of spend (1 vs. 1)
– Employee productivity (2015)	High	~4X higher productivity ($52,100 vs. $12,300 EBITA per employee)

1 Leaders includes the Leading company, while Laggards includes Declining and Trailing companies.
2 Intellectual property strength is based on impact of the patent on its field using 12 factors including number of times cited, breadth, and litigation (higher number implies stronger patent).

1.3 HVAC

Segment snapshot
Companies analyzed: 12
Economic profit/revenue (2001–15 average): 1.6%
2015 EBITA margin: 10.8%

Drivers of performance—HVAC

The HVAC product segment covers commercial and residential heating, ventilation, and air conditioning equipment. From 2001 to 2015, HVAC generated positive EP/R (1.6 percent) and annual TRS (13.0 percent), outperforming the Industrials sector as a whole while falling short of other product segments in building technologies.

Over the past 15 years, the HVAC product segment initially enjoyed strong demand driven by a global building boom from 2001 to 2007 before the financial crisis rocked residential and commercial construction starting in 2008–09. Since then, HVAC has benefited from new regulatory requirements for energy efficiency standards, reduction of greenhouse gas emissions, and tax incentives for qualified energy-efficient equipment. In addition, demographic and geographic trends have created further tailwinds for room air-conditioning systems in developing countries.

Leading companies were successful in navigating this changing environment and differentiated themselves with technological innovation and profitability improvements, positioning themselves in the right parts of the value chain on the back of high-volume M&A (Exhibit D8).

For example, Leading companies gained early entry into energy efficiency, grabbing a large share of the replacement market for less-efficient HVAC systems. In addition, these companies took more direct control of their distribution to improve customer intimacy and service as well as enhance distribution coverage. They utilized programmatic M&A to achieve both. Leading players completed an average of 22 deals during the 15-year cycle, more than five times as many deals as Trailing companies. In contrast, Trailing companies used M&A primarily to expand geographically (approximately 60 percent of their deals focused on geographical expansion) rather than to achieve product differentiation and margin improvement. This approach resulted in comparatively poor quality of revenue growth (2 percent for Trailing companies versus 18 percent for Leaders).

Finally, Leading companies focused on operational productivity improvements with systematic worldwide plant and supply chain consolidation while delivering SG&A cost reductions. As a result, opex margin improvements surpassed those of Trailing companies by 550 basis points.

Exhibit D8 HVAC: "What you did" mattered significantly and affected performance

Driver	Impact	Leaders vs. Laggards[1] difference
Management choices: What you did (2001–15)		
1. Quality of revenue growth (ΔEP/ΔR)	High	+1,600 basis points (+1,800 basis points vs. +200 basis points)
2. Margin management		
– Gross margin change	Medium	+140 basis points (+640 basis points vs. +500 basis points)
– Operating expenditures change	High	+550 basis points (+170 basis points vs. -380 basis points)
3. M&A strategy (number and size of deals)	High	~5X more deals (22 vs. 4) with comparable absolute ($85 million vs. $67 million) and relative deal size (deals ~5% of acquirer's market cap)
4. Resource allocation		
– R&D productivity	Medium	Stronger IP[2] (34 vs. 22) with fewer patents per $ million of spend (0.4 vs. 3.5)
– Employee productivity (2015)	High	2.5X higher productivity ($30,000 vs. $12,000 EBITA per employee)

1 Leaders includes Leading and Rising companies, while Laggards includes Declining and Trailing companies.
2 Intellectual property strength is based on impact of the patent on its field using 12 factors including number of times cited, breadth, and litigation (higher number implies stronger patent).

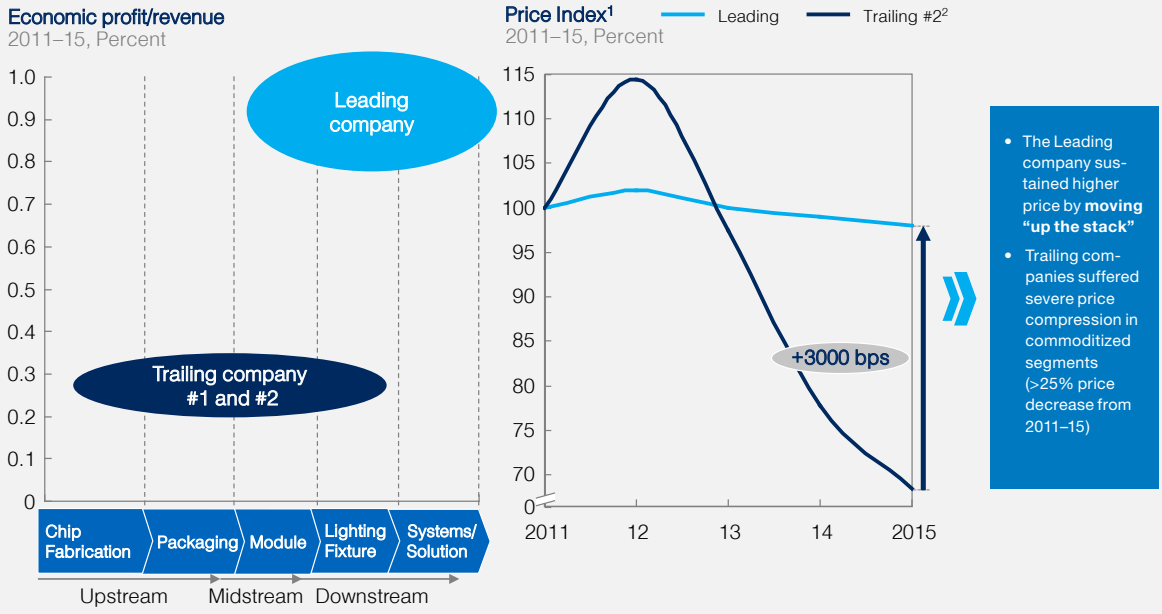
Identifying the markets and product segments with potential for differentiation, high-quality revenue growth, and favorable economics—"where to play"—is a key driver of value creation and a hallmark of many Leading companies. In building technologies, the lighting and food-processing product segments illustrate how Leading companies have used their knowledge on where to play to strengthen their leadership position.

#1 Lighting

From 2011 to 2015, the Leading company in lighting moved "up the stack" to find better opportunities for differentiation. The company identified and invested in areas of the downstream value chain that were less cyclical and more stable. By moving downstream into solutions and services, the Leader escaped the fate of Trailing companies, which suffered price compression as the upstream segments became increasingly commoditized (Exhibit D9).

Exhibit D9 Leading company is more successful in driving differentiation and sustaining price over time

Company segment choice and pricing trends, 2011–15



1 Tracked based on % changes in price as reported in companies' 10K filings (does not account for product mix change).
2 Only include Trailing company #2 with reported pricing information.

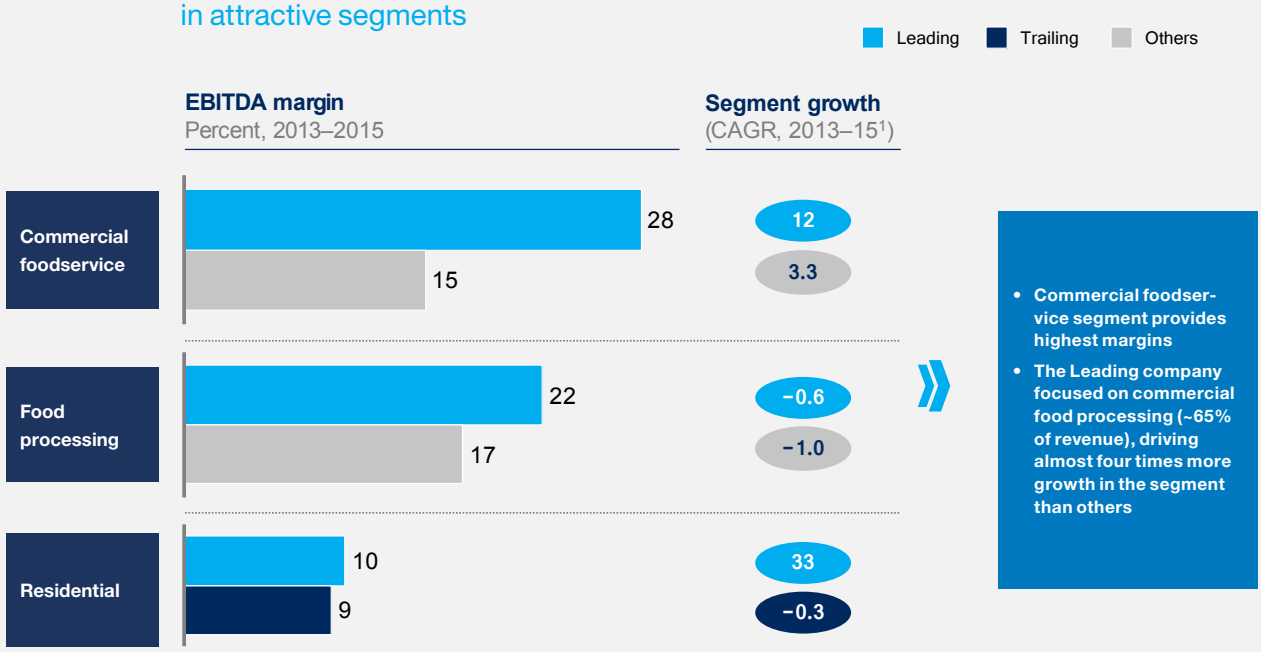
#2 Food processing

The food processing product segment has three different subsegments with very different economics—commercial foodservice, food processing, and residential (Exhibit D10). The commercial foodservice segment has the highest margin opportunity as food service operators (for example, restaurants, retail outlets, and hotels) require efficient, specialized machinery to meet their throughput and harsh usage requirements. Products in this segment include conveyer ovens, deck ovens, fryers, and rethermalizers.

In the food processing product segment, cooking and baking have similar equipment but different and typically less specialized product specifications. Products include batch ovens, frying systems, and food preparation equipment such as battering equipment, blenders, and slicers. Margins in this segment are more modest but still ahead of the residential product segment with products like home appliances such as stoves, ovens, dishwashers, and refrigerators.

Leading companies were aware of this distinction and knew where to play. Leading companies were able to generate more economic profit than Trailing companies by focusing on these more differentiated commercial and high-margin premium segments of the residential segment.

Exhibit D10 The Leading company maintained higher margins by playing predominantly in attractive segments



1 Includes only years when data is available across all segments.

2 TEST AND MEASUREMENT

Segment snapshot
Companies analyzed: 21
Economic profit/revenue (2001–15 average): 2.9%
2015 EBITA margin: 20.3%

Overview

The test and measurement subsector delivers equipment, sensors, and services across four product segments: general purpose and electronic, life sciences and analytical equipment, spatial, and non-destructive (Exhibit D11). Analysis of the subsector covered 21 companies that collectively generated $62 billion in revenues in 2015. For the purpose of this deep dive, non-destructive was excluded from the further breakdown analysis due to small sample size.

Exhibit D11 Test and measurement product segments for analysis

# of companies[1]	Revenue[2] $Bn	EBITA $Bn
EP/R %	Multiples	Cumulative TRS, %

Product segments[3]	Description	Example companies	Segment performance		
General purpose/ electronic	Weighing scales, manometers, level gauges, flowmeters, logic analyzers, signal generators, spectrum analyzers, oscilloscopes	AMETEK, Sensata Technologies, TERADYNE	8	18.2	3.1
			0.9	17.3	4.3
Life sciences & analytical	Chromatography, spectroscopy, spectrometry, particle characterization	Agilent Technologies, ThermoFisher SCIENTIFIC, Waters THE SCIENCE OF WHAT'S POSSIBLE.™	8	31.9	6.4
			1.8	17.3	10.4
Spatial	Cameras, frames, spatial analysis software, laser markers	TOPCON, HEXAGON, Trimble	4	9.1	2.5
			8.7	19.1	13.6
Non-destructive	Laboratory and industrial scales, load cell systems, Rainin pipettes and tips, analytical instruments	METTLER TOLEDO	1	2.4	0.5
			6.3	19.7	14.4

1 Companies with more than $1 billion in revenue in 2014.
2 Total 2015 revenue of the companies addressed in analysis.
3 Exclude segment with one company.

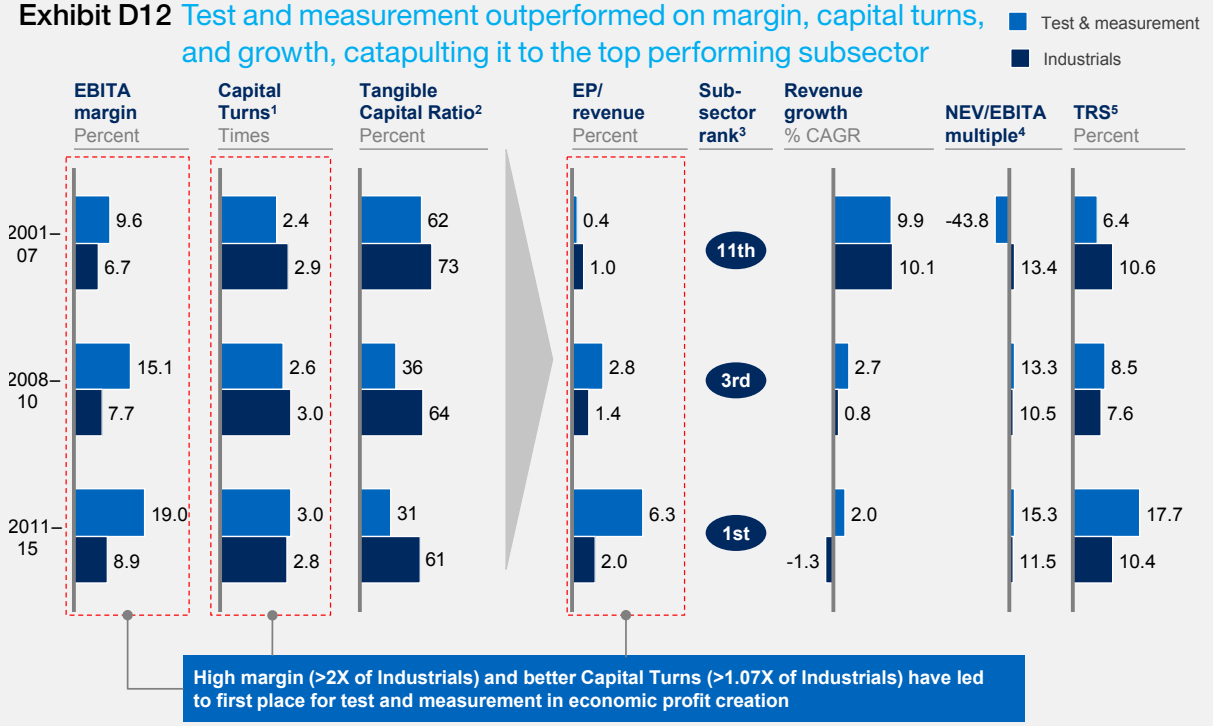
Subsector performance, 2001–15

Test and measurement had a phenomenal run over the past 15 years, moving from 11th (out of 12 subsectors evaluated) in 2001–07 to first by 2011–15 (Exhibit D12). During this time, the subsector's EP/R improved from 0.4 percent to 6.3 percent. By 2011–15, test and measurement outperformed overall Industrials by 430 basis points on EP/R, 730 basis points on TRS, and 330 basis points on revenue growth. This strong performance was driven by an increase in EBITA margins by 940 basis points, from 9.6 percent in 2001–07 to 19.0 percent in 2011–15.

Performance by product segment, 2001–15

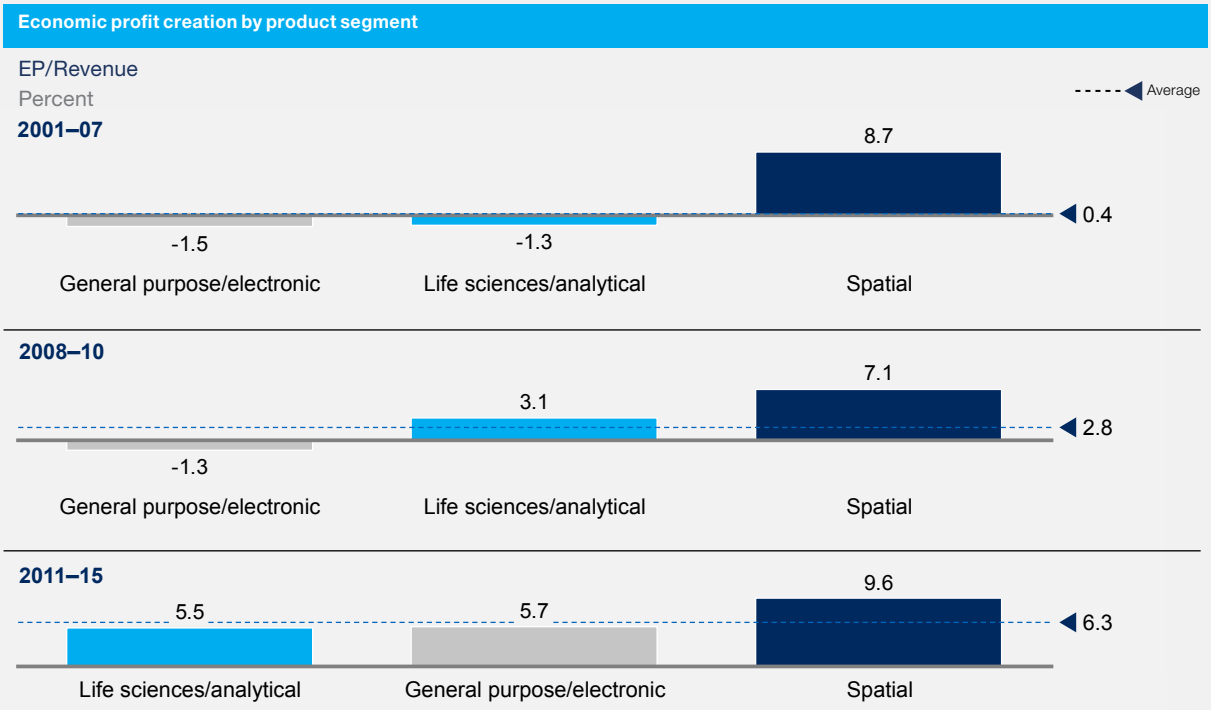
De-averaging test and measurement's performance shows considerable variance across different product segments, although the gap has narrowed in recent years (Exhibit D13). Spatial has consistently been the top-performing segment in test and measurement, with EP/R in the 7.1 to 9.6 percent range over the past 15 years. The other two subsectors—general purpose and electronics and life science and analytics—started out with negative EP/R in the first cycle (-1.5 and -1.3 percent, respectively, in 2001–07) but improved their performance significantly by the third cycle (5.7 and 5.5 percent EP/R, respectively, in 2011–15). As a result, the gap in their EP/R performance versus spatial decreased from an average of 1,010 basis points in 2001–07 to 400 basis points in 2011–15.

Exhibit D12 Test and measurement outperformed on margin, capital turns, and growth, catapulting it to the top performing subsector



1 Revenue/Average Invested Capital excluding goodwill over two years.
2 Tangible Capital Ratio defined as Operating Invested Capital/Total Invested Capital. Lower ratio Indicates higher amount of goodwill.
3 Ranked out of 12 subsectors.
4 Net Enterprise Value (NEV)/Earning Before Interest Tax and Amortization multiple.
5 Weighted average Total Return to Shareholders (TRS) by market capitalization for the time period.

Exhibit D13 "De-averaging" test and measurement's EP/R shows significant performance variation

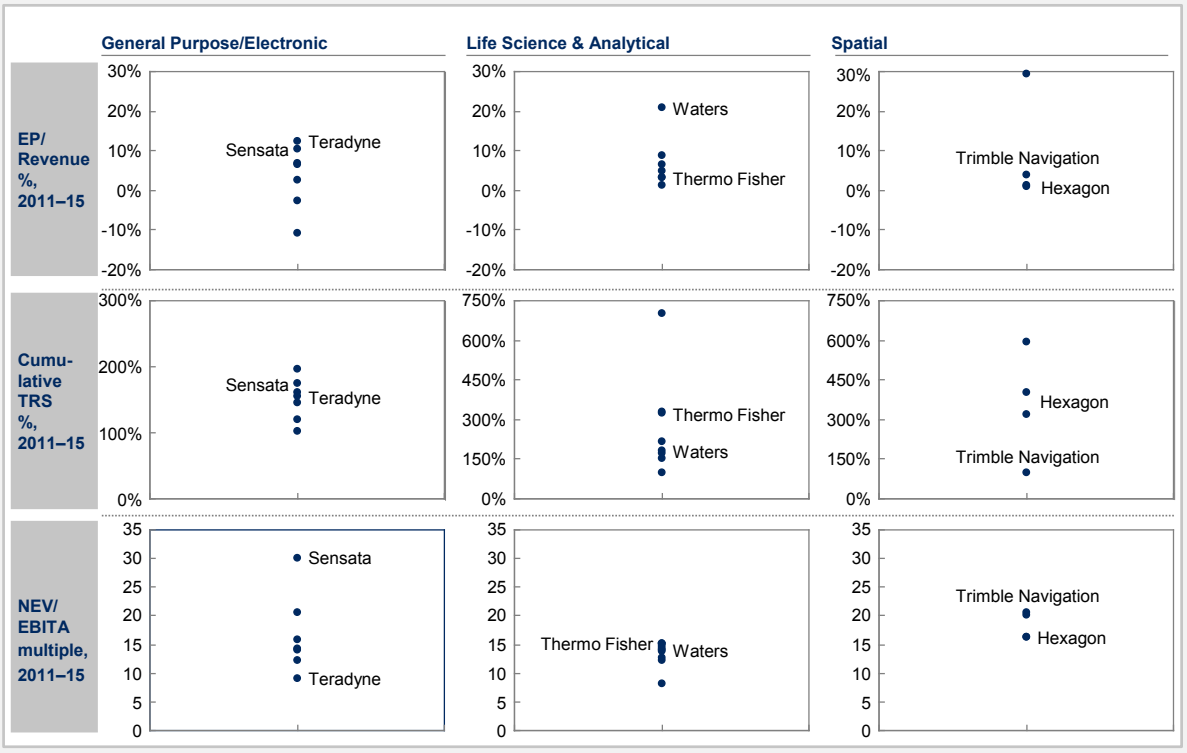


NOTE: Excludes Mettler-Toledo, which is the only company analyzed in the non-destructive product segment. EP/R for 2001–2007 was 3.8%, 2008–2010 was 7.4%, and 2011–2015 was 9.3%.

Performance by company within product segments, 2001–15

Analysis of EP/R, cumulative TRS, and EBITA multiple across companies in the test and measurement subsector shows significant variance in performance (Exhibit D14), although the magnitude of variance differs by segment. For instance, the general purpose and electronic product segment had the largest variance in EP/R performance, ranging from -10.7 percent to 12.5 percent. The life science and analytical and spatial segments were characterized by breakout EP/R performance by the leaders, while their peers performed in a relatively narrow band.

Exhibit D14 There is significant variation in performance for companies within each segment of test and measurement



2.1 GENERAL PURPOSE/ ELECTRONIC

Segment snapshot
Companies analyzed: 8
Economic profit/revenue (2001–15 average): 0.9%
2015 EBITA margin: 17%

Drivers of performance—General purpose and electronic

The general purpose and electronic product segment consists of companies that produce automated test equipment, other test equipment and sensors, manometers, level gauges, flowmeters, logic analyzers, signal generators, oscilloscopes, and spectrum analyzers. From 2001 to 2015, the segment's EP/R performance improved considerably, from -1.5 percent in 2001–07 to 5.7 percent in 2011–15.

In recent years, the segment has benefited from tailwinds in demographic, social, and technological megatrends. Specifically, soaring data traffic, an expanding IoT ecosystem, and demand in mobile communications have generated significant demand and new performance requirements that have unlocked opportunities for innovation and differentiation. This tailwind served as a rising tide for the entire segment.

Leading companies differentiated themselves from their peers by leveraging quality of revenue growth, innovation, programmatic M&A, and employee productivity improvements to enhance their position (Exhibit D15). For instance, Leading companies built a strong presence in the sensor market by offering solutions to customers that moved beyond stand-alone sensors to include controls that were integrated into a broader set of test and measurement equipment. With these "up-the-stack" strategies, Leading companies successfully positioned themselves to deliver the full value of data generated by the sensors. This enabled them to generate significantly higher EP per dollar of revenue growth (198 percent versus 42 percent for Trailing companies).

Leading companies also engaged in more frequent and programmatic M&A—an average of 15 deals from 2001 to 2015 compared with 3 deals for Trailing companies during the same period—and utilized these deals to move into profitable markets (for example, automotive).

Finally, they displayed relentless cost discipline, increasing their advantage in operating margin change over Trailing companies to 1,080 basis points by 2015. Leading companies also created stronger IP (48 versus 36) and achieved higher employee productivity ($41,000 EBITA per employee compared with $23,000 for Trailing companies) consistent with the broader set of Leading Industrials companies.

Exhibit D15 General purpose and electronic: "What you did" determined performance

Driver	Impact	Leaders vs. Laggards[1] difference
Management choices: What you did (2001–15)		
1. Quality of revenue growth (ΔEP/ΔR)	High	+$15,600 basis points (+19,800 basis points vs. +4,200 basis points)
2. Margin management		
– Gross margin change	Low	-2,390 basis points (+530 basis points vs. +2,920 basis points)
– Operating expenditures change	High	+1,080 basis points (+2,810 basis points vs. +1,730 basis points)
3. M&A strategy (number and size of deals)	High	5X more deals (15 vs. 3) with smaller absolute ($29 million vs. $360 million) and relative deal size (9% vs. 13% acquirer's market cap)
4. Resource allocation		
– R&D productivity	Low	Stronger IP[2] (48 vs. 36) but lower number of patents per $ million of spend (0.1 vs. 0.7)
– Employee productivity (2015)	High	~2X higher productivity ($41,000 vs. $23,000 EBITA per employee)

1 Leaders includes Leading and Rising companies, while Laggards includes Declining and Trailing companies.

2 Intellectual property strength is based on impact of the patent on its field using 12 factors including number of times cited, breadth, and litigation (higher number implies stronger patent).

2.2 LIFE SCIENCES/ ANALYTICAL

Segment snapshot
Companies analyzed: 8
Economic profit/revenue (2001–15 average): 1.8%
2015 EBITA margin: 20.1%

Drivers of performance—Life sciences/analytical

The life sciences and analytical product segment includes companies focused on chromatography, spectroscopy, spectrometry, and particle characterization equipment. The segment's performance improved significantly over the past 15 years, moving from -1.3 percent EP/R in 2001–07 to 5.5 percent EP/R by the 2011–2015 cycle. The segment had no companies consistently in the bottom quartile (Trailing), so our analysis of drivers of performance is based on comparing Leading companies to their Declining peers (Exhibit D16).

The life sciences and analytical segment has benefited from tailwinds based on demographic, social, regulatory, and technological megatrends. An aging population has begun to transform patient needs. At the same time, traditional beliefs on delivery of care and transparency in medicine have shifted the emphasis in medicine from reaction to prevention. Innovations in biological modeling are being introduced in preclinical phases to define treatment protocols and dose selection. Further, predictive diagnostics are being rolled out to determine disease predisposition. Outside of medicine, increasingly stringent regulations require analytical instruments for food and environmental testing. Demand in this segment is driven by genomic instrumentation, chromatography, mass spectrometry, and surface science techniques.

Leading companies differentiated themselves versus their Declining peers by focusing on quality of revenue growth and productivity improvements (Exhibit D16). For instance, Leading companies generated 2.5 times higher EP per dollar of revenue growth (25 percent versus 10 percent for Declining companies). Leading companies also delivered materially stronger returns on their R&D spend. For example, they generated stronger intellectual property (patent strength of 47 compared with 22 for Declining companies). Finally, Leading companies also achieved approximately 1.5 times higher employee productivity ($95,000 EBITA per employee compared with $65,000 for Declining companies).

Exhibit D16 Life sciences and analytical: "What you did" mattered significantly and affected performance

Driver	Impact	Leaders vs. Laggards[1] difference
Management choices: What you did (2001–15)		
1. Quality of revenue growth (ΔEP/ΔR)	High	+1,500 basis points (+2,500 basis points vs. +1,000 basis points)
2. Margin management		
– Gross margin change	High	-1,570 basis points (-270 basis points vs. +1,300 basis points)
– Operating expenditures change	Low	+200 basis points (+650 basis points vs. +450 basis points)
3. M&A strategy (number and size of deals)	Low	~0.35X fewer deals (11 vs. 30) with smaller absolute ($20 million vs. $135 million) but similar relative deal size (0.3% vs. 0.3% acquirer's market cap)
4. Resource allocation		
– R&D productivity	Medium	Stronger IP[2] (47 vs. 22) but fewer patents per million $ of spend higher (0.9 vs. 1.3)
– Employee productivity (2015)	Medium	~1.5X higher productivity ($95,000 vs. $65,000 EBITA per employee)

1 Leaders includes Leading and Rising companies, while Laggards includes Declining companies.

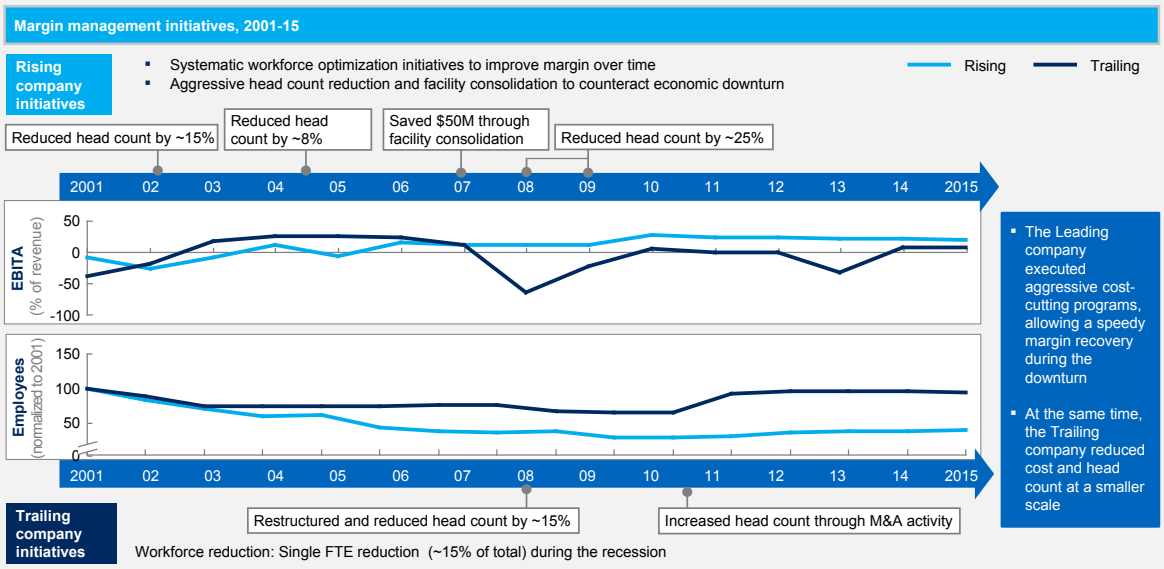
2 Intellectual property strength is based on impact of the patent on its field using 12 factors including number of times cited, breadth, and litigation (higher number implies stronger patent).

MARGIN MANAGEMENT BY CONTROLLING COSTS AND IMPROVING EMPLOYEE PRODUCTIVITY

Margin management is critical to deliver positive economic profit. An integrated productivity and cost management program hits all levers (gross and opex margins, cost management, and employee productivity) with equal rigor. Leading companies ensure they have the right cost and operational structure by actively restructuring through time and showing additional agility when market conditions require (for example, during economic downturns).

Margin management and employee productivity were particularly evident in the general purpose test and measurement product segment. Both the Trailing and Rising companies began the 2001–15 period in roughly the same profitability position. However, the Rising company chose to launch and implement a series of cost-reduction initiatives before the economic downturn. These moves helped it reduce head count by approximately 25 percent and consolidated facilities successfully as margins rose from negative to more than 20 percent. By the time market conditions deteriorated in 2008–09, the Rising company was positioned to capture cost savings and experienced enough to swiftly deploy a major cost-cutting initiative to reduce head count by another 25 percent. As a result, the Rising company's margin stayed flat during the downturn, building an enduring profitability advantage. In contrast, the Trailing company rode the market into the downturn and took less-decisive action during the 2009 downturn as demonstrated by employee counts and deteriorating margins over time (Exhibit D17).

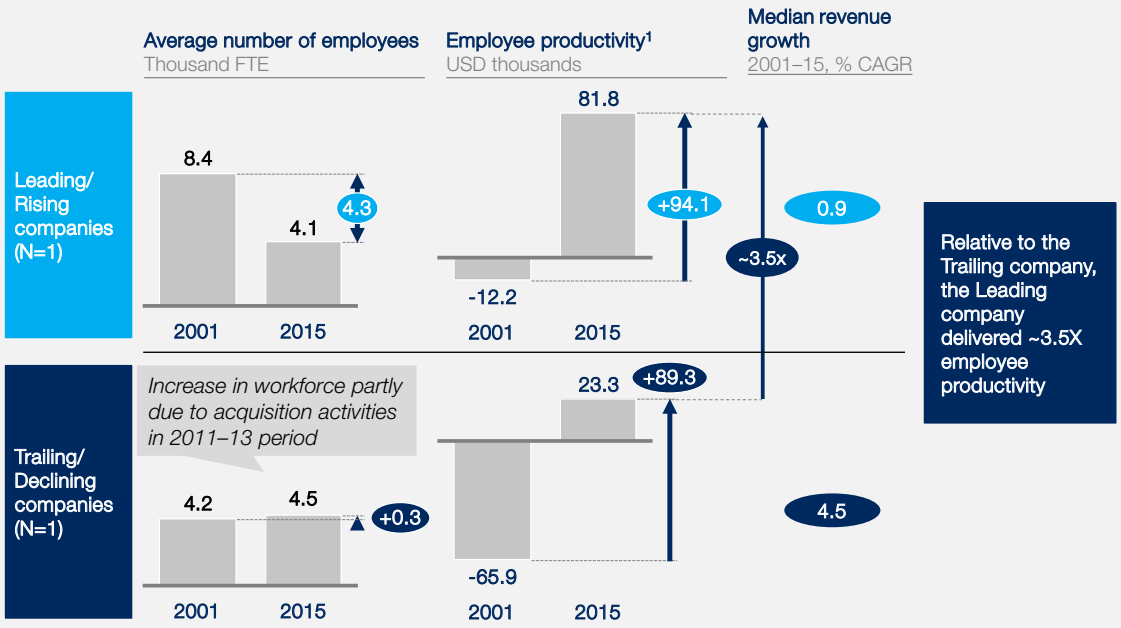
Exhibit D17 Case example: Reduced COGS through restructuring initiatives and head count reduction boosted margins for Leaders



SOURCE: McKinsey Strategy Practice and Corporate Performance Analytics™

The Leaders' focus delivered employee productivity levels that were more than three times the EBITA per employee of the Lagging companies' levels (Exhibit D18) while reducing overall employee levels by approximately 50 percent through time.

Exhibit D18 Leading companies are more effective in improving employee productivity



1 Employee productivity defined as average EBITA per average number of employees

3. ELECTRICAL EQUIPMENT

Segment snapshot
Companies analyzed: 19
Economic profit/revenue (2001–15 average): 3.5%
2015 EBITA margin: 13.2%

Overview

The electrical equipment subsector covers three product segments that include equipment and services for automation, motors and controls, and low-voltage equipment (Exhibit D19). Analysis of the subsector included 19 companies that collectively generated $99 billion in 2015 revenue.

Exhibit D19 Electrical equipment consists of three segments

# of companies[1]	Revenue[2] $Bn	EBITA $Bn
EP/R %	Multiples	Cumulative TRS, %

Product segments[3]	Description	Example companies	Segment performance		
Automation – discrete and process	▪ **Discrete controllers** – I/O modules, PLCs hardware ▪ **Process Control** – distributed controllers, process and temperature controllers, instrumentation devices	Rockwell Automation, azbil	4	40.8	5.5
			4.2	10.2	9.5
Motors and controls	▪ **Motors:** Fractional AC motors, integral AC and DC motors ▪ **Drives:** AC drives, brushed and brushless DC drives	Nidec All for dreams, TECO, Mabuchi Motor	7	20.9	2.3
			2.9	16.9	12.6
Low-voltage equipment	▪ **Relays:** Electro-mechanical, electronic control and solid state relays ▪ **Other equipment:** MCBs, RCDs, industrial pushbuttons, circuit breakers	legrand, Havells	7	36.5	5.2
			2.9	12.9	10.3
Multi-application electrical equipment	▪ Embedded computing, intelligent industrial applications (peripherals, motherboards, RFID platforms), automation (controllers and I/Os)	Advantech	1	1.1	0.2
			11.1	21.4	16.3

1 Companies with more than $1 billion in revenue in 2014.
2 Total 2015 revenue of the companies addressed in analysis.
3 High-voltage electrical equipment has been included in the Power Equipment's T&D product segment.

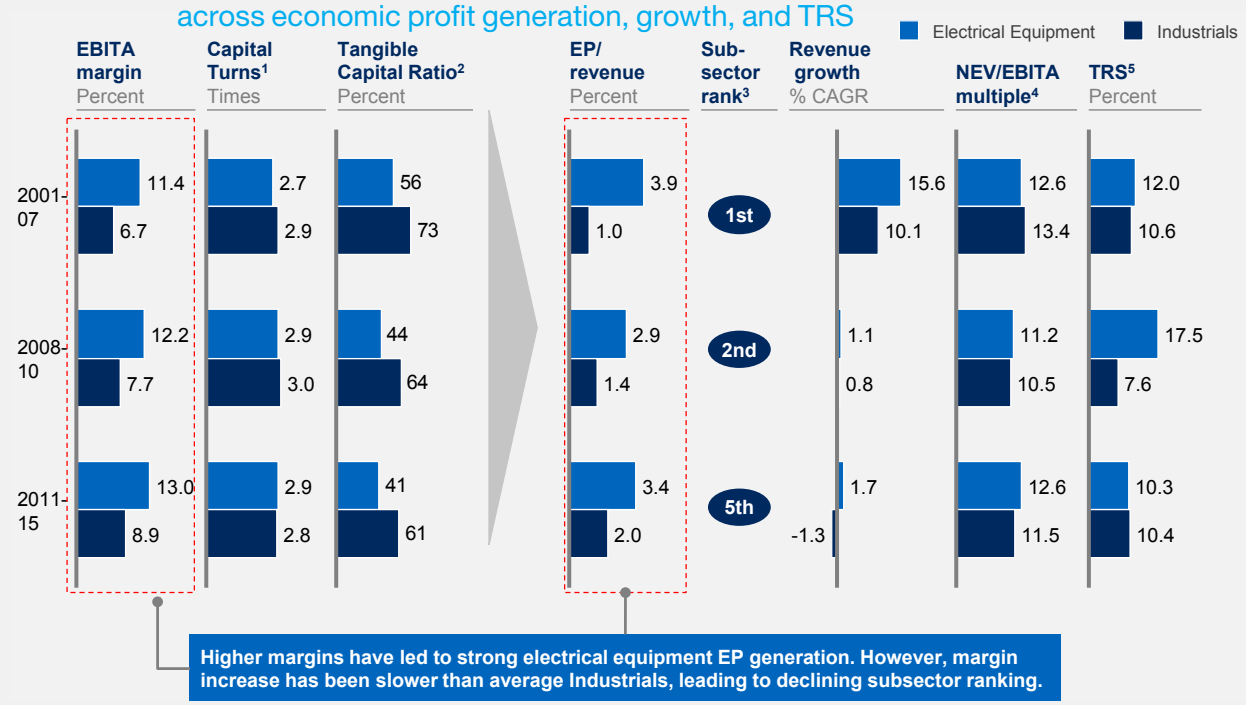
Subsector performance, 2001–15

From 2001 to 2015, electrical equipment outperformed Industrials but saw its relative performance decline from first to fifth rank as its pace of margin improvement lagged behind and tangible capital ratio declined more rapidly than Industrials (Exhibit D20). Through all cycles, electrical equipment achieved EBITA margins that were more than 400 basis points higher than the sector overall, although the improvement from first cycle to third cycle was only 160 basis points (11.4 to 13.0 percent) versus 220 basis points for Industrials (6.7 to 8.9 percent). Over this time, the tangible capital ratio also decreased by 1,500 basis points versus a 1,200 basis point decline for Industrials. Although capital turns increased by 0.2 turns from 2.7 to 2.9 percent, the decline in tangible capital drove a 50-basis-point decrease in EP/R from 2001–07 to 2011–15. Also, TRS performance deteriorated by 170 basis points from 12.0 percent in 2001–07 to 10.3 percent in 2011–15. On the brighter side, electrical equipment's revenues rose faster than the sector as a whole in each cycle, though the lead declined to 300 basis points in 2011–15 from 550 basis points in 2001–07.

Performance by product segment, 2001–15

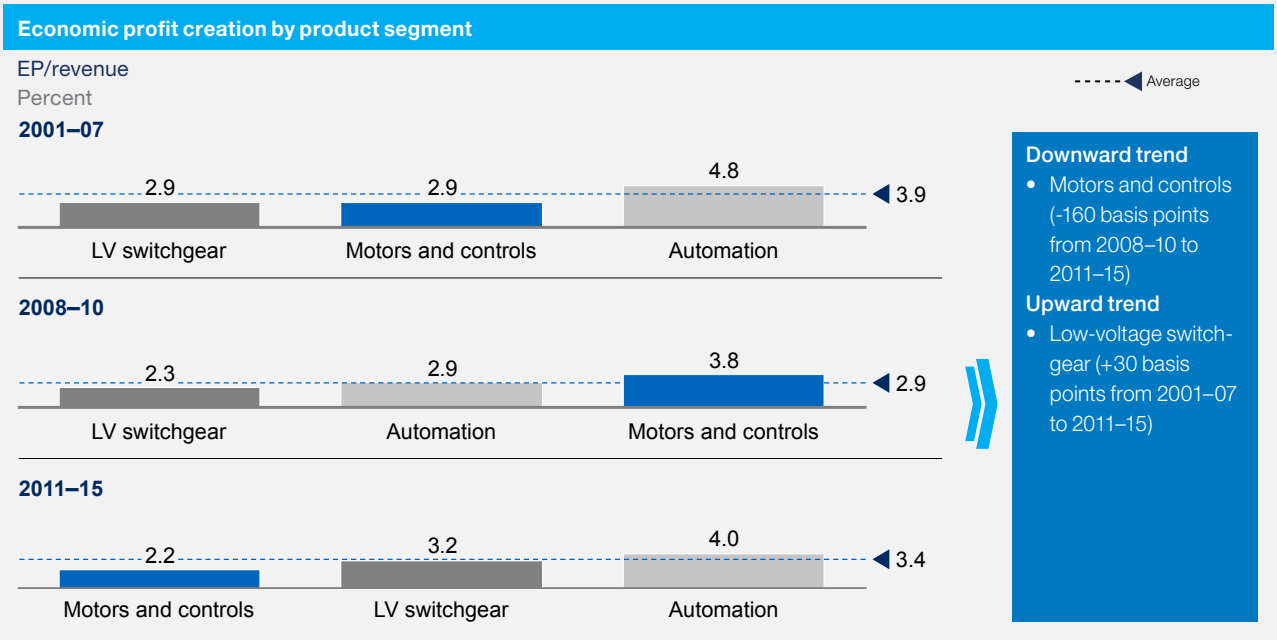
The electrical equipment subsector shows variance in EP/R performance across product segments (Exhibit D21) but to a lesser extent than observed in other subsectors. The spread remained largely consistent through time at 190 basis points in the 2001–07 cycle, 150 basis points in the 2008–10 cycle, and 180 basis points in the 2011–15 cycle.

Exhibit D20 Electrical equipment has historically outperformed Industrials across economic profit generation, growth, and TRS



1 Revenue/Average Invested Capital excluding goodwill over two years.
2 Tangible Capital Ratio defined as Operating Invested Capital/Total Invested Capital. Lower ratio indicates higher amount of goodwill.
3 Ranked out of 12 subsectors.
4 Net Enterprise Value (NEV)/Earning Before Interest Tax and Amortization multiple.
5 Weighted average Total Return to Shareholders (TRS) by market capitalization for the time period.

Exhibit D21 "De-averaging" electrical equipment's EP/R shows significant variation in performance

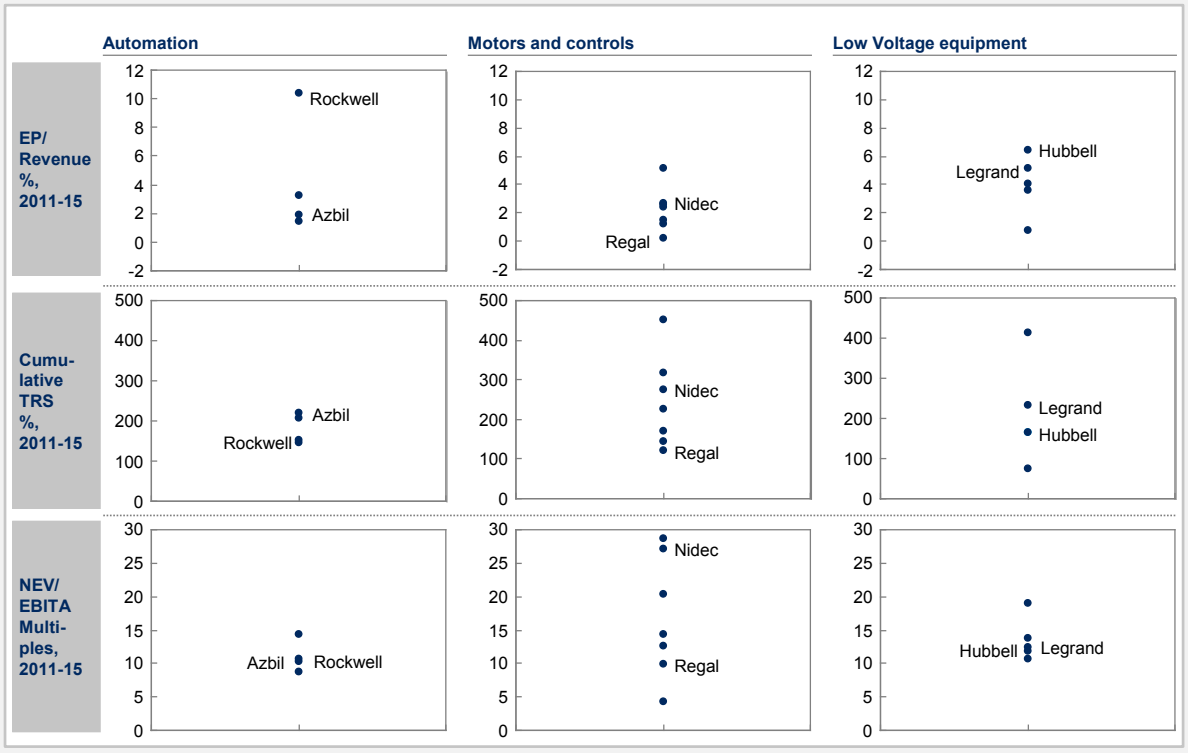


Automation performed in the top two in each period. Motors and controls' performance fluctuated through all three positions, ultimately declining 160 basis points from 2008–10 to 2011–15, ending in the last spot. Low-voltage switchgear performed at the bottom of the subsector in the first two periods but was able to climb to the middle in 2011–15, rising 90 basis points from the 2008–10 period.

Performance by company within product segments, 2001–15

The performance of individual companies within the subsector's product segments demonstrated significant variation (Exhibit D22). Automation had the largest EP/R spread—more than 890 basis points—with companies' EP/R ranging from 1.5 percent to 10.4 percent. However, automation also had the smallest TRS and multiples spread. Conversely, low-voltage switchgear had the highest average company level EP/R performance. Motors and controls had both the highest TRS and multiple but also the greatest spread in each of these metrics.

Exhibit D22 There is significant variation in performance for companies within each segment of electrical equipment



3.1 AUTOMATION

Segment snapshot
Companies analyzed: 4
Economic profit/revenue (2001–15 average): 4.2%
2015 EBITA margin: 13.5%

Drivers of performance—Automation

The automation product segment consists of companies that manufacture equipment such as discrete controllers (for example, I/O modules, PLC hardware) and process controls (for example, distributed controllers, process and temperature controllers, and instrumentation devices). Automation outperformed the Industrials sector as a whole on key indicators such as EP/R (4.2 percent to 1.4 percent) and annual TRS (9.5 percent to 8.6 percent) from 2001 to 2015.

Automation benefited from demographic, geographic, technology, and end-market megatrends. The industrialization of China and the globalizing workforce created a strong need for developed market companies to deliver productivity improvements to match the cost position of competitors in low-cost countries. Furthermore, the continued rise of the consumer class has begun to spread wage pressure into China and other previously low-cost countries, further pushing the demand for automation in these countries. Finally, outsized end-market growth (for example, oil and gas, chemicals) during the commodity supercycle provided further tailwinds.

Despite the importance of these tailwinds, perhaps the most impactful trend has been the technology disruptions that have reduced the cost of automation and increased the complexity and quality requirements for manufactured products. The cost of automation has declined as the costs of computing, connectivity, and other electronic components have continued their exponential decline. In addition, expectations for greater quality, particularly in highly controlled production processes, have driven demand both in new automation and replacements. Finally, product complexity has increased, requiring the higher-stability processes that only automation can deliver (particularly in cases where manual labor cannot deliver at any cost).

Moreover, automation is seeing its own technology revolution. Industry 4.0 and the Internet of Things are poised to disrupt at a level not seen since the last industrial revolution, with automation being a significant beneficiary. Automation serves as the brain that brings closer integration of operational and information technology between manufacturing floor inputs and outputs, the broader enterprise systems connected to customers, and the supply chain. Here, automation is delivering the benefits of many new use cases and management techniques such as RFID for manufacturing and inventory synchronization, high-level cloud computing, power to the edge, smart collaborative robotics, and wireless connectivity for equipment. While the pace of adoption has been slowed by the large install base of programmable logic controllers (PLCs) and legacy communication protocols, automation is expected to continue to move toward PC control automation and industrial ethernet as both the benefits grow and the next replacement cycle arrives.

Within automation, Leading companies differentiated themselves through better quality of revenue growth and margin management, both in their choices on where to play and which products to offer and in their proactive cost restructuring on the gross margin line. Furthermore, Leading companies focused on resource allocation, delivering superior R&D outcomes (augmented by acquisitions) and greater employee productivity.

All companies in automation typically target a limited set of geographies or have an industry focus—for example, discrete versus process automation, oil and gas, or chemicals. However, Leading companies were not content to offer products but continued to innovate and move toward offering software solutions.

As a result, Leading companies generated two times higher economic profit per dollar of revenue growth (39 percent versus 19 percent for Declining companies) (Exhibit D23).

While all companies attempted to improve margins at points, Leading companies proactively and consistently restructured their operations. They set clear goals in productivity and capacity management to lower operating expenditures, providing transparency around progress against the goals. Leading companies also delivered employee productivity that was three times higher ($57,000 versus $17,000) compared with their Trailing peers. Trailing companies tended to take a more reactive approach to cost restructuring and struggled to cover fixed costs in down cycles—which inhibited their ability to fund their growth strategies such as moving up the technology stack

or expanding geographically.

Leading companies also deployed a programmatic M&A strategy, completing nearly five times as many acquisitions as Trailing companies. Leading companies focused on smaller deals (average size of $48 million) to expand into new geographies and end markets, and they augmented these acquisitions with better R&D execution. While Trailing companies tended to spend more on research, the Leading companies generated higher-quality intellectual property (patent strength of 55 versus 17).

Exhibit D23 Automation: "What you did" mattered significantly and affected performance

Driver	Impact	Leaders vs. Laggards[1] difference
Management choices: What you did (2001–15)		
1. Quality of revenue growth (ΔEP/ΔR)	High	+2,000 basis points (+3,900 basis points vs. +1,900 basis points)
2. Margin management		
– Gross margin change	High	+530 basis points (+1,050 basis points vs. +520 basis points)
– Operating expenditures change	Low	-330 basis points (-140 basis points vs. +190 basis points)
3. M&A strategy (number and size of deals)	High	~5X more deals (24 vs. 5) with smaller absolute ($48 million vs. $75 million) and relative deal size (0.6% vs. 3.4% of acquirer's market cap)
4. Resource allocation		
– R&D productivity	Medium	Stronger IP[2] (55 vs. 17) but fewer patents per $ million of spend (0.6 vs. 1.2)
– Employee productivity (2015)	High	~3X higher productivity ($57,000 vs. $17,000 EBITA per employee)

1 Leaders includes Leading and Rising companies, while Laggards includes Declining and Trailing companies.
2 Intellectual property strength is based on impact of the patent on its field using 12 factors including number of times cited, breadth, and litigation (higher number implies stronger patent).

3.2 MOTORS AND CONTROLS

Segment snapshot

Companies analyzed: 7

Economic profit/revenue (2001–15 average): 2.9%

2015 EBITA margin: 11.0%

Drivers of performance—Motors and controls

The motors and controls product segment includes companies that produce motors (for example, fractional AC motors and integral AC and DC motors) and drives (for example, AC drives and brushed and brushless DC motor drives). Motors and controls outperformed Industrials from 2001 to 2015. Motors and controls delivered higher EP/R (2.9 percent) and annual TRS (12.6 percent) versus Industrials average (1.4 and 8.6 percent, respectively).

Over the past 15 years, motors and controls was mainly affected by regulatory and technology trends. Energy-efficiency requirements led to high-efficiency motors. New use cases emerged, including small motors used in medical devices and the rise of electric cars. Furthermore, new materials, higher-frequency operation, smaller and integrated controls, and customization instead of commercial off-the-shelf products have altered the competitive dynamics and will continue to do so going forward.

Motors and controls was unique in having Leading companies that chose different paths but with a common theme: One focused on specialized niche applications, while the other on motors in one size segment of the market with large volumes, which allowed for greater potential capital efficiency. In contrast, Trailing companies attempted to play across all segments delivering motors as well as commodity motors.

The Leading company focusing on specialized niche applications (specialty leader) was able to increase gross margins by 570 basis points (versus 140 basis points for Trailing companies) from 2001 to 2015 (Exhibit D24). It also employed programmatic M&A (30 deals from 2001 to 2015) and focused on R&D productivity, delivering intellectual property that was significantly stronger (55 versus 17 for Trailing companies). Last, it achieved two times higher employee productivity compared to its Trailing peers ($10,500 versus $5,000 EBITA per employee).

Conversely, the Leading company in the commodity segments (commodity leader) focused on operational and capital productivity using less M&A than most Trailing companies (two deals from 2001 to 2015), and taking advantage of off-patent technology to build their products.

Exhibit D24 Motors and controls: "What you did" mattered significantly and affected performance

Driver	Impact	Leaders vs. Laggards[1] difference
Management choices: What you did (2001–15)		
1. Quality of revenue growth (ΔEP/ΔR)	Low	-900 basis points (+500 basis points vs. +1,400 basis points)
2. Margin management		
– Gross margin change	Medium	+430 basis points for specialty leader (+570 basis points vs. +140 basis points)
	Low	-1,550 basis points for commodity leader (-1,410 basis points vs. +140 basis points)
–Operating expenditures change	Low	-360 basis points for specialty leader (-170 basis points vs. +190 basis points)
	High	+1,110 basis points for commodity leader (+1,300 basis points vs. +190 basis points)
3. M&A strategy (number and size of deals)	High	**Specialty leader:** 15X more deals (30 vs. 2) with higher absolute deal size ($173 million vs. $143 million) but smaller relative deal size (1.6% vs. 9.4% acquirer's market cap)
	No impact	**Commodity leader:** no deals
4. Resource allocation		
– R&D productivity	High	Stronger IP[2] (47 for the commodity leader and 55 for the specialty leader vs. 17) and patents per $ million of spend (0.6 for commodity, 0.1 for specialty vs. 1.2)
–Employee productivity (2015)	Medium	2X/1.5X higher productivity ($10,500/$7,400 vs. $5,000 EBITA per employee)

1 Leaders includes Leading and Rising companies, while Laggards includes Declining and Trailing companies.
2 Intellectual property strength is based on impact of the patent on its field using 12 factors including number of times cited, breadth, and litigation (higher number implies stronger patent).

4. POWER EQUIPMENT

Segment snapshot
Companies analyzed: 52
Economic profit/revenue (2001–15 average): 0.8%
2015 EBITA margin: 6.5%

Overview

The power equipment subsector spans six product segments: wind, solar, energy storage, fossil fuels and reciprocating engines, nuclear, and transmission and distribution (Exhibit D25). In addition, there is a diversified power equipment segment that was excluded from the further breakdown analysis due to small sample size. Subsector analysis included 52 companies, which collectively generated $144 billion in revenues in 2015.

Exhibit D25 Power equipment consists of major players in six product segments

# of companies[1]	Revenue[2] $Bn	EBITA $Bn
EP/R %	Multiples	Cumulative TRS, %

Product segments	Description	Example companies	Segment performance		
Wind	Turbines, power systems, and services required for power generation from wind energy	NORDEX, SUZLON, Vestas	7	25.1	2.3
			1.0	14.2	6.2
Solar	Solar cell modules, panels, arrays, and services required for power generation from solar energy	SUNTECH, SUNPOWER, First Solar	12	25.3	1.8
			-1.0	16.4	-1.7
Energy storage	Batteries and other devices for utility-grade, motive, and back-up energy storage	EnerSys, SAMSUNG SDI	10	23.9	1.8
			0.3	13.6	10.6
Fossil fuels and reciprocating engines	Gas turbines, boilers, fossil-fuel generators, and engines	WÄRTSILÄ, DEUTZ, BRIGGS&STRATTON	11	49.7	2.0
			1.5	26.8	17.5
Nuclear	Turbines, boilers, and other equipment in nuclear power plants	DONGFANG ELECTRIC, POWER MACHINES, BWXT	2	2.4	0.2
			-0.5	15.0	4.9
Transmission and distribution	Balance of system, inverters, transformers, and other equipment used in the electrical grid	XD 中国西电集团 CHINA XD GROUP, MEIDEN	9	16.0	1.2
			0.7	19.1	16.9

1 Companies with more than $1 billion in revenue in 2014.
2 Total 2015 revenue of the companies addressed in analysis.

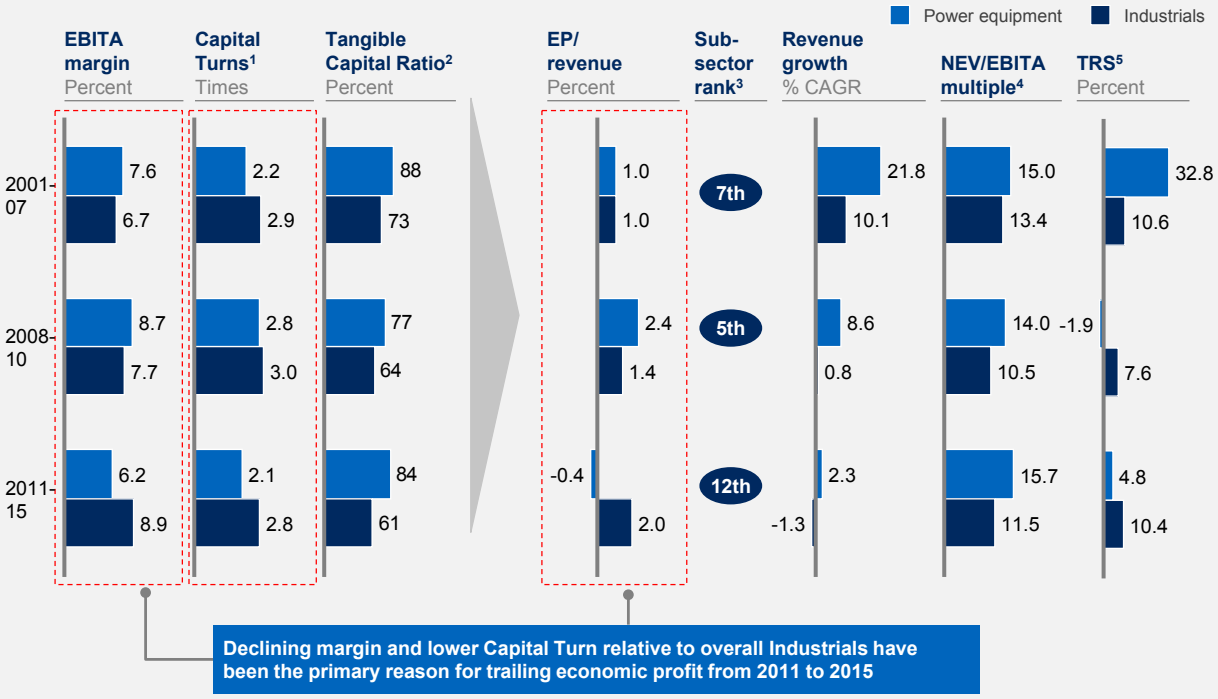
Subsector performance, 2001–15

Over the past 15 years (2001–15), power equipment outperformed the Industrials sector on annual TRS (11 percent versus 8.6 percent) but fell short on EP/R (0.8 percent versus 1.4 percent). Power equipment's lower performance over this time was primarily driven by deteriorating performance in recent years (-0.4 percent EP/R in 2011–15) even as overall Industrials improved (Exhibit D26). During the 2011–15 cycle, power equipment EBITA margin decreased 250 basis points to 6.2 percent from 8.7 percent in 2008–10. Capital turns decreased by 0.7 turns from 2.8 to 2.1 in the same time frame, reducing EP/R by 280 basis points (from 2.4 percent to -0.4 percent). TRS performance deteriorated by 2,800 basis points from 32.8 percent in 2001–07 to 4.8 percent in 2011–15. As a result, power equipment moved from the middle of the Industrials pack in 2001–07 and 2008–10 cycles to last place among all 12 subsectors in 2011–15.

Performance by product segment, 2001–15

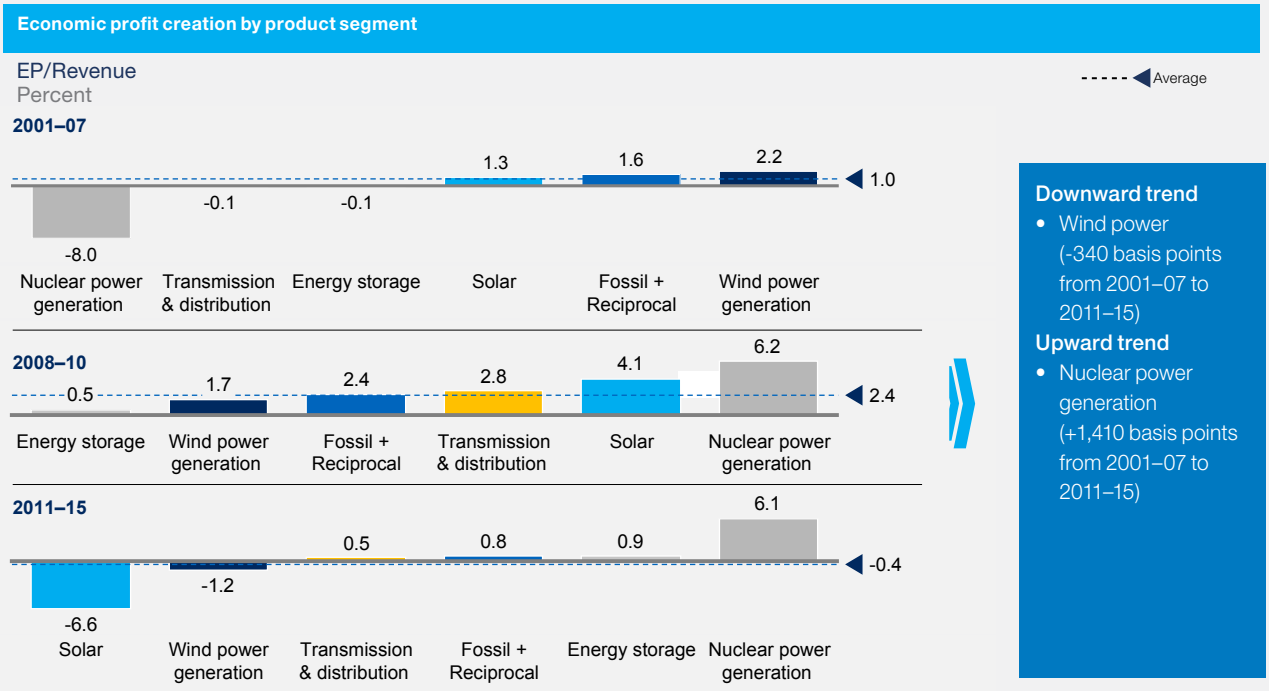
A breakout of power equipment's performance by product segment shows significant variance in performance both within and across time periods (Exhibit D27). For example, in the 2001–07 cycle, EP/R ranged from -8.0 percent for nuclear power generation to 2.2 percent for wind power generation, a 1,020 basis point spread. In the 2011–15 cycle, the range increased to 1,270 basis points, from -6.6 percent for solar to 6.1 percent for nuclear power generation.

Exhibit D26 Despite stronger growth and multiples, power equipment has recently lagged behind Industrials in economic profit, margins, and TRS



1 Revenue/Average Invested Capital excluding goodwill over two years.
2 Tangible Capital Ratio defined as Operating Invested Capital/Total Invested Capital. Lower ratio indicates higher amount of goodwill.
3 Ranked out of 12 subsectors.
4 Net Enterprise Value (NEV)/Earning Before Interest Tax and Amortization multiple.
5 Weighted average Total Return to Shareholders (TRS) by market capitalization for the time period.

Exhibit D27 "De-averaging" power equipment EP/R shows significant variation in performance



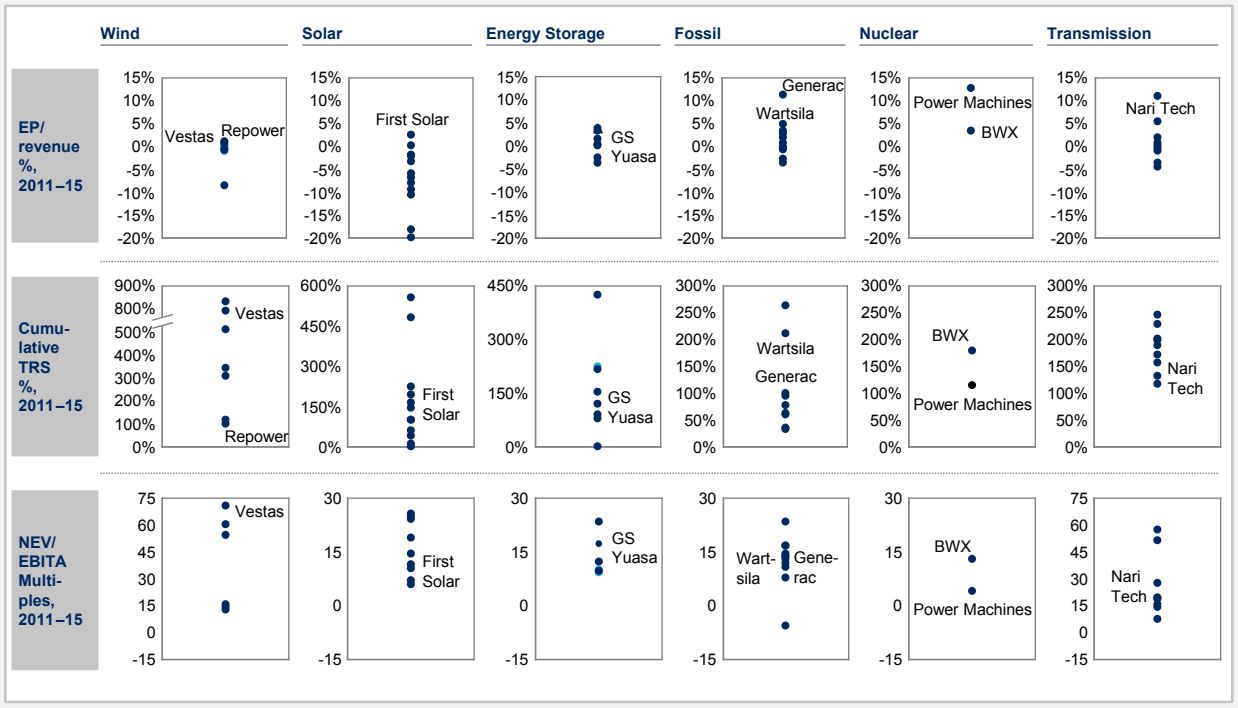
NOTE: Excludes Xiantang Electric, which is the only company analyzed in the diversified power equipment segment. EP/R for 2001–2007 was 1.2%, 2008–2010 was -0.2%, and 2011–2015 was -3.6%.

In addition, nuclear power generation showed both a strong upward trend and variation through time, moving from -8.0 percent EP/R in the 2001–07 cycle to 6.1 percent in the 2011–15 cycle. In contrast, solar experienced a downward trend in EP/R while experiencing a similar level of variation (moving to -6.6 percent in the 2011–15 cycle from 4.1 percent in 2008–10).

Performance by company within product segments, 2001–15

Looking beneath overall subsector performance, companies across various product segments in power equipment exhibited significant variation in performance (Exhibit D28). Solar had the most pronounced spread of 2,230 basis points with companies' EP/R ranging from -20.0 percent to 2.3 percent. Nuclear was the only product segment in which all companies generated positive EP/R from 2011 to 2015. Wind demonstrated the highest TRS and multiples.

Exhibit D28 There is significant variation in performance for companies within each segment of power equipment



4.1 ENERGY STORAGE

Segment snapshot

Companies analyzed: 10

Economic profit/revenue (2001–15 average): 0.3%

2015 EBITA margin: 7.5%

Drivers of performance—Energy storage

The energy storage product segment covers batteries and devices for utility-grade, motive, and backup power storage. Although energy storage delivered positive EP/R (0.3 percent) and annual TRS (10.6 percent) from 2001 to 2015, it trailed the Industrials sector overall (1.4 and 8.6 percent, respectively).

Over the past 15 years, energy storage has benefited considerably from technological and regulatory trends. Technological trends such as the rise of lithium ion batteries and storage solutions for load shifting, power quality, electric vehicles, and uninterruptible power supplies have changed the industry. New entrants (for example, Tesla, with its Gigafactory) and new technologies (for example, flow battery systems) are attempting to disrupt the cost curve and accelerate technology development.

Regulatory trends such as mandates and incentives for energy storage—including requirements for greenhouse gas emissions and reduction of peak electrical generation—have begun to accelerate the adoption of newer use cases. For example, energy storage solutions can address issues arising from the increase of renewable energy sources such as solar and wind, which provide irregular energy based on sun and wind conditions. Energy that is provided during peak sun- or wind-hours during the day becomes available for consumption during non-peak hours including night hours. In addition, as the cost of storage comes down, private and commercial customers are realizing the opportunity to arbitrage their energy cost by using batteries and other storage solutions, fueling further demand for storage solutions.

In this environment, Leading companies differentiated themselves by focusing on high quality of growth, margin management, and employee productivity, including making sure to deliver the full synergy potential of their M&A programs.

Leading companies pursued higher-quality revenue growth by offering solutions instead of products with a greater capacity to generate incremental EP/R (6 cents per dollar of revenue). Conversely, Trailing companies lost 5 cents of economic profit for each dollar of new revenue (Exhibit D29).

Leading companies delivered higher EP/R performance with a keen focus on resource allocation and employee productivity. They were able to create more value with their workforce, achieving more than five times higher productivity than Trailing companies ($49,600 EBITA per employee compared with $9,400).

Although both Leading and Trailing companies trailed the Industrials sector average for Leaders in the number of M&A deals (11 and 5, respectively, versus 18), they employed different M&A strategies. Given the attractiveness of each additional dollar of revenue, Leading companies focused acquisitions on unlocking further growth in new geographies and were rigorous in executing post-merger integration to capture cost synergies in order to retain or enhance the quality of revenue growth.

Exhibit D29 Energy storage: "What you did" mattered significantly and affected performance

Driver	Impact	Leaders vs. Laggards[1] difference
Management choices: What you did (2001–15)		
1. Quality of revenue growth (ΔEP/ΔR)	High	+1,100 basis points (+600 basis points vs. -500 basis points)
2. Margin management		
– Gross margin change	Low	+20 basis points (-660 basis points vs. -680 basis points in 2013)
– Operating expenditures change	High	+960 basis points (+740 basis points vs. -220 basis points 2013)
3. M&A strategy (number and size of deals)	High	~2X more deals (11 vs. 5) with smaller absolute ($75 million vs. $330 million) and relative deal size (2% vs. 11% of acquirer's market cap)
4. Resource allocation		
– R&D productivity	Low	Slightly stronger IP[2] (27 vs. 22) with fewer patents per $ million of spend (0.3 vs. 4.8)
– Employee productivity (2013)	High	~5X higher productivity ($49,600 vs. $9,400 EBITA per employee)

1 Leaders includes Leading and Rising companies, while Laggards includes Declining and Trailing companies.
2 Intellectual property strength is based on impact of the patent on its field using 12 factors including number of times cited, breadth, and litigation (higher number implies stronger patent).

5. FLOW CONTROL

Segment snapshot
Companies analyzed: 28
Economic profit/revenue (2001–15 average): 2.5%
2015 EBITA margin: 13.9%

Overview

The flow control subsector covers products and services across flow management, diversified flow control, and specialty flow treatment (Exhibit D30). The subsector analysis included 28 companies that collectively generated $74.9 billion in revenues in 2015.

Exhibit D30 Flow control consists of three major segments

# of companies[1]	Revenue[2] $Bn	EBITA $Bn
EP/R %	Multiples	Cumulative TRS, %

Product segments	Description	Example companies	Segment performance		
Flow management	Pumps, compressors, valves, and meters	WEIR, GRACO, FLOWSERVE	16	32.6	4.0
			1.7	11.4	9.5
Diversified flow control	<50% revenue from flow management products (for example, pumps), integrated systems, and other products including heat exchangers	PENTAIR, Parker, SULZER, ALFA LAVAL	8	34.6	5.5
			3.5	11.4	10.3
Specialty flow treatment	Filtration, desalination, hydraulic, and pneumatic systems, and flow storage systems	KURITA, Actuant THE DRIVE TO LEAD	4	7.7	1.0
			3.0	12.1	6.1

1 Companies with more than $1 billion in revenue in 2014.
2 Total 2015 revenue of the companies addressed in analysis.

Subsector performance, 2001–15

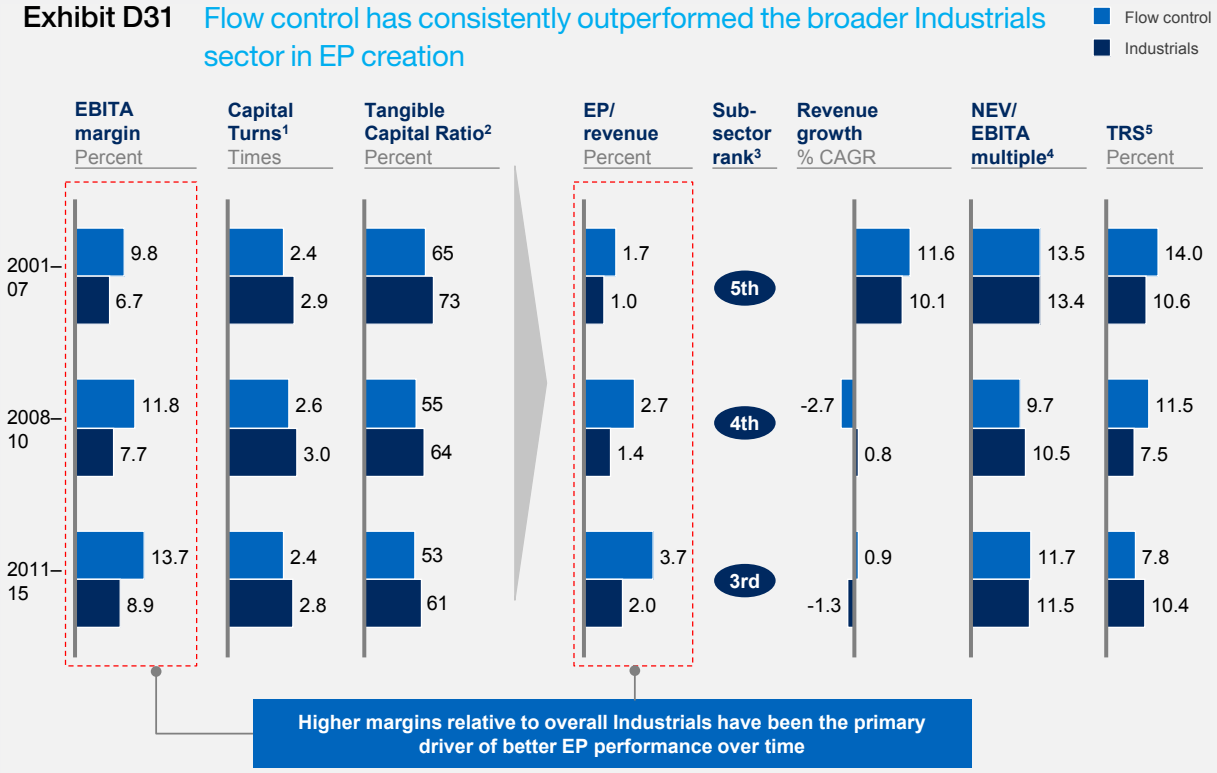
Over the past 15 years, flow control consistently outperformed the Industrials sector on economic profit generation. The subsector's EP/R lead over Industrials expanded from 70 basis points in 2001–07 (1.7 percent versus 1.0 percent) to 170 basis points in 2011–15 (3.7 percent versus 2.0 percent), driven primarily by breakout EBITA performance. Flow control's EBITA margin increased 390 basis points, from 9.8 percent in 2001–07 to 13.7 percent in 2011–15. This increase was nearly double the rise of 220 basis points increase in EBITA margin for Industrials (from 6.7 percent in 2001–07 to 8.9 percent in 2011–15). As a result, the subsector's ranking among all 12 subsectors improved from fifth in 2001–07 to third in 2011–15 (Exhibit D31).

Performance by product segment, 2001–15

A breakout of flow control's performance by product segment shows slight variance in performance both within and across time periods (Exhibit D32). For example, in the 2001–07 cycle, EP/R ranged from 1.2 percent for flow management to 2.7 percent for specialty flow treatment, a 150 basis point spread. In the 2011–15 cycle, the range increased to 230 basis points, from 2.5 percent for flow management to 4.8 percent for diversified flow control.

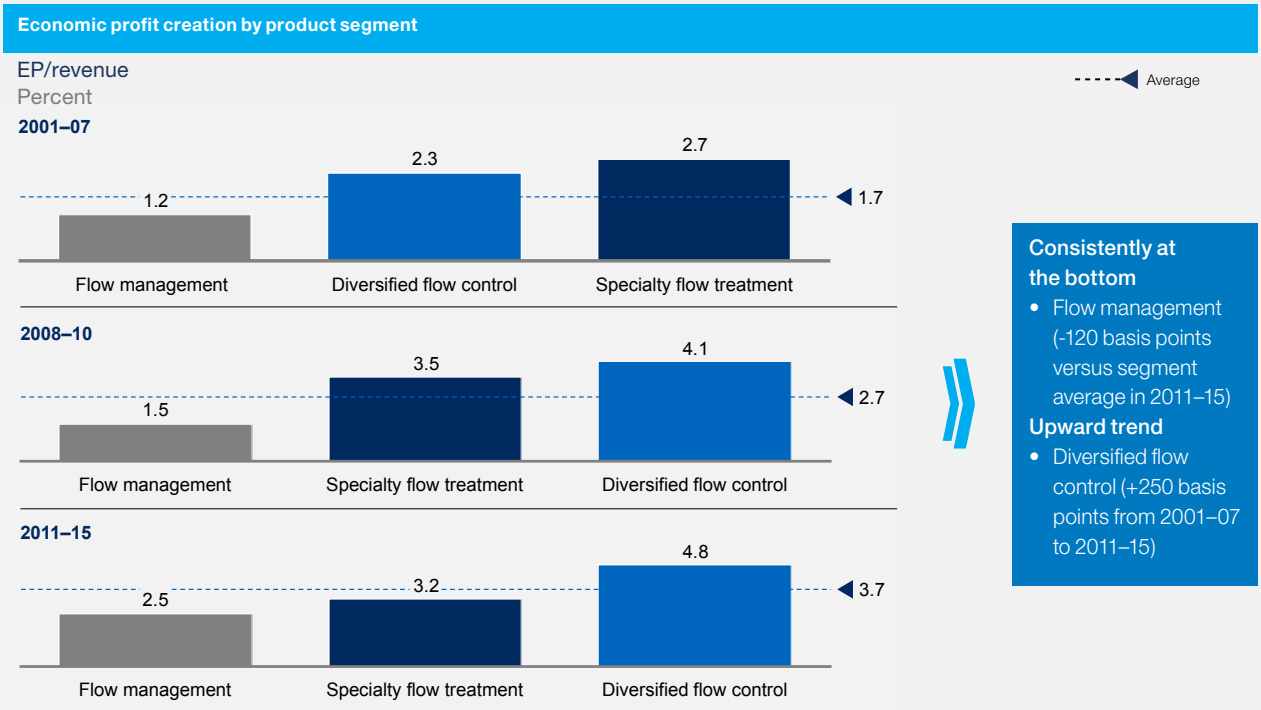
In addition, diversified flow control achieved the largest uptick in performance among segments, moving from 2.3 percent EP/R and second rank in the 2001–07 cycle to 4.8 percent and first rank in the 2011–15 cycle.

Exhibit D31 Flow control has consistently outperformed the broader Industrials sector in EP creation



1 Revenue/Average invested Capital excluding goodwill over two years.
2 Tangible Capital Ratio defined as Operating Invested Capital/Total Invested Capital. Lower ratio indicates higher amount of goodwill.
3 Ranked out of 12 subsectors.
4 Net Enterprise Value (NEV)/Earning Before Interest Tax and Amortization multiple.
5 Weighted average total return to shareholders (TRS) by market capitalization for the time period.

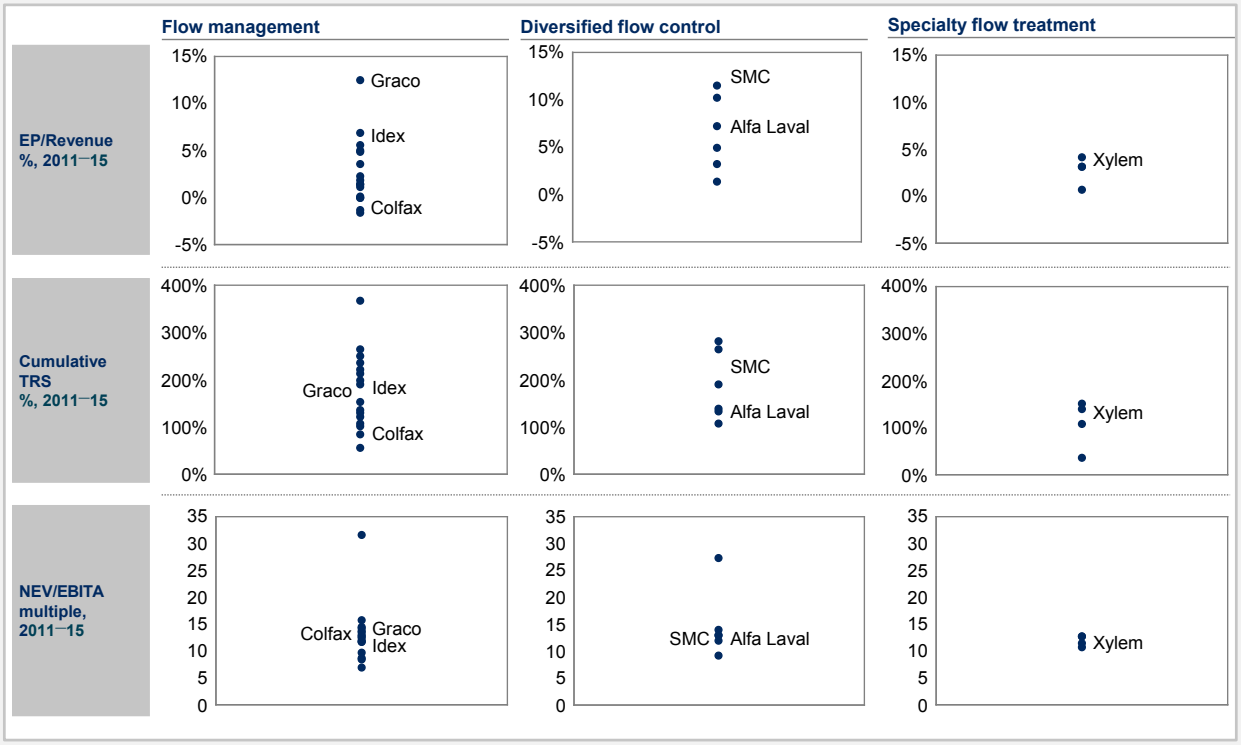
Exhibit D32 "De-averaging" flow control's EP/R shows significant variation in performance



Performance by company within product segments, 2001–15

Looking beneath overall subsector performance, companies across various product segments in flow control exhibited significant variation in performance (Exhibit D33). Flow management had the largest spread of 1,400 basis points, with companies' EP/R ranging from -1.6 percent to 12.4 percent. In addition, flow management was the only product segment in which companies generated negative EP/R from 2011 to 2015. Flow management also demonstrated the highest TRS and multiples.

Exhibit D33 There is significant variation in performance for companies within each segment of flow control



5.1 FLOW MANAGEMENT

Segment snapshot
Companies analyzed: 16
Economic profit/revenue (2001–15 average): 1.7%
2015 EBITA margin: 12.3%

Drivers of performance—Flow management

The flow management product segment includes companies that produce pumps, compressors, valves, and meters. From 2001 to 2015, flow management slightly outpaced the Industrials sector on key metrics such as EP/R (1.7 percent) and annual TRS (9.5 percent).

Regulatory trends, especially around new efficiency standards, created tailwinds for the segment in recent years and spurred innovation in energy efficiency, material science, and condition monitoring. For example, energy cost is a large portion of the total cost of ownership in pumps (along with repair and maintenance, dwarfing the initial cost of the pump). The introduction of variable speed drives has enabled a significant reduction in energy consumption.

The Leading flow management company differentiated itself versus its Trailing peers on the quality of revenue growth, M&A strategy, and employee productivity (Exhibit D34).

The Leading company pursued "higher-calorie" revenue growth (7.4 percent CAGR from 2001 to 2015) that had a greater capacity to generate incremental EP/R (13 cents per dollar of revenue). Conversely, Trailing companies pursued "negative-calorie" revenue growth by 7.2 percent CAGR, while losing 6 cents of economic profit for each dollar of new revenue.

M&A strategies diverged among flow management companies. The Leading company and Trailing companies executed the same number of deals—15—from 2001 to 2015, but the average deal size was significantly different: $29 million compared with $340 million. While the Leading company used acquisitions to enter new product and market segments and strengthen its core business, the Trailing companies focused on geographic expansion. The Leading company was also able to create approximately 2.5 times more value with its workforce, with EBITA per employee of around $50,500 versus $21,200 for Trailing companies.

Exhibit D34 Flow management: "What you did" mattered significantly and affected performance

Driver	Impact	Leaders vs. Laggards[1] difference
Management choices: What you did (2001–15)		
1. Quality of revenue growth (ΔEP/ΔR)	High	+1,900 basis points (+1,300 basis points vs. -600 basis points)
2. Margin management		
– Gross margin change	Low	-330 basis points (+300 basis points vs. +660 basis points)
– Operating expenditures change	Low	Margin decrease for Leaders and Laggards (-170 basis points vs. -860 basis points)
3. M&A strategy (number and size of deals)	Medium	Same number of deals (15) but smaller absolute ($29 million vs. $340 million) and relative deal size (1% vs. 10% acquirer's market cap)
4. Resource allocation		
– R&D productivity	Medium	Similar IP strength[2] (24 vs. 22), but 3X more patents per $ million of spend (0.9 vs. 0.3)
– Employee productivity (2015)	High	~2.5X higher productivity ($50,500 vs. $21,200 EBITA per employee)

1 Leaders includes the Leading company, while Laggards includes Declining and Trailing companies.
2 Intellectual property strength is based on impact of the patent on its field using 12 factors including number of times cited, breadth, and litigation (higher number implies stronger patent).

5.2 DIVERSIFIED FLOW CONTROL

Segment snapshot
Companies analyzed: 8
Economic profit/revenue (2001–15 average): 3.5%
2015 EBITA margin: 15.9%

Drivers of performance—Diversified flow control

The diversified flow control product segment consists of companies that manufacture a broad range of flow control products but have less than 50 percent of revenue in this segment. From 2001 to 2015, this product segment generated an EP/R of 3.5 percent and annual TRS of 10.3 percent, outperforming the Industrials sector average (1.4 and 8.6 percent, respectively).

The same regulatory and technology trends that created tailwinds for the flow management segment also created a rising tide for companies in the diversified flow control segment. The Leading company in the segment differentiated itself versus its Trailing peers by focusing on quality of revenue growth, margin management, and productivity improvements.

For instance, the Leading company pursued "high-calorie" revenue growth (6.9 percent CAGR from 2001 to 2015) that increased its capacity to generate incremental EP/R (approximately 19 cents per dollar of revenue). Conversely, Trailing companies pursued "empty-calorie" revenue growth (6.7 percent CAGR), creating no significant incremental economic profit for each dollar of new revenue (Exhibit D35).

In addition, the Leading company was able to improve its gross margin by 1,650 basis points from 2001 to 2015, while its Trailing counterparts were able to improve their gross margin by 1,030 basis points over the same period.

The Leading company was also able to open up a significant lead on Trailing companies in resource allocation. It achieved stronger IP (34 versus 27) and nearly quadrupled its productivity from 2001 to 2015, to EBITA per employee of $58,000 (versus $36,500 for the Trailing companies).

Last, unlike other Industrials product segments, M&A did not figure prominently in standout performance. The Leading company did not make any acquisitions during the 15-year cycle, instead focusing on organic growth and margins.

Exhibit D35 Diversified flow control: "What you did" mattered significantly and affected performance

Driver	Impact	Leaders vs. Laggards[1] difference
Management choices: What you did (2001–15)		
1. Quality of revenue growth (ΔEP/ΔR)	High	+1,860 basis points (+1,870 basis points vs. +10 basis points)
2. Margin management		
– Gross margin change	High	+620 basis points (+1,650 basis points vs. +1,030 basis points)
– Operating expenditures change	Low	Margin decrease for Leaders and Laggards (-270 basis points vs. -440 basis points)
3. M&A strategy (number and size of deals)	Low	No major deals; Trailing peers had 17 deals per company with an average size of $120 million per company
4. Resource allocation		
– R&D productivity	Medium	Slightly stronger IP[2] (34 vs. 27), more patents per $ million of spend (0.6 vs. 0.1)
– Employee productivity (2015)	Medium	~1.6X higher productivity (~$58,000 vs. $36,500 EBITA per employee)

1 Leaders includes Leading and Rising companies, while Laggards includes Declining and Trailing companies.
2 Intellectual property strength is based on impact of the patent on its field using 12 factors including number of times cited, breadth, and litigation (higher number implies stronger patent).

USING PROGRAMMATIC M&A TO ACQUIRE TECHNOLOGY AND ACHIEVE DIFFERENTIATION

M&A (tightly linked to corporate strategy) offers a vehicle to accelerate a variety of strategies that may be too expensive, time sensitive, or competitively critical to rely just on organic growth to deliver. Some examples include pursuing growth in adjacencies without access to customers or distribution, a strong brand name in a specific niche, or the talent and capabilities to develop machine-learning algorithms. For example, Leaders in flow management engaged in programmatic M&A focused on capability building rather than pursuing larger deals to bulk up. From 2001 to 2015, Leaders and Laggards each completed deals at the same frequency (15—equal to one acquisition per year). However, Leaders' average transaction value ($29 million) was less than one-tenth that of Laggards. Leaders focused their strategy on entering new product and market segments (50 percent of deals) and acquiring technology to strengthen their position in their core segment. They also expanded their product and technology capabilities to enhance their position with existing customers and the profitability of their offerings as well as gaining greater access to new end markets within their existing geographies. In contrast, Laggards focused their acquisitions on geographic expansion (60 percent of their transactions) and less on entering new product or market segments (20 percent of all transactions) (Exhibit D36). Pursuing this strategy allowed Leading companies in flow management to have quality of growth that was approximately 1,900 basis points higher than their Trailing peers (13 percent versus -6 percent).

Exhibit D36 M&A program: Number, size, and type of M&A deals for Leading versus Trailing companies

	Total number of deals per company[1] 2001–15	**Average deal value** $ million	**Average deal size** % of acquirer's market cap	**Deal rationale**
Leading companies (N=3)	15	29	~1	Acquisition strategy focused on targets to: ▪ Enter new product and market segments ~50% of transactions ▪ Strengthen position in core segment ~35% of transactions
Trailing companies (N=2)	15	340	~10	Acquisition strategy focused on achieving geographic expansion (~60% of transactions) to drive growth, rather than on entering new product/market segment (~20% of transaction)

Success factors

Compared to Trailing companies, Leading companies:

- **Did smaller deals** (1% vs 10% of acquirer's market cap)
- **Focused more on entering new product/market segments (~50% of transactions vs ~20% for Trailing companies)**

1 Average total number of acquisitions per company from 2001-15.

6. INDUSTRIAL MACHINERY

Segment snapshot
Companies analyzed: 45
Economic profit/revenue (2001–15 average): 2.1%
2015 EBITA margin: 11.1%

Overview

The industrial machinery subsector spans product segments that provide equipment and services used for machining, food packaging and other specialized machinery, customer-facing machines, robotics, printing machinery, textiles, and material handling. In addition, there are a number of diversified machinery companies that produce equipment across multiple product segments. For this analysis, four smaller segments have been combined into "others" due to the small sample size based on a cutoff of $1 billion in revenues (Exhibit D37). Our analysis of the subsector included 45 companies that collectively generated $121 billion in 2015 revenue.

Exhibit D37 Industrial machinery consists of players in four large segments and four smaller segments grouped as 'others'

# of companies[1]	Revenue[2] $Bn	EBITA $Bn
EP/R %	Multiples	Cumulative TRS, %

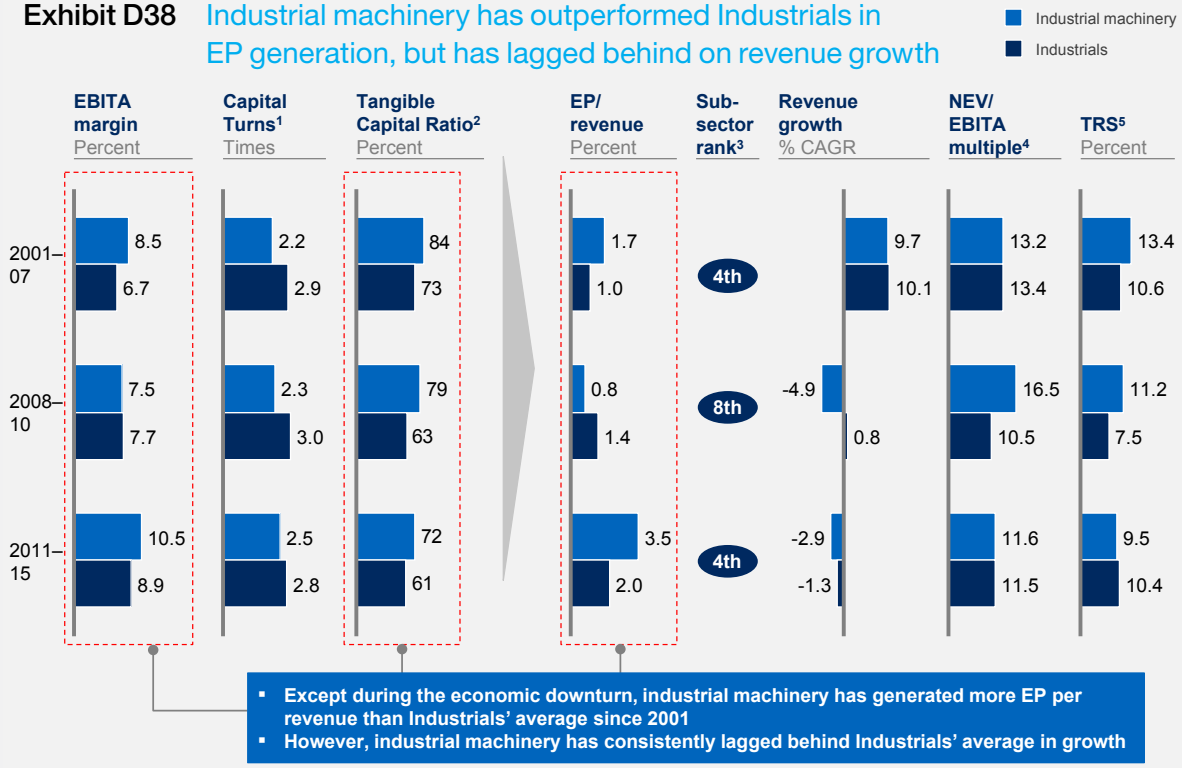
Product segments	Description	Example companies	Segment performance		
Machining	Mills, lathes, casting machines, cutting machines, press brakes, grinders, machining tools	SANDVIK, AMADA, KENNAMETAL	15	34.9	3.2
			1.7	11.0	8.7
Food packaging/ specialized machinery	Box manufacturing, laminating machines, pharmaceutical pill packaging	IMA, BOBST, KRONES	8	20.7	2.0
			1.5	13.0	13.7
Customer-facing machines	ATM, money counters, mailing equipment	pitney bowes, NCR, ingenico GROUP	7	22.5	3.6
			4.2	9.9	6.8
Diversified machinery	Diversified interests	OKI, DÜRR, Sumitomo Heavy Industries	6	18.9	1.3
			(0.2)	14.1	9.6
Others	Robotics Printing machinery Textiles Material handling	FANUC, KUKA, HEIDELBERG, KONECRANES Lifting Businesses	9	23.8	3.2
			3.2	10.8	5.7

1 Companies with more than $1 billion in revenue in 2014.
2 Total 2015 revenue of the companies addressed in analysis.

Subsector performance, 2001–15

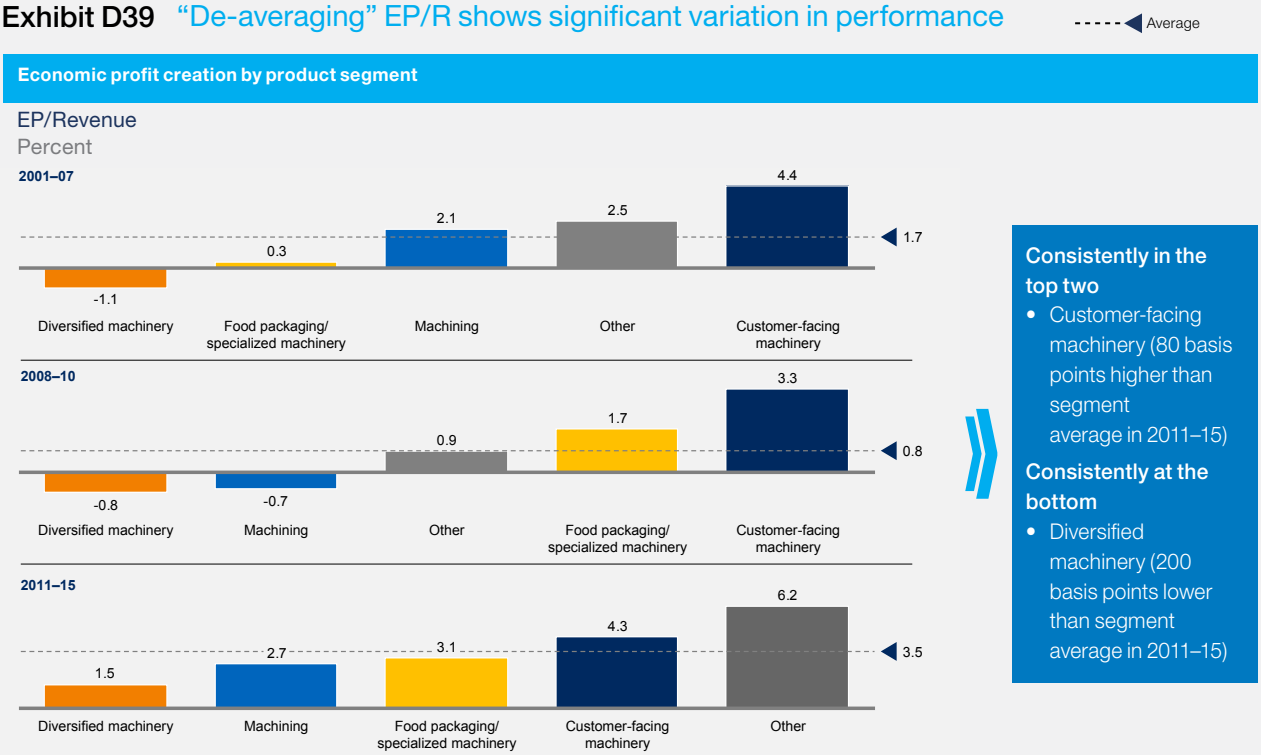
From 2001 to 2015, industrial machinery achieved an EP/R of 2.1 percent and annual TRS of 9.6 percent, outperforming the Industrials sector (1.4 percent and 8.6 percent, respectively) as a whole. The subsector's superior performance was driven largely by higher EBITA margins (for example, 10.5 percent versus 8.9 percent for Industrials in the 2011–15 cycle) and tangible capital ratio (for example, 72 percent versus 61 percent in the 2011–15 cycle) (Exhibit D38). As a result, the subsector was able to begin and end the 15-year cycle as the fourth-ranked subsector, despite lagging Industrials as a whole in growth and capital turns.

Exhibit D38 Industrial machinery has outperformed Industrials in EP generation, but has lagged behind on revenue growth



1 Revenue/Average Invested Capital excluding goodwill over two years.
2 Tangible Capital Ratio defined as Operating Invested Capital/Total Invested Capital. Lower ratio indicates higher amount of goodwill.
3 Ranked out of 12 subsectors.
4 Net Enterprise Value (NEV)/Earning Before Interest Tax and Amortization multiple.
5 Weighted average Total Return to Shareholders (TRS) by market capitalization for the time period.

Exhibit D39 "De-averaging" EP/R shows significant variation in performance



Consistently in the top two
- Customer-facing machinery (80 basis points higher than segment average in 2011–15)

Consistently at the bottom
- Diversified machinery (200 basis points lower than segment average in 2011–15)

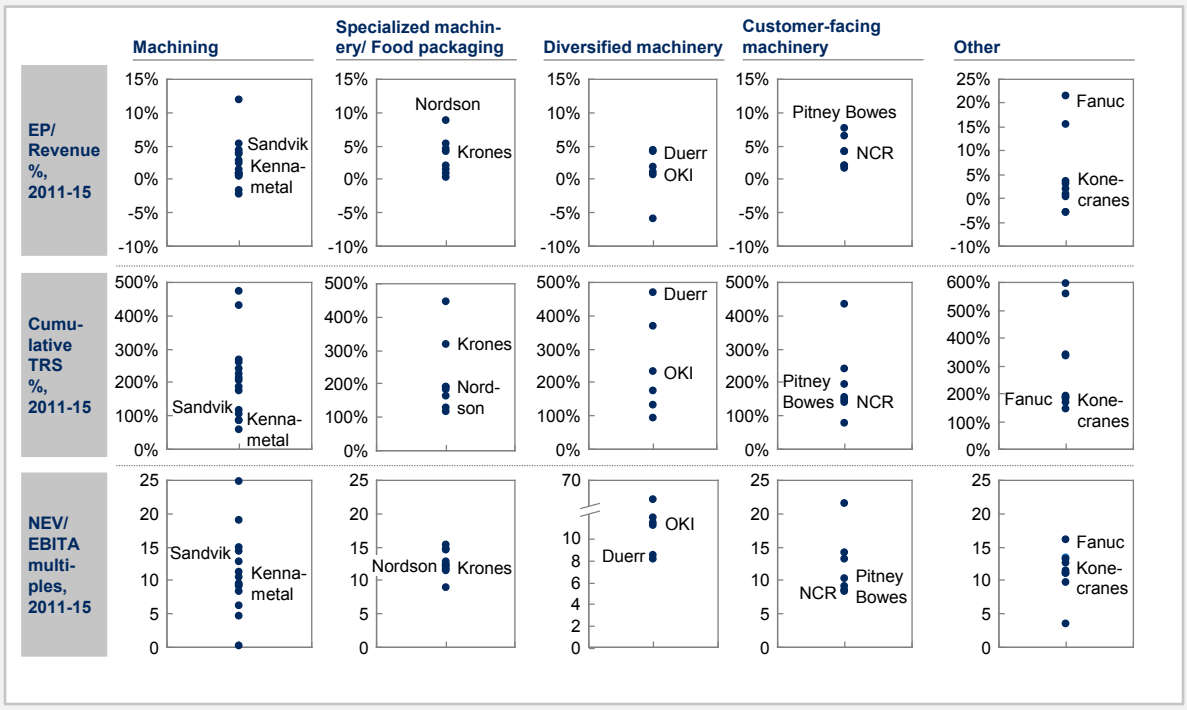
Performance by product segment, 2001–15

De-averaging industrial machinery's performance shows significant variance in performance across subsectors and through time (Exhibit D39). For example, in the 2001–07 cycle, EP/R ranged from -1.1 percent for diversified machinery to 4.4 percent for customer-facing machinery. This pattern was mirrored in the subsequent cycles as well. Diversified machinery remained at the bottom, moving by 260 basis points from 2001–07 to 2011–15. Within "other," robotics was a top performer, leading "other" from 2.5 percent in 2001–07 to 6.2 percent in 2011–15.

Performance by company within product segments, 2001–15

The performance of individual companies in industrial machinery's product segments has varied substantially. Both machining and specialized machinery/food packaging exhibited a wide range of company performance across EP/R, cumulative TRS, and NEV/EBITA (Exhibit D40). Diversified machinery exhibited the highest multiples while companies in "other" led in TRS and EP/R.

Exhibit D40 There is significant variation in performance for companies within each segment of industrial machinery



6.1 MACHINING

Segment snapshot

Companies analyzed: 15
Economic profit/revenue (2001–15 average): 1.7%
2015 EBITA margin: 9.2%

Drivers of performance—Machining

The machining product segment comprises companies that produce machines covering mills, lathes, casting machines, cutting machines, press brakes, grinders, machining tools, and others. From 2001 to 2015, machining generated an EP/R of 1.7 percent and annual TRS of 8.7 percent—broadly in line with the sector average on both metrics.

In recent years, machining has fluctuated greatly due to end-market trends such as changes in commodity (affecting mining equipment companies) and oil prices (affecting drilling and clean energy equipment companies) and overall economic slowdown in parts of the world. In addition, regulatory trends have generated new sustainability requirements that put pressure on margins.

Leading companies learned to operate in this environment and differentiated themselves on margin management (particularly gross margin), M&A strategy, and resource allocation.

Leading machining companies adapted to the changing world by diversifying their portfolios (for example, balancing oil-drilling and jet-engine equipment during changes in oil prices), focusing on the high-end market (less volatile), innovating new products (for example, lead-free material for manufacturers of small watch components), and emphasizing geographic diversity (offsetting economic volatility or recessions in specific regions).

In addition, Leading companies cut costs aggressively through time and during the downturn (2008–10) and were able to return to historical EBITA levels once the economy started to recover. Over the 15-year cycle, Leaders increased their gross margins by nearly 15 percent. Trailing companies were less successful in adjusting to dynamic market conditions and became vulnerable to external forces affecting their segments. As a result, they were unable to drive any improvements in gross margin.

On M&A, Leading companies made approximately twice as many acquisitions as Trailing companies and the deals were larger in size ($59 million versus $28 million).

Finally, Leading companies outperformed Trailing companies in resource allocation, with stronger intellectual property and patents (patent strength of 24 versus 17). Trailing companies, however, were able to match the Leading companies in employee productivity (EBITA per employee of $23,200 versus $24,200 for Trailing companies).

Exhibit D41 Machining: "What you did" mattered significantly and affected performance

Driver	Impact	Leaders vs. Laggards[1] difference
Management choices: What you did (2001–15)		
1. Quality of revenue growth (ΔEP/ΔR)	Low	-800 basis points (+200 basis points vs. +1,000 basis points)
2. Margin management		
– Gross margin change	High	+1,500 basis points (+1,480 basis points vs. -20 basis points)
– Operating expenditures change	Low	-2,390 basis point (-1,610 basis points vs. +780 basis points)
3. M&A strategy (number and size of deals)	Medium	~2X more deals (10 vs. 6) with larger absolute deal size ($59 million vs. $28 million) and similar relative deal size (1% of acquirer's market cap)
4. Resource allocation		
– R&D productivity	Medium	Stronger IP[2] (24 vs. 17), similar number of patents per $ million of spend (1.6 vs. 1.9)
– Employee productivity (2015)	Low	Similar productivity ($23,200 vs. $24,200 EBITA per employee)

1 Leaders includes Leading and Rising companies, while Laggards includes Declining and Trailing companies.
2 Intellectual property strength is based on impact of the patent on its field using 12 factors including citations, number of times cited, breadth, and litigation (higher number implies stronger patent).

6.2 FOOD PACKAGING AND SPECIALIZED MACHINERY

Segment snapshot
Companies analyzed: 8
Economic profit/revenue (2001–15 average): 1.5%
2015 EBITA margin: 9.7%

Drivers of performance—Food packaging and specialized machinery

The food packaging and specialized machinery product segment consists of companies that produce box-manufacturing machines, laminating machines, and pharmaceutical pill packaging. From 2001 to 2015, it delivered an EP/R of 1.5 percent and annual TRS of 13.7 percent, in line with the Industrials sector average on EP/R and outperforming on TRS (1.4 and 8.6 percent, respectively).

Similar to the food processing segment, food packaging benefited from three of the six megatrends in recent years: demographic, geographic, and regulatory. Over the full 15-year cycle, the industry has grown due to higher demand for packaged food in developed economies (for example, snack food) and emerging economies (such as beverages, processed food). While the financial crisis drove a contraction, innovation and increased specialization have partially re-energized sales in recent years.

Leading companies differentiated themselves versus their Trailing peers by focusing on margin management (for example, playing more heavily in the high-end market), driving differentiation with innovation, building customized machinery, and using programmatic M&A while focusing on resource allocation.

Leading companies delivered a variety of innovations to their customers: extending shelf life, reducing spoilage, and increasing overall appeal of packages. Further, they specialized—building customized machines to solve customers' pain points (for example, value-added processing such as coatings, better labeling, and eye-catching packages for beverage products).

In addition, Leading companies proactively restructured costs rather than waiting to react to external forces. They were able to drive significant productivity increases over time. As part of the cost focus, Leading companies pursued systematic cost (through applications of lean strategies and workforce reduction) and productivity improvement programs (for example, lower inventory due to reducing manufacturing lead time) to deliver benefits across the entire company at the same time. Furthermore, Leading companies turned many capital and opex conventions on their head by structuring their customized machinery programs to include upfront customer payments and development-linked progress payments.

Leading companies aligned their M&A strategy tightly to their core strategy, completing twice the number of acquisitions (14 versus 7) as their Trailing counterparts (Exhibit D42). Leading companies used acquisitions to enhance their intellectual property and differentiation, gaining new patents and expanding into new, high-margin end markets. Leading companies used this to strengthen their core business (for example, acquiring companies specialized in flexible packaging) while also divesting non-core businesses. Leaders also excelled in resource allocation, delivering more from their R&D with stronger patents (patent strength of 47 versus 27) and higher employee productivity (EBITA per employee of $46,800 versus $19,700 at Trailing companies).

Exhibit D42 Food packaging/specialized machinery: "What you did" mattered significantly and affected performance

Driver	Impact	Leaders vs. Laggards[1] difference
Management choices: What you did (2001–15)		
1. Quality of revenue growth (ΔEP/ΔR)	Medium	+300 basis points (+800 basis points vs. +500 basis points)
2. Margin management		
– Gross margin change	Low	-1,600 basis points (-100 basis points vs. +1,500 basis points)[2]
– Operating expenditures change	High	+1,870 basis points (+230 basis points vs. -1,640 basis points)[2]
3. M&A strategy (number and size of deals)	Medium	2X more deals (14 vs. 7) with ~3X larger absolute deal value ($67M vs. $23M) and similar relative deal size (3.5% vs. 3.0% of acquirer's market cap)
4. Resource allocation		
– R&D productivity	High	Stronger IP[3] (47 vs. 27) but similar patents per $ million of spend (1.4 vs. 1.2)
– Employee productivity (2015)	High	~2.5X higher productivity ($46,800 vs. $19,700 EBITA per employee)

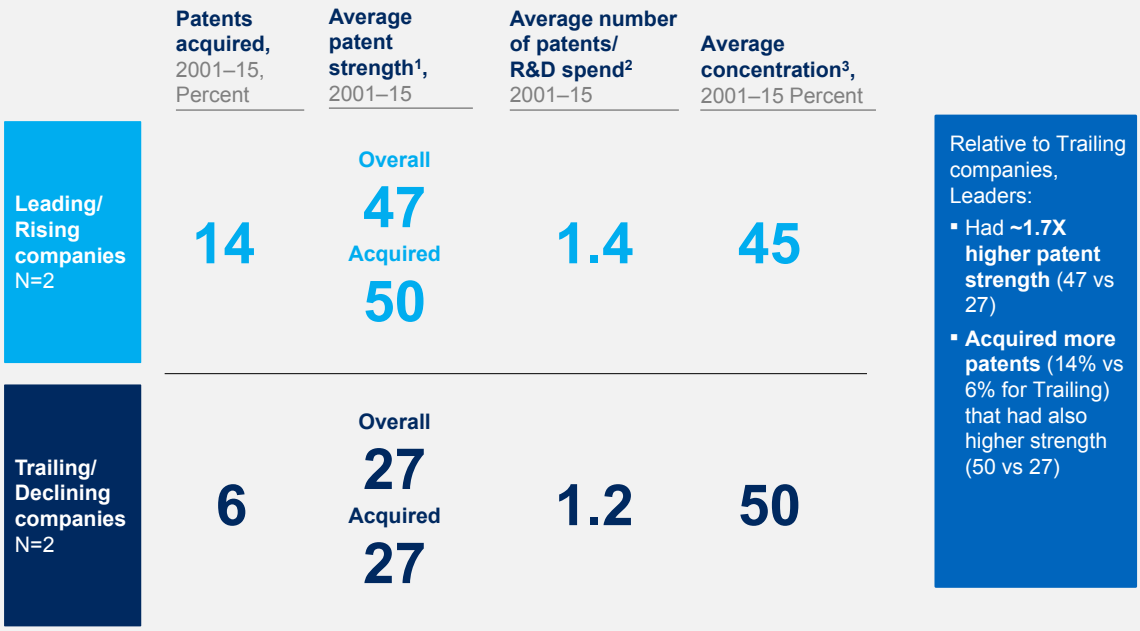
1 Leaders includes Leading and Rising companies, while Laggards includes Declining and Trailing companies.
2 Analysis period 2005–2015.
3 Intellectual property strength is based on impact of the patent on its field using 12 factors including number of times cited, breadth, and litigation (higher number implies stronger patent).

OPTIMIZING R&D RESOURCE ALLOCATION TO DRIVE INNOVATION

Product differentiation allows Leading companies to obtain superior gross margins in very competitive markets. Differentiation requires strong intellectual property (IP) to ensure a "better mousetrap." While it is difficult to capture fully both the differences in the quality of a company's IP and its sustained ability to create IP, one approach is to evaluate the strength of the company's patent portfolio and the numbers of patents developed. When a company is able consistently to produce more and stronger patents, it is more likely to have a highly differentiated product portfolio with a significant lead over other players.

For example, Leaders in food packaging and specialized machinery have been able to create more and consistently higher-quality patents (Exhibit D43). Leaders followed a disciplined approach to R&D, focusing on generating high-quality IP. As a result of this effort, Leaders in food packaging and specialized machinery produced patents with almost double the strength of Laggards (patent strength of 47 versus 27) at a similar output of patents per million dollar spend (1.4 versus 1.2). While both types of companies acquired patents through M&A (Leaders acquired 14 percent of patents compared with Laggards at 6 percent), Leaders focused on acquiring high-quality patents to enhance their organic portfolio (patent strength of 50 for Leaders and 27 for Laggards). The Leaders' choices stand in contrast to the Laggards', which did not use M&A to enhance their overall IP position, resulting in challenges in differentiating their products and achieving premium margins. As a result, Leaders had on average a 450 basis points higher gross margin and a 1,030 basis points higher EBITA margin than Laggards in 2015.

Exhibit D43 R&D resource allocation: Size, strength, and concentration of patent portfolio for Leading vs. Trailing companies



1 Patent strength is a measure of the impact of the patent on its field, using 12 factors including number of times cited, breadth, litigation, etc. (higher number is better).
2 Average number of patents per company per million dollars R&D spend.
3 Percent of company patents within the top two CPC patent classification codes.

Glossary

Advanced analytics	A range of analytic techniques and tools for the acquisition and transformation of raw data into information to predict future outcomes
Business-to-Business	Commerce transactions between businesses, such as between a manufacturer and a wholesaler, or between a wholesaler and a retailer
CAGR	Compound annual growth rate (CAGR) describes the mean annual growth rate over a number of years
Capital Turns	Sales/Average Invested Capital excluding Goodwill
Cloud computing	On-demand delivery of compute power, database storage, applications, and other IT resources via the internet
Declining companies	Companies that were in the top, second, or third quartile of their product segment on EP/R performance in the first cycle (2001–07) and in the bottom quartile in the third cycle (2011–15)
Earnings Multiple	Earnings Multiple = Net Enterprise Value (NEV)/Earnings before Interest, Taxes, and Amortization (EBITA)
EBIT	Earnings before Interest and Tax
EBITA	Earnings before Interest, Taxes, and Amortization
EBITDA	Earnings before Interest, Taxes, Amortization, and Depreciation
Economic Profit (EP)	Economic Profit = Net Operating Profit less Adjusted Taxes – Weighted Average Cost of Capital (WACC) x Invested Capital (IC)
Employee productivity	Earnings before Interest, Taxes, and Amortization (EBITA) per employee
EP/R	EP/R = Economic Profit/Revenue
IC	Invested Capital
Industry 4.0	Integration of hard- and software into industrial and customer relation processes based on cyber-physical systems and the Internet of Things and Services
Internet of Things	Integration of connected software and data gathering software into physical end devices to allow exchange of data
IP	Intellectual property rights, including copyright, patents, trademarks, and design rights
Leading companies	Companies that were in the top quartile of their product segment on EP/R performance both in the first (2001–07) and third (2011–15) cycles
NEV	Net Enterprise Value
NOPLAT	Net Operating Profit less Adjusted Taxes
Rising companies	Companies that were in the bottom three quartiles of their product segment on EP/R performance in the first cycle (2001–07) and in the top quartile in the third cycle (2011–15)
ROIC	Return on Invested Capital
Trailing companies	Companies that were in the bottom quartile of their product segment on EP/R performance in both the first (2001–07) and third (2011–15) cycles
Tangible Capital Ratio	Average Invested Capital excluding Goodwill/Average Invested Capital including Goodwill
TRS	Total Return to Shareholders, including capital gains and dividends
WACC	Weighted Average Cost of Capital

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