McKinsey & Company

Construction and Building Technology – poised for a breakthrough?

Preface

The tumultuous business environment of the past two decades has raised questions about how construction and building technology companies can thrive in the future. McKinsey has investigated the industry's experience and the performance of individual companies in it to conclude that companies can create value by taking advantage of trends expected to act as tailwinds for healthy industry growth in the long term. At the same time, decision makers can benefit from learning the performance imperatives adopted by companies that did best during the last economic cycle.

This report offers a broad perspective on the industry's historical performance and outlook. To start, it looks at how industry players fared before, during, and after the 2008–09 financial crisis and identifies the key drivers of superior performance. It then identifies several trends shaping the industry's future and offers an outlook for industry growth. It ends with a discussion of how construction and building players can prepare to thrive in the coming years.

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

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Executive summary

The construction and building technology industry is a major force in the global economy and a key source of production and employment. Yet, despite its significance, the industry showed relatively weak performance from 2002 to 2018, when construction and building technology companies as a whole trailed the S&P 500 in terms of return on invested capital (ROIC) and profit margins based on earnings before interest, taxes, depreciation, and amortization (EBITDA). High fragmentation, low productivity, and slow adoption of technology have contributed to slow recovery and value creation, even after the 2008 financial crisis.

Still, while the overall industry suffered, our analysis of more than 1,000 global companies reveals that certain traits distinguish companies that achieved or maintained top-quartile performance. In this report, we combine knowledge gathered about top-performing companies with an analysis of industry trends to identify ways to succeed in the construction and building technology industry of the future. As companies strive for breakthrough and success in the next phase, understanding and adopting the performance traits of winning companies is imperative.

Our analysis, which included looking at companies across the construction and building technology value chain over a period of 16 years, uncovered significant variation in ROIC performance. Looking at companies with ROIC in the top quartile showed us that they outperformed their peers in four ways:

— Achieved higher quality of revenue by focusing on uniqueness of their offerings and positioning with customers.

— Aggressively pursued margin expansion through relentless focus on efficient profit-revenue spread and operating leverage.

— Leveraged M&A more actively to enter new markets or build scale in core markets.

— Improved free cash flow (FCF) by systematically driving down cash conversion cycle.

While the four performance drivers apply across the value chain, when we compare across construction and engineering, finishing components and major systems equipment segments also revealed variations in drivers that mattered the most.

We also assessed the construction and building technology industry overall to identify significant trends that could enhance or impede growth. We identified five trends that we expect will on balance create tailwinds to promote healthy growth in the long term as they reshape the construction and building technology industry:

— Rapid urbanization is bringing fast growth in spending on real estate assets, especially in sub-sectors such as multifamily housing and warehouses.

— "Green" building activity is increasing in response to changing customer preferences, tighter regulatory standards, and greater focus on occupant health.

— Building automation is becoming more widespread as the Internet of Things continues to drop in cost and consumers demand greater energy efficiency, safety, and connectivity.

— Technology is enabling greater operational efficiency at companies that leverage analytics, digital construction tools, and robotics.

— Horizontal moves along the value chain are occurring as industry players create integrated offerings and introduce new channels and pricing models.

While these trends present opportunities for construction and building technology companies to thrive in the future, the companies that create the most value will be ones that not only adopt the winning playbook of leaders from the last cycle but also capitalize on industry trends when selecting and adapting those plays.

Introduction:

Value creation in the construction and building technology industry

The construction and building technology industry not only accounts for 14 percent of global GDP, it also fuels broader economic growth and drives employment. Spending across construction's residential, commercial, infrastructure, and industrial asset classes includes purchases of raw materials, construction machinery, advanced lighting and cooling systems, skilled and unskilled labor, and much more. The industry's value chain includes suppliers, builders, and services businesses across seven segments (Exhibit 1).

Exhibit 1

The construction and building technology value chain has seven segments

Products and services across the construction and building technology value chain

(X.X) Global market size, estimate, 2018, $ trillion

Development	Construction and engineering	Construction machinery	Basic materials	Finishing components	Major systems equipment		Maintenance	Total
Real estate advisory and development	Construction and engineering	Earthmoving equipment	Cement, concrete, aggregates	Building envelope	Power equipment	Cooling and heating equipment	Facility management	
	• End-to-end developers, builders, operators	• Excavators		• Roofing	• Power generation	• Support equipment (boilers, cooling towers, furnaces, compressors, chillers, heat pumps, air-handling units)	• Hard services (mechanical, electrical maintenance)	
Real estate investment trusts	• Engineering design	• Loaders	Steel, including	• Insulation	• Transmission (high-, low-voltage cables)		• Soft services (janitorial, cafeteria, landscaping)	
	• Construction	• Bulldozers	• Bars	• Siding				
		• Graders	• Pipes	• Doors, windows, shutters	• Switchboards, switchgears			
Building operators and lessons		• Scrapers		• Glass		• HVAC equipment controls (thermostats)		
	Specialty contracting	Material-handling equipment	Others, including	Building interior	Building automation systems	• Ducting (ducts, registers, grilles)	Energy management	
	• Electrical work	• Cranes	• Timber	• Walls	• HVAC controls	• Filters	• Energy procurement	
	• Mechanical work	• Conveyors	• Plywood	• Flooring	• Lighting controls		• Energy conservation	
	• Prefabricated housing		• Glass	• Ceiling	• Fire & life safety controls		• Alternative energy agreements	
			• Clay	• Wood-based products		Lighting		
		Concrete and road construction machinery		• Kitchen storage and cabinetry		• Luminaries		
		• Concrete mixers and pavers		• Sanitaryware	Plumbing	• Lamps		
		• Pumps			• Water infrastructure (eg, culverts, basins)			
		• Asphalt mixers		Supporting materials		Fire and security		
		• Concrete trucks		• Paints	• Water treatment (septic tanks, filters)			
				• Coatings		Elevators and escalators		
				• Adhesives	• Flow control (pumps, compressors, valves)			
				• Construction accessories (fasteners, bolts, screws)	• Piping, fixtures (kitchen and bathroom)			

| 1.0 | 5.0 | 0.4 | 2.6 | 0.8 | 1.5+ | | 0.6 | ~12 |

Limited improvement in the construction and building technology industry's performance has caused it to trail the S&P 500 on two key metrics—return on invested capital (ROIC) and earnings margins calculated with earnings before interest, taxes, depreciation, and amortization (EBITDA)—over the 16 years from 2002 to 2018 (Exhibit 2). In addition, construction just managed to be neck-to-neck on total shareholder returns (TSR). High fragmentation, low productivity, and slow adoption of technology have been a drag on value creation and have caused the industry to lag in its recovery from the 2008 financial crisis. In fact, it lost $350 billion in economic profit from 2012 to 2016.

Exhibit 2

The construction and building technology industry's performance trails the S&P 500 on earnings and return on invested capital (ROIC)

X% Construction and building technology change, percentage points

X% S&P 500 change, percentage points

	2002–07: Growth	2008–12: Slump and slowdown	2013–18: Delayed recovery
Average EBITDA margin[1]	1.6 / 1.9	1.7 / -0.9	1.0 / 2.5
Cumulative ROIC[2]	5.5 / 4.4	0.3 / -1.4	2.3 / 1.7
Cumulative TSR[3]	56.0 / 32.3	46.8 / 70.4	-47.6 / -38.6

Years: 2002 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 2018
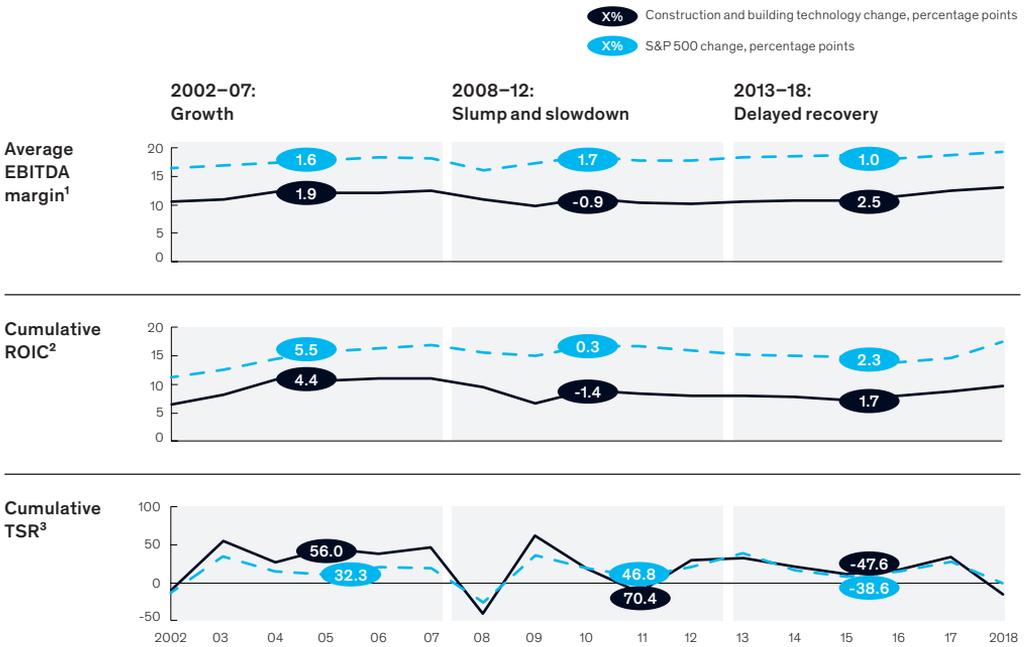
1. Earnings before interest, taxes, and amortization, weighted by revenue.
2. Return on invested capital, weighted by invested capital.
3. Total shareholder returns, weighted by market capitalization.
Source: McKinsey Corporate Performance Analytics; S&P Capital IQ

Viewing the data in roughly five-year increments in Exhibit 2, we also see that the industry exhibited varied performance characteristics. The pre-downturn period (2002–07) was marked by growth as ROIC and EBITDA margins expanded. As expected, during the downturn (2008–12), the industry observed a slump and slowdown with contraction in ROIC and margin performance. Coming out of the crisis, recovery was delayed; the construction and building technology industry finally started to pick up performance in 2015.

Drivers of industry performance

One of the key contributors to this pattern of trailing has been low productivity. While productivity in agriculture, manufacturing, and mining has increased since 1990, construction productivity has declined (Exhibit 3).

The industry's productivity challenges cut across all geographies and economies, lagging average productivity by three percentage points. Major factors explaining this low productivity are industry fragmentation and low adoption of digital technology.

Exhibit 3

Construction productivity has declined relative to other sectors

Global productivity growth,
gross real value (2010 $) added per person engaged, indexed (1991 = 100)
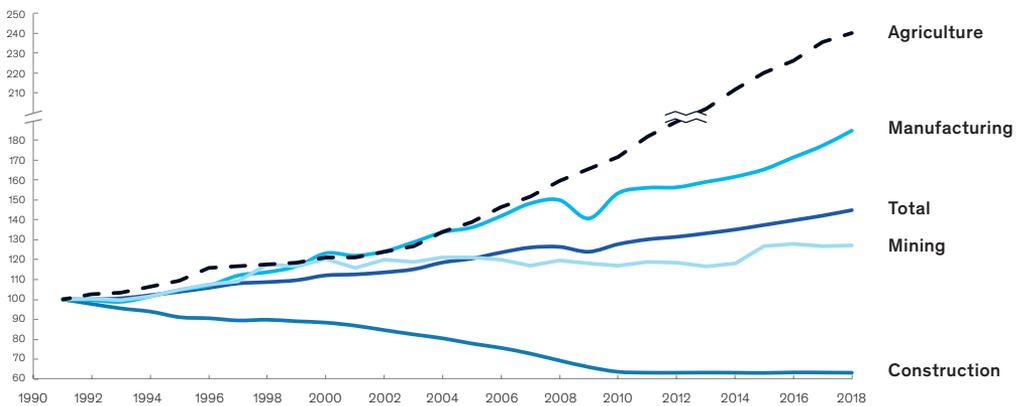
Source: World Bank, IHS, International Labour Organization

The construction industry consists of a plethora of small and medium-size companies. Such businesses are especially widespread within certain segments, including development, construction and engineering, basic materials, and finishing components (Exhibit 4). One reason for this fragmentation is that projects tend to be geographically dispersed and have bespoke requirements that compromise transparency on project costs or performance of contractors. The high fragmentation tends to restrict productivity not only by preventing the critical mass required to drive major technological advancements or changes in the industry but also by causing asymmetrical information and an opaque marketplace.

Exhibit 4

The construction and building technology industry shows widespread fragmentation

Landscape of construction and building technology sector

	...especially for development, construction and engineering, basic materials, and finishing components

Fragmented space...

Revenues from construction sector, public companies
$ trillion   ~$6T

Top 25% (20 companies)

Medium 50%
~250 companies

Bottom 25%
950+ companies

Construction sector company

Industry segment	Market share of top 3 players, %
Development	12
Construction and engineering	8
Construction machinery	~45
Basic materials	7
Finishing components	10
Major systems equipment	~25
Maintenance	~25

Source: McKinsey Corporate Performance Analytics, S&P Capital IQ

The construction and building technology industry's use of digital technology is low, as measured by the McKinsey Global Institute's Digitization Index. The index—constructed using a set of metrics for digital assets, digital usage, and digital labor—ranks construction, agriculture, and mining at the bottom relative to other industries.

The challenge for construction

Despite showing signs of post-crisis recovery (2013–18), the construction and building technology industry clearly struggled with recovery and value creation, especially relative to other industries. During the post-crisis period, three construction segments—basic materials, construction and engineering, and finishing components—cumulatively lost approximately $350 billion in economic profit (Exhibit 5). Out of 59 industries, finishing components ranked 43rd for amount of economic profit generated. Construction and engineering ranked 49th, and the basic materials segment was near the bottom in 55th place.

Exhibit 5

The construction sector struggled with recovery and value creation even in the post-crisis period

Total economic profit generated, by sector, 2012–16

Average economic profit of companies in given industry,[1] $ million
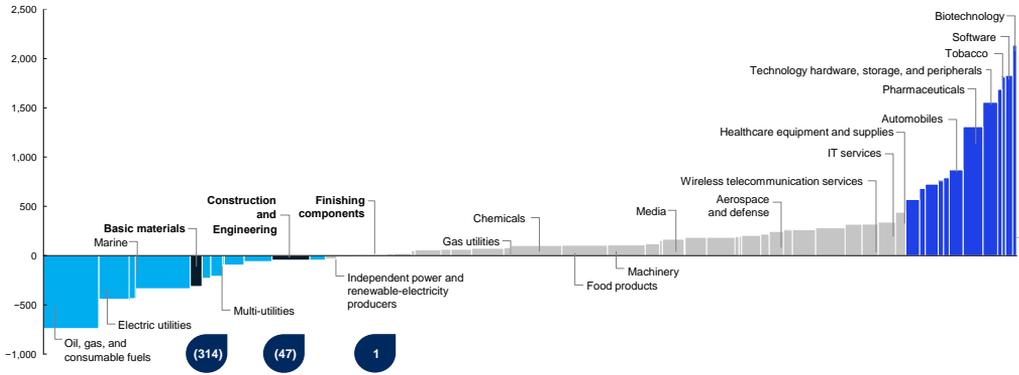
1. Total economic profit in industry divided by the number of companies in the industry. Top 3,000 nonfinancial publicly listed companies by revenues in 2016 less firms with insufficient data to calculate an accurate average economic profit for 2002–06 and 2012–16; n = 2,394 companies in 59 industries.
Source: McKinsey Strategy Practice, Beating the Odds model v25.2; Corporate Performance Analytics by McKinsey

While the industry overall struggled with value creation, performance differed considerably across the seven industry segments. The segments related to equipment—such as construction machinery and major systems equipment—created value, while other segments destroyed it during the 16-year period of analysis (Exhibit 6). Looking at ROIC, major-systems equipment companies outdid the other industry segments (Exhibit 7).
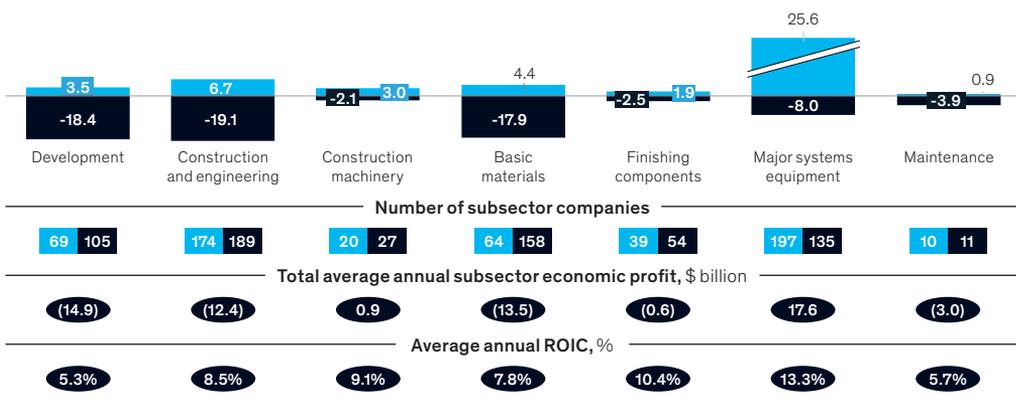
Exhibit 6

Construction machinery and major equipment were the only sectors that created economic profit from 2002 through 2018

Economic-profit distribution across construction and building technology segments

Average yearly economic profit, 2002–18, $ billion   Peers with +ve EP ☐X☐ ■X■ Peers with -ve EP

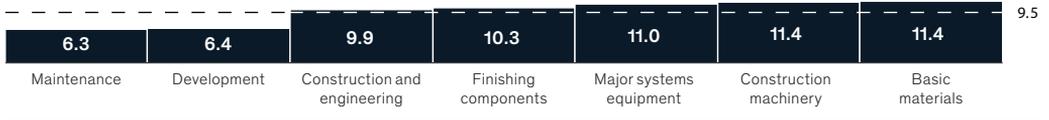|	Development	Construction and engineering	Construction machinery	Basic materials	Finishing components	Major systems equipment	Maintenance
Number of subsector companies	69 105	174 189	20 27	64 158	39 54	197 135	10 11
Total average annual subsector economic profit, $ billion	(14.9)	(12.4)	0.9	(13.5)	(0.6)	17.6	(3.0)
Average annual ROIC, %	5.3%	8.5%	9.1%	7.8%	10.4%	13.3%	5.7%

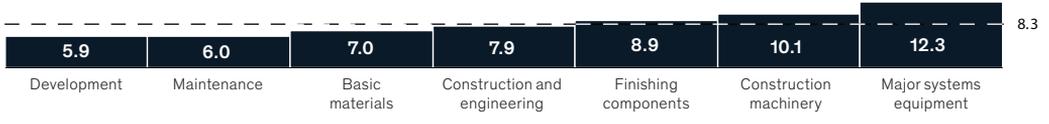Source: S&P Capital IQ; Corporate Performance Analytics by McKinsey

Exhibit 7

Major systems equipment companies had the highest return on invested capital (ROIC) in 2008–18
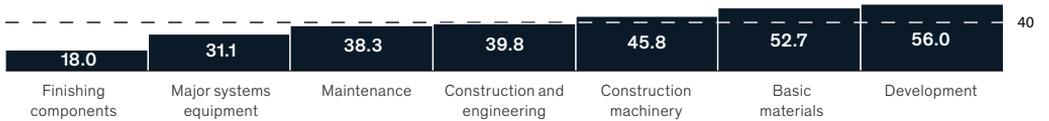
ROIC by industry segment, %

2002–07

6.3	6.4	9.9	10.3	11.0	11.4	11.4	9.5
Maintenance	Development	Construction and engineering	Finishing components	Major systems equipment	Construction machinery	Basic materials	

2008–12

5.9	6.0	7.0	7.9	8.9	10.1	12.3	8.3
Development	Maintenance	Basic materials	Construction and engineering	Finishing components	Construction machinery	Major systems equipment	

2013–18

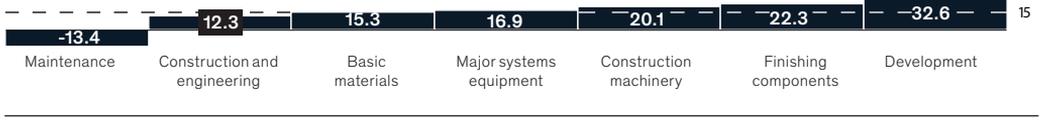| 5.0	5.0	6.6	7.6	8.4	11.7	15.4	8.5
Development	Maintenance	Basic materials	Construction machinery	Construction and engineering	Finishing components	Major systems equipment	

Exhibit 8

With higher ROIC, major systems equipment companies took the lead in total shareholder returns over time
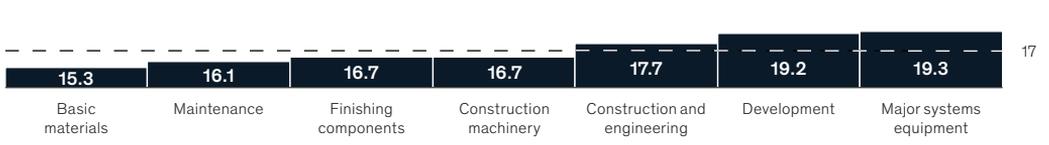
Cumulative TSR,[1] by segment, %

2002–07

18.0	31.1	38.3	39.8	45.8	52.7	56.0	40
Finishing components	Major systems equipment	Maintenance	Construction and engineering	Construction machinery	Basic materials	Development	

2008–12

-13.4	12.3	15.3	16.9	20.1	22.3	-32.6	15
Maintenance	Construction and engineering	Basic materials	Major systems equipment	Construction machinery	Finishing components	Development	

2013–18

15.3	16.1	16.7	16.7	17.7	19.2	19.3	17
Basic materials	Maintenance	Finishing components	Construction machinery	Construction and engineering	Development	Major systems equipment	

This helped the segment improve its relative performance in total shareholder returns (Exhibit 8). The challenge in lower-performing construction sectors is to find similar levels of success by emulating initiatives, such as automation and new business models, that have benefited the equipment-related sectors.

Performance differences also were evident among the 1,040 companies included in our analysis. Over the 16-year period, some companies consistently remained at or rose to the top quartile of performance based on ROIC. In this report, we refer to these companies as leaders (see sidebar "About the research") and use their best practices as a source of ideas about how other companies can improve their performance. The challenge facing individual companies, like that of construction and building technology industry, is to identify which of these ideas they can successfully apply.

In the following sections of this report, we will explore how construction and building technology companies have been profiting from and can better seize the opportunities facing the industry. We identify what business practices have driven the success of top-performing companies. Then we turn to the major trends that are creating tailwinds for the construction and building technology industry. Applying the information we gathered in our research, we then offer an outlook for the construction and building technology industry and suggest how companies can take advantage of ongoing trends and lessons from past years to assemble a winning playbook.

About the research

The objective of the research is to identify what practices of top-performing construction and building technology companies during the economic downturn beginning in 2008 enabled them to outperform the other companies. These practices suggest what the industry would need to focus on in order to thrive in the future.

We analyzed the performance of a global sample of 1,040 public companies across the seven value-chain segments in the construction & building technology industry over three periods: pre-downturn (2002–07), downturn/crisis (2008–12), and recovery (2013–18).

For each of the seven value-chain segments, we assigned the companies to quartiles based on their ROIC performance within the segment. Quartiles were assigned for the pre-downturn (2002–07) and recovery (2013–18) time periods, as shown in the exhibit. Based on their quartile position in each time period, we defined two groups of companies:

1. *Leaders.* These companies ended in the top quartile in 2013–18. Some of these companies consistently stayed in the top quartile; we call them leading companies. Other leaders improved their position from 2002–07 by climbing to the top quartile; we call them rising companies.

2. *Laggards.* The laggards are companies that ended the period in the bottom quartile. Companies that were not in the bottom in 2002–07 but dropped to the bottom quartile in 2013–18 are called declining companies. Companies that were consistently in the bottom quartile in both time periods are trailing companies.

Notably, only 46 percent of the companies that were in the top quartile during pre-downturn period remained there in the recovery period and became leading companies.
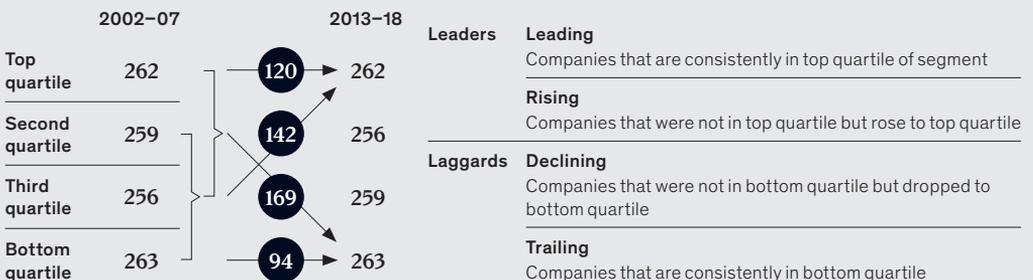
For each segment, we identified top-performing companies based on their ROIC performance within the segment

Company performance across cycles

(x) No. of companies transitioned

Number of companies, categorized by quartile on ROIC performance within each segment[1]
Number of companies, total companies = 1,040

	2002–07		2013–18
Top quartile	262	(120) →	262
Second quartile	259	(142)	256
Third quartile	256	(169)	259
Bottom quartile	263	(94) →	263

Leaders	**Leading** Companies that are consistently in top quartile of segment
	Rising Companies that were not in top quartile but rose to top quartile
Laggards	**Declining** Companies that were not in bottom quartile but dropped to bottom quartile
	Trailing Companies that are consistently in bottom quartile

1. Quartile ranking determined by main segments in the value chain, eg, construction and engineering, basic materials, finishing components, construction machinery
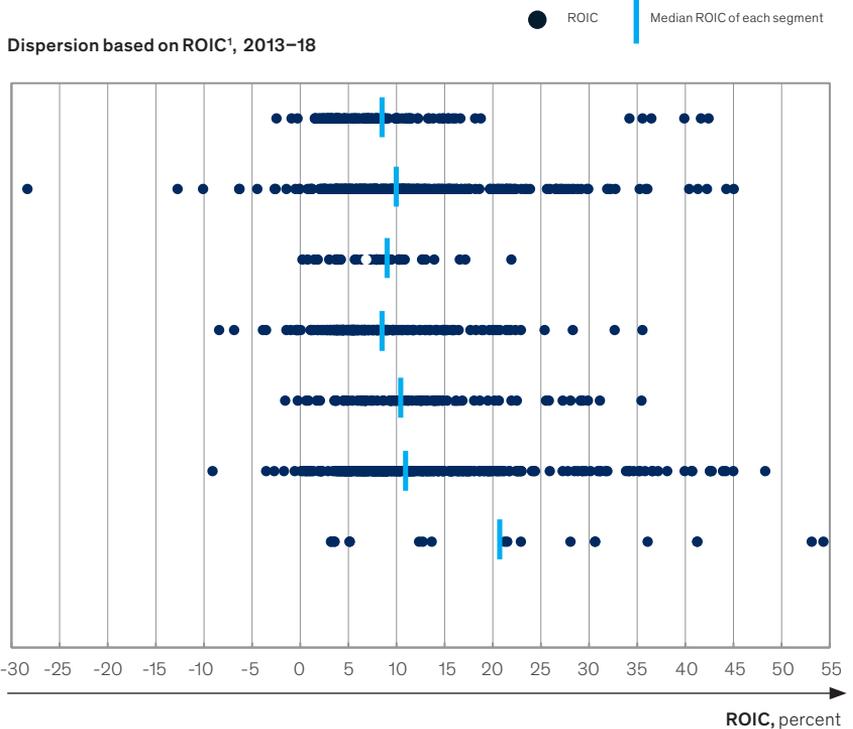Source: S&P Capital IQ; Corporate Performance Analytics by McKinsey

Industry performance

As discussed earlier, the construction and building technology has trailed S&P 500 on value creation for a better part of last two decades (2002–18). The industry's struggle with value creation continued even in the post-crisis period. However, not every company within the industry is affected equally. After the last economic slowdown, the ROIC performance across companies within each segment of the industry showed significant dispersion (Exhibit 9). After identifying the leaders and laggards (see sidebar on "About the research") across 1,040 companies based on their ROIC performance pre-downturn (2002–07) and recovery (2013–18) time periods, we focused on the companies' value creation and margins.

Exhibit 9

There was significant performance variation within each segment

Construction and building technology segments

Dispersion based on ROIC[1], 2013–18

● ROIC   ▌ Median ROIC of each segment

Development

Construction and engineering

Construction machinery

Basic materials

Finishing components

Major systems equipment

Maintenance

-30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55

ROIC, percent

1. Calculated as weighted average of invested capital across the years
Source: McKinsey Corporate Performance Analytics, CapIQ

The leaders—that is, companies that achieved or maintained top-quartile performance, as described earlier—consistently outperformed their peers on margins, gaining a lead of 530 basis points in EBITDA over laggards (Exhibit 10). In addition, leaders showed signs of post-crisis revenue acceleration, which helped them extend their lead in value creation metrics, specifically, economic profit (relative to revenues), ROIC, and TSR (Exhibit 11).

Exhibit 10

Leaders consistently outperformed their peers on margins and showed signs of post-crisis revenue acceleration

%
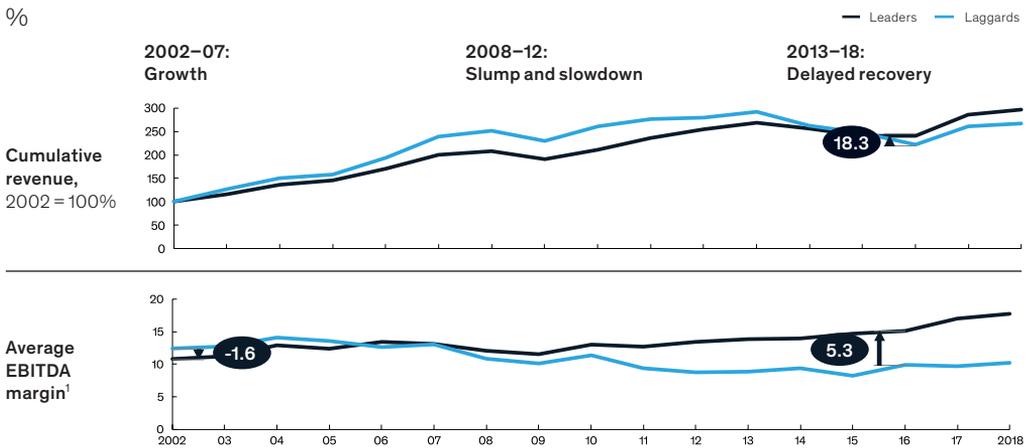
1. Weighted average EBITDA/revenue by company revenue. EBITDA is earnings before interest, taxes, depreciation, and amortization.
Source: S&P Capital IQ; Corporate Performance Analytics by McKinsey
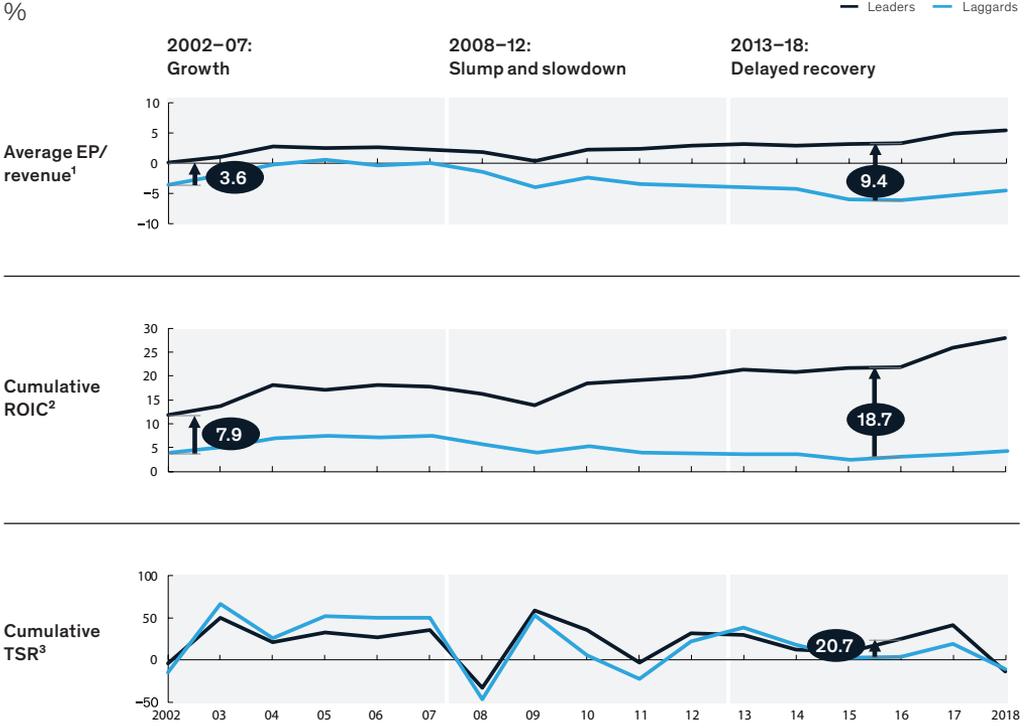
We then investigated what the leaders did differently and how. The approach included evaluating a variety of strategies based on analysis of certain metrics across the population of leaders (518 companies) and laggards (522 companies). The consideration set of metrics included revenue growth, margin expansion, employee productivity (revenue per employee, margin per employee, and so on), extent of scale, cash flow margins, capital turns, and more. For each of the metrics, we focused on looking for correlations with top-tier performance to uncover the "what" and then dug deeper to understand the "how."

We started by looking at how much of leaders' success is nature versus nurture—that is, where they began (starting attributes) versus what they did (management actions). To determine the impact of starting attributes on future success, we looked at companies' quartile position before the 2008 downturn.

Exhibit 11

The leaders' performance advantage increased over time

%

Average EP/revenue[1]

Cumulative ROIC[2]

Cumulative TSR[3]

2002–07: Growth

2008–12: Slump and slowdown

2013–18: Delayed recovery

— Leaders — Laggards

1. Weighted average economic profit divided by company revenue.
2. Return on invested capital weighted by invested capital.
3. Total shareholder returns weighted by market capitalization at beginning of fiscal year, indexed to 100% in 2002.
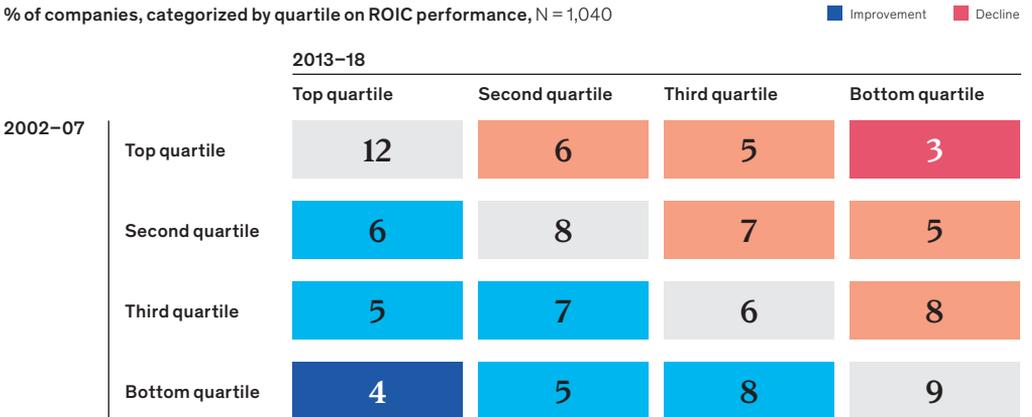Source: S&P Capital IQ; Corporate Performance Analytics by McKinsey

More than 65 percent of companies changed quartiles over time, indicating that starting positions were not reliable indicators (Exhibit 12). Moreover, leaders and laggards were relatively evenly distributed across the segments.

Exhibit 12

A company's starting quartile was not an indicator of future success

Company performance across cycles

% of companies, categorized by quartile on ROIC performance, N = 1,040

■ Improvement ■ Decline

2002–07	2013–18			
	Top quartile	Second quartile	Third quartile	Bottom quartile
Top quartile	12	6	5	3
Second quartile	6	8	7	5
Third quartile	5	7	6	8
Bottom quartile	4	5	8	9

This finding made the exercise to identify the management actions all the more important. We determined that leaders during the financial downturn had shared performance traits. These fall into four categories:
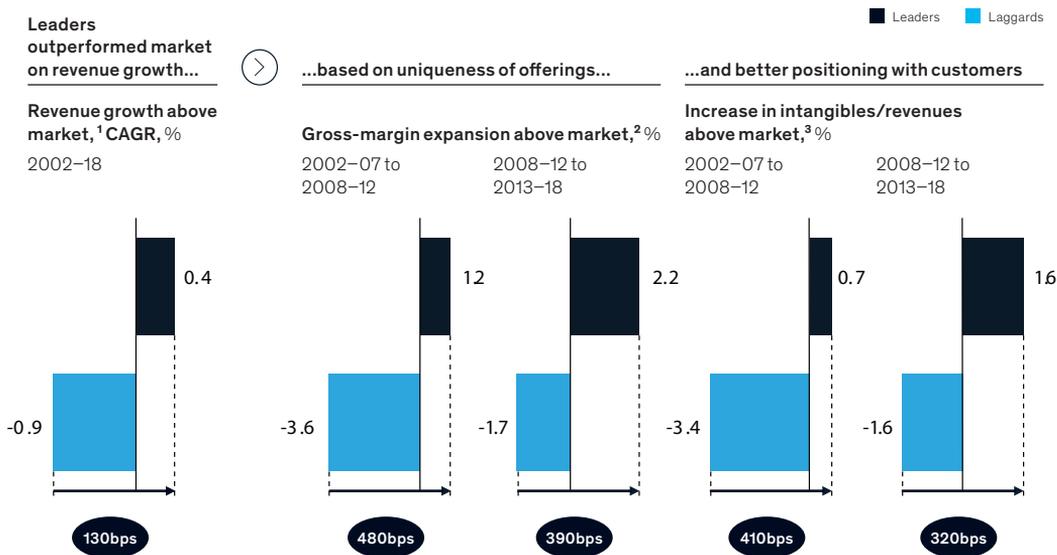
1. *Achieved higher quality of revenue* by focusing on uniqueness of their offerings and positioning with customers.

2. *Aggressively pursued margin expansion* through relentless focus on efficient profit-revenue spread and operating leverage.

3. *Leveraged M&A more actively* to enter new markets or build scale in core markets.

4. *Improved free cash flow (FCF)* by systematically driving down cash conversion cycle.

We call these four categories "performance imperatives" because as companies strive for value creation in the next phase, understanding and adopting the performance traits of the winning companies from the previous cycle is essential.

Quality of revenue

Comparing growth of leaders and laggards relative to the overall market from 2002 to 2018, we find that leaders achieved 130 basis points higher growth above market versus laggards. But how? According to our research, companies typically show growth above market in two situations: they have differentiated product or service offerings (proxied by gross-margin expansion above market) that allow for higher prices, and if they are well positioned with customers through strong intellectual property (proxied by their level of intangible assets).

Exhibit 13

Leaders prioritized higher quality of revenue

Leaders outperformed market on revenue growth...

⟩

...based on uniqueness of offerings...

...and better positioning with customers

■ Leaders   ■ Laggards

Revenue growth above market,[1] CAGR, %

2002–18

Gross-margin expansion above market,[2] %

2002–07 to 2008–12

2008–12 to 2013–18

Increase in intangibles/revenues above market,[3] %

2002–07 to 2008–12

2008–12 to 2013–18

0.4

1.2

2.2

0.7

1.6

-0.9

-3.6

-1.7

-3.4

-1.6

130bps

480bps

390bps

410bps

320bps

1. Difference of cumulative revenue growth of companies within leading/rising or trailing/declining groups and average market revenue growth, weighted by distribution of companies across the 7 segments within leading/rising and trailing/declining groups.
2. Difference between average gross margin expansion (weighted by revenue) within leading/rising or trailing/declining groups and average market gross margin expansion, weighted by distribution of companies across the 7 segments within leading/rising and trailing/declining groups.
3. Difference between average intangibles/revenue increase (weighted by revenue) within leading/rising or trailing/declining groups and average market increase in intangibles/ revenues, weighted by distribution of companies across the 7 segments within leading/rising and trailing/declining groups.

Source: S&P Capital IQ; Corporate Performance Analytics by McKinsey

In our sample, uniqueness of offerings provided leaders with an overall gross-margin expansion above market of 870 basis points (Exhibit 13). And we found consistent outperformance from each five-year increment to the next: 480 basis points pre-downturn to during the downturn and 390 basis points from the downturn to recovery.

Companies' position with customers, measured as increase in intangibles (such as goodwill) over revenue above the market, gave leaders an overall 730-basis-point increase in intangibles above market from 2002 to 2018: 410 basis points pre-downturn and 320 basis points during recovery.
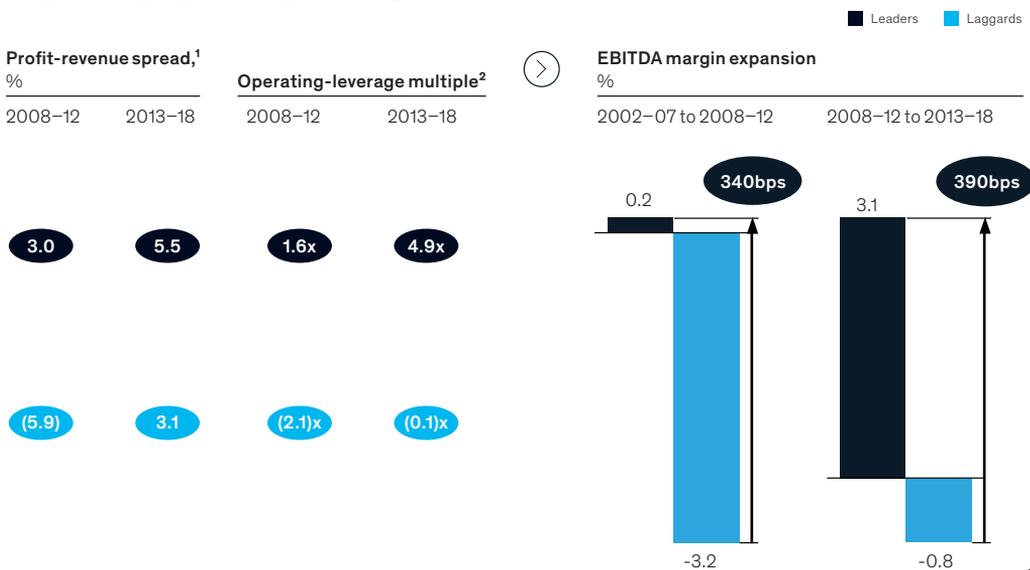
Margin expansion

We analyzed the EBITDA margins of leaders and laggards to assess the expansion achieved especially during and after downturn. The drivers of any differences in margin expansion between the two are typically explained by two metrics: profit–revenue spread (PRS), measured as growth in EBITDA above growth in revenue, and operating-leverage multiple (OLM), measured as the extent to which EBITDA growth outpaces revenue growth. These two metrics help us understand companies' focus on driving bottom-line improvement faster than the top line.

Leaders recovered from the slowdown in 2008–09 with a margin expansion gap of 390 basis points over laggards and maintained margins from before the downturn to during (a margin expansion of 20 basis points from before the downturn to during, versus a decline of 320 basis points for laggards). Leaders did so by getting to a more efficient frontier of PRS and OLM during and after the crisis (Exhibit 14). Leaders had a higher PRS of 3 percent and higher OLM at 1.6 times during the crisis. After the crisis, leaders built on their lead further: PRS rose to 5.5 percent, and OLM rose to 4.9 times.

Exhibit 14

Leaders got ahead of the economic cycle by aggressively pursuing margin expansion through efficient profit-revenue spread and improving operating leverage

■ Leaders ■ Laggards

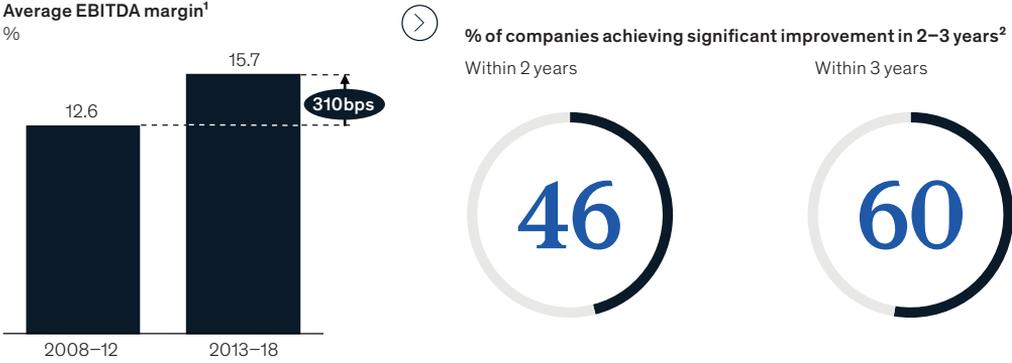| Profit-revenue spread,[1] %		Operating-leverage multiple[2]			EBITDA margin expansion %	
2008–12	2013–18	2008–12	2013–18		2002–07 to 2008–12	2008–12 to 2013–18
3.0	5.5	1.6x	4.9x		0.2 340bps	3.1 390bps
(5.9)	3.1	(2.1)x	(0.1)x		-3.2	-0.8

1. Percentage growth in EBITDA minus percentage growth in revenue.
2. Percentage growth in EBITDA divided by percentage growth in revenue.
Source: S&P Capital IQ; Corporate Performance Analytics by McKinsey

This outperformance indicates that after the crisis, leaders accelerated their focus on expanding EBITDA margin, rather than on revenue growth. Notably, 46 percent of leaders achieved a significant portion of their EBITDA improvement within the first two years, while 60 percent achieved the same within three years, demonstrating that speed was most certainly of the essence (Exhibit 15). Companies that waited too long to react or did not react at all suffered at the bottom of the table in terms of ROIC performance.

Exhibit 15

The margin expansion of 310 basis points post-crisis was delivered in an accelerated time frame

Margin improvement performance of leaders following recovery from 2008 crisis

Average EBITDA margin[1]
%

% of companies achieving significant improvement in 2–3 years[2]

12.6	15.7

310bps

| 2008–12 | 2013–18 |

Within 2 years

46

Within 3 years

60

1. Weighted average by revenue.
2. Significant improvement was measured as 60% or more.
Source: S&P Capital IQ; Corporate Performance Analytics by McKinsey
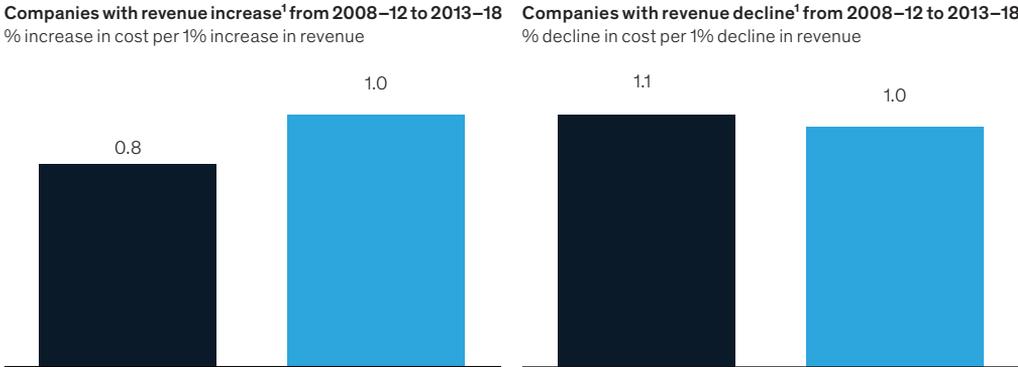
In addition, leaders achieved this margin expansion by transforming their cost structure to control fixed and variable costs depending upon the company's growth cycle. They kept costs fixed during revenue increase to unlock gains from operating leverage and made costs variable during revenue decline to make the company more resilient (Exhibit 16).

Exhibit 16

Leaders transformed their cost structure to keep costs fixed during revenue increase and make them variable during revenue decline

% change in cost (cost of goods sold plus operating expenses) for every 1% change in revenue, 2013–18 vs. 2008–12

■ Leaders ■ Laggards

Companies with revenue increase[1] from 2008–12 to 2013–18
% increase in cost per 1% increase in revenue

| 0.8 | 1.0 |

Companies with revenue decline[1] from 2008–12 to 2013–18
% decline in cost per 1% decline in revenue

| 1.1 | 1.0 |

1. Increase/decline calculated between average of 2008–12 and 2013–18 revenues and average of 2008–12 and 2013–18 sum of cost of goods sold and operating expenses.
Source: S&P Capital IQ; Corporate Performance Analytics by McKinsey

M&A strategy

We investigated the M&A activity of the two groups of companies throughout the 16-year period to understand if the volume of deals explained any differences in scale. Compared with laggards, leaders initiated more acquisitions to enter either new markets or grow share in their core markets and solidify their higher scale position. From 2002 through 2018, leading companies closed an average of 2.5 times more M&A deals than laggards.

Thus, focus on programmatic M&A proved to be a strong lever for leaders to maintain their scale advantage over laggards.
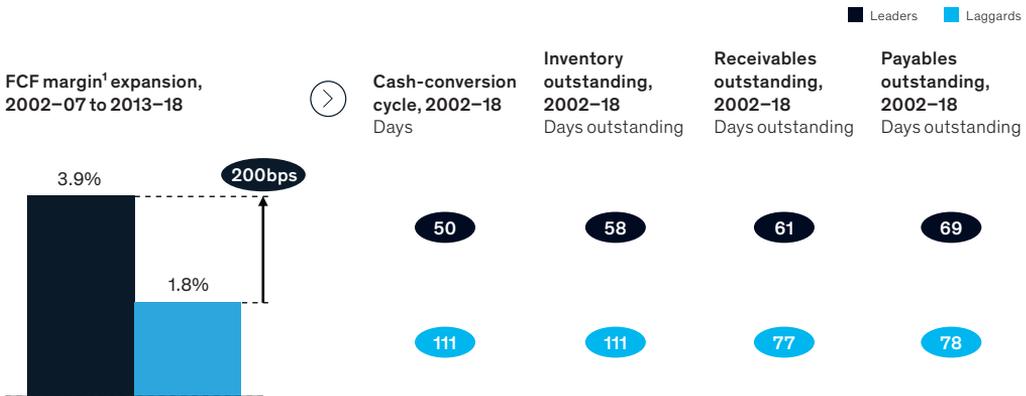
Free cash flow improvement

Cash flow position is a critical marker of financial strength in the construction and building technology industry, which depends on the ability to turn cash fast. We therefore compared the cash-conversion cycles of leaders and laggards to understand differences in FCF margin and its drivers.

Leaders in the industry generally took less time to create cash flows from what they invested, with a total cash-conversion cycle that was more than 50 percent shorter than that of laggards (Exhibit 17). This shorter cycle enabled leaders to more effectively generate and use cash. From 2002 to 2018, leaders expanded their FCF margins by 200 basis points more than laggards did.

Exhibit 17

Leaders unlocked more cash through shortening of their cash conversion cycles

■ Leaders   ■ Laggards

		Cash-conversion cycle, 2002–18 Days	Inventory outstanding, 2002–18 Days outstanding	Receivables outstanding, 2002–18 Days outstanding	Payables outstanding, 2002–18 Days outstanding
FCF margin[1] expansion, 2002–07 to 2013–18					

3.9%   200bps

1.8%

| Leaders | 50 | 58 | 61 | 69 |
| Laggards | 111 | 111 | 77 | 78 |

1. Percentage growth in EBITDA minus percentage growth in revenue.
2. Percentage growth in EBITDA divided by percentage growth in revenue.
Source: S&P Capital IQ; Corporate Performance Analytics by McKinsey

Leaders pulled two levers to maintain the shorter cash-conversion cycle before and after the crisis. First, leaders maintained their inventory cycle at 58 days, whereas laggards' inventory days increased by 32 days, to 111. Second, leaders improved credit terms with their customers to counter the impact of suppliers tightening payment terms. Laggards showed no improvement in credit terms.

* * *

The four performance drivers apply across the construction and building technology value chain, but the extent of their use has varied by industry segment. Comparing players in construction and engineering, finishing components, and major systems equipment, we found areas in which leaders excelled at one or more of four performance imperatives:

Construction and engineering. For this segment, cash is king. Leaders in construction and engineering reduced their cash-conversion cycle by half (from 30 days in 2002–07 to 15 days in 2013–18) by shortening inventory conversion cycles and improving credit terms with customers.

Finishing components. Here, the imperative that made the most difference was improvement in operating expenses, enabling margin expansion and focus on programmatic M&A. Leaders in this segment increased the gap in EBITDA margin relative to laggards from 420 basis points in 2002 to 620 basis points in 2018, driven by 140 basis points of superior improvement in operating expenses. M&A enabled leaders in all three segments to maintain greater scale relative to laggards by closing more deals. However, the finishing components segment pulled this lever hardest, closing five times as many deals as laggards in their segment.

Major systems equipment. Leaders in this segment stole the show on higher quality of revenue and gross-margin improvement. Leaders saw the highest revenue growth above market (220 basis points higher from 2002 to 2018), driven by gross-margin expansion of 550 basis points above market (2002–07 versus 2013–18) and an increase in intangibles to revenue of 880 basis points above market across the same two time periods. Leaders in major systems equipment also obtained the largest gap in EBITDA margins relative to laggards in their segment (rising from 670 basis points in 2002 to 1,630 basis points in 2018), thanks to greater expansion of gross margin relative to laggards.

Although our analysis shows that practices vary by industry segment and company, the imperatives remain. We have seen that the most successful companies in the construction and building technology industry weathered difficult times with a combination of pursuing higher quality of revenue, superior margin management, focus on programmatic M&A, and effective cash management.

Trends

While looking back at company performance provides important information for crafting a strategy, players in the construction and building technology industry also must take into account the dramatic changes reshaping the industry. Our analysis of activity in construction and building technology suggests five trends that will have a significant impact:

— *Shift in spending to real-estate assets*, due to rapid urbanization with fast growth in sectors such as multifamily housing and warehouses

— *Increased "green" building activity*, due to changing customer preferences, tightening regulatory standards, and an increased focus on occupant health

— *Rise of building-automation technology* as the Internet of Things (IoT) continues to decline in cost and consumers demand greater energy efficiency, safety, and connectivity

— *Technology-driven operational efficiency* via analytics, digital construction tools, and robotics

— *Horizontal moves along the value chain* as industry players create integrated offerings and introduce new channels and pricing models

Together, these trends could provide tailwinds that fuel healthy growth for the construction and building technology industry as a whole. In this section, we take a closer look at each of these trends.
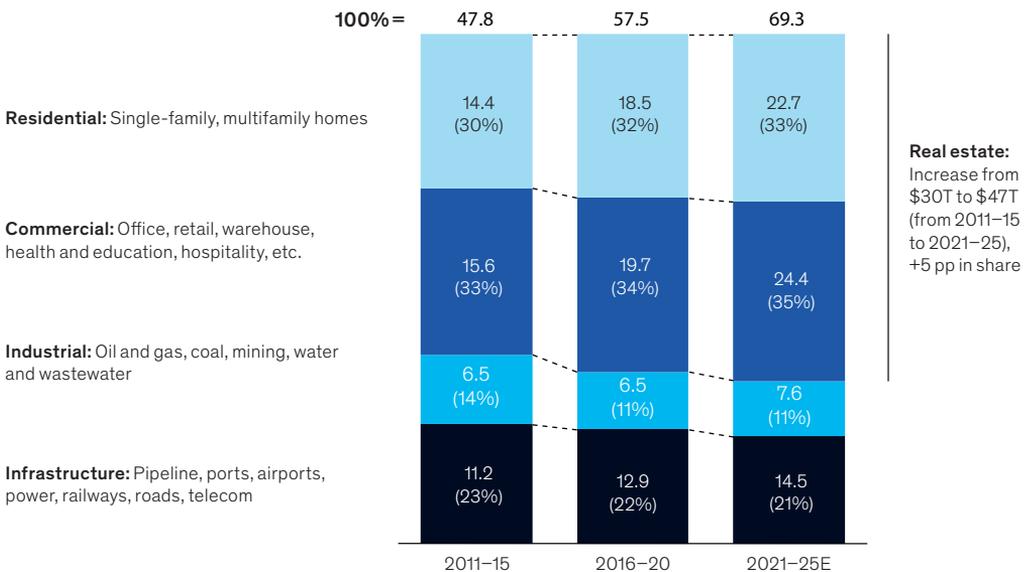
Shift in spending to real-estate assets

The industry is experiencing a shift in spending away from infrastructure and industrials and toward residential and commercial real-estate assets. This is driven by rapid urbanization. Over the period from 2011 to 2025, we expect spending in residential and commercial real-estate asset classes to grow by approximately $17 trillion and increase in share by five percentage points (Exhibit 18).

Exhibit 18

Spending across real-estate asset classes (residential and commercial) is expected to grow

Construction spending, by asset class, cumulative over given period
Real 2008 prices, $ trillion
(% share of overall spending)

	2011–15	2016–20	2021–25E
100% =	47.8	57.5	69.3
Residential: Single-family, multifamily homes	14.4 (30%)	18.5 (32%)	22.7 (33%)
Commercial: Office, retail, warehouse, health and education, hospitality, etc.	15.6 (33%)	19.7 (34%)	24.4 (35%)
Industrial: Oil and gas, coal, mining, water and wastewater	6.5 (14%)	6.5 (11%)	7.6 (11%)
Infrastructure: Pipeline, ports, airports, power, railways, roads, telecom	11.2 (23%)	12.9 (22%)	14.5 (21%)

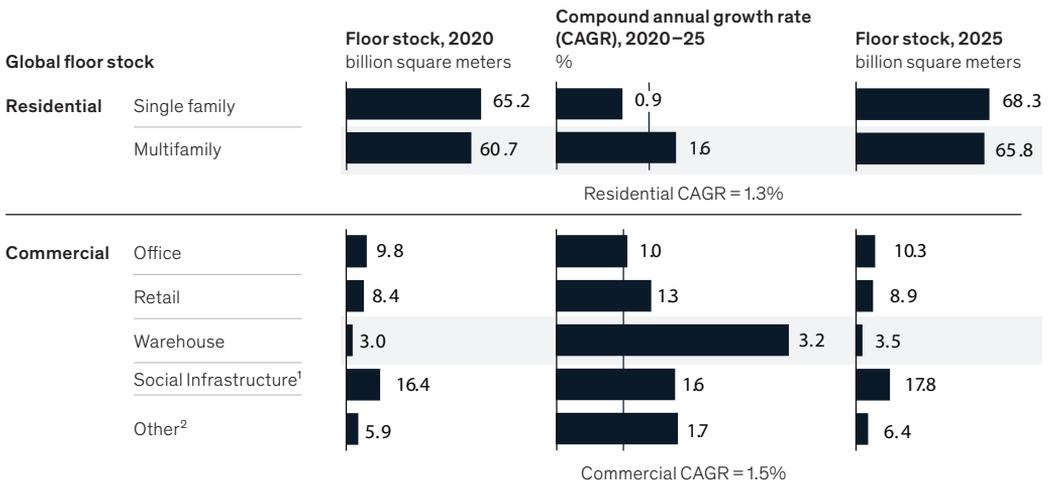**Real estate:** Increase from $30T to $47T (from 2011–15 to 2021–25), +5 pp in share

Source: Global Insight; International Transport Forum; Global Water Intelligence; World Energy Outlook; MEED; World Bank; African Development Bank; Asian Development Bank; Moody's Analytics; national accounts

The increasing share of residential and commercial construction is likely to have a positive influence on both upstream and downstream segments of the construction value chain. Finishing components, building equipment, and facilities management may experience higher demand along with increased opportunities for contracting services. And as consumer expectations evolve, more applications for smart building solutions—for example, energy and resource efficiency, access control, and connected homes—will emerge.

Furthermore, we are seeing faster growth in certain specific subclasses of real estate assets. Multifamily housing units are on the rise, with increased rental activity, rising home prices, and demographic shifts that support demand (Exhibit 19). Similarly, e-commerce and cold storage are driving growth in warehouses. Such asset classes help to create a critical mass of large-scale projects, thereby offering more opportunities for the industry across segments. Contractors would require wholesale supply for building materials and a wide range of machinery and equipment inputs for both kinds of construction, along with increased content for HVAC, plumbing, electricity, and so on. Multifamily units also require building management. Warehouse construction will especially increase demand for products and services that contribute to efficiency, including those that support technology functionality such as applications of IoT-enabled building automation.

Exhibit 19
Real-estate growth will vary by asset class

Global floor stock		Floor stock, 2020 billion square meters	Compound annual growth rate (CAGR), 2020–25 %	Floor stock, 2025 billion square meters
Residential	Single family	65.2	0.9	68.3
	Multifamily	60.7	1.6	65.8
			Residential CAGR = 1.3%	
Commercial	Office	9.8	1.0	10.3
	Retail	8.4	1.3	8.9
	Warehouse	3.0	3.2	3.5
	Social Infrastructure[1]	16.4	1.6	17.8
	Other[2]	5.9	1.7	6.4
			Commercial CAGR = 1.5%	

1. Includes education, healthcare, institutional, etc.
2. Includes hotels, restaurants, transport, etc.
Source: Navigant Research

1. Dodge Data Analytics, World Green Building Trends, 2018. Respondents identified themselves as architects/designers, contractors/builders, specialists/consultants, owners/developers, engineering firms, and investors. Overall, 33 percent of respondents were from companies that are members of World Green Building Council.
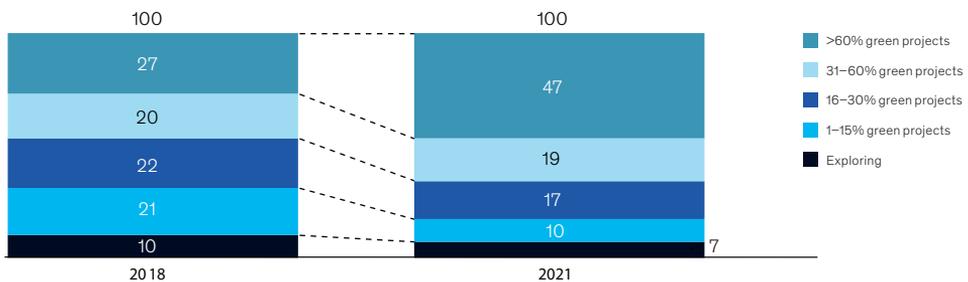
Increased "green" building activity

Green projects—defined as buildings that have efficient energy and water consumption—use environmentally friendly materials, deploy recycling and reuse, offer improved indoor air quality, and show environmental consideration in design, construction, and operation. Such projects are gaining momentum globally. According to a survey conducted by Dodge Data Analytics,[1] people in the construction and building technology industry expect a rise in green building activity: 47 percent of respondents in 2018 said the percentage of construction projects that can be considered green will be more than 60 percent in 2021. Meanwhile, only 27 percent said the same percentage described the mix of construction projects in 2018, the year of the survey (Exhibit 20).

Exhibit 20
The level of "green" building activity is growing

Share of construction projects that are or are expected to be green,[1]
% of respondents

1. Green projects are defined as buildings that have efficient energy and water consumption, use environmentally friendly materials, deploy recycling and reuse, offer improved indoor air quality, and show environmental consideration in design, construction, and operation.
Source: Dodge Data Analytics, World Green Building Trends 2018

The same survey identified three top triggers for pursuing green projects: client demands, environmental regulation, and a focus on occupant health. Customers are demanding construction of green buildings, as they see benefits such as savings in operating costs and increases in asset value. Reduced water and energy consumption in green buildings translates to potentially lower operating costs, estimated to fall by 14 percent a year over a five-year period.

In addition, more and more governments are launching initiatives to promote green building activity. Consider a few examples:

— In the United States, the Environmental Protection Agency introduced several laws and regulations on environment-related topics for the construction sector. These include regulations for air and water protection, waste treatment, and the use of lead in construction.

— France's Energy Transition for Green Growth Act aims to increase the use of ecological and renewable energy sources and includes construction initiatives, including reimbursement of up to 30 percent of total energy systems modernization through tax allowances and 0 percent loans.

— Germany's Energy Savings Ordinance lays out a framework to calculate the energy performance of buildings and the setting of minimum energy-performance requirements (with separate requirements for new and existing buildings). Amendments to the law introduce high standards with incentives aiming to reduce demand for energy for buildings by 20 percent as of 2020 and by 80 percent in 2050.

— China's Green Building Evaluation Label introduced clear goals for the development of green buildings by 2020. The goals include increasing the share of newly constructed green buildings in urban areas to 50 percent and improving the energy efficiency of newly constructed buildings in urban areas by 20 percent relative to 2015 levels.

Several notable green buildings use a combination of design, materials, and technology to promote sustainability. The German Reichstag uses an energy system based upon a mix of solar energy, geothermal power, combined heat and power, biofuel generators, and innovative ventilation. A geothermal installation cools the building in summer and provides heat in winter, and more than 80 percent of the electricity needed is generated internally. Since its implementation, annual carbon dioxide emissions fell from 7,000 tons to less than 1,000. Australia's K2 Housing Project is an apartment complex that uses only renewable energy and is partially made of recycled timber. Its deployment of rainwater harvesting, gray-water reuse, solar water heating, and photovoltaic panels means that K2 apartments use 55 percent less electricity, 46 percent less gas, and 53 percent less water than conventional apartments.

In the United States, Idaho's Banner Bank Building has an abundant geothermal energy source that bubbles beneath ground level. It has a water reclamation system and backup generators that run on vegetable oil, a biodiesel source of energy. Factoring in a company program that encourages employees to commute by public transportation, carpool, or bicycle, total water and energy usage reductions are estimated to be 65 percent and 50 percent, respectively, compared with conventional buildings.

Rise of building automation

Healthy growth also is projected in the market for building automation, which includes five subsegments: building management systems, HVAC controls, fire detection and controls, security systems, and lighting controls. The overall global market for building automation is forecast to grow by slightly more than 7 percent from 2018 through 2023 (Exhibit 21). By far, the largest segment in building automation is building security, due to strong demand for security services, such as security system integration and remote monitoring services. This segment is expected to grow fastest, at a compound annual growth rate (CAGR) of 7.4 percent from 2018 to 2023.

Exhibit 21

Building automation is projected to accelerate rapidly, particularly in security systems

Global building automation market
$ billion

Compound annual growth rate, 2018–23
%

■ Building management systems ■ Lighting controls ■ Fire detection ■ HVAC controls ■ Security systems
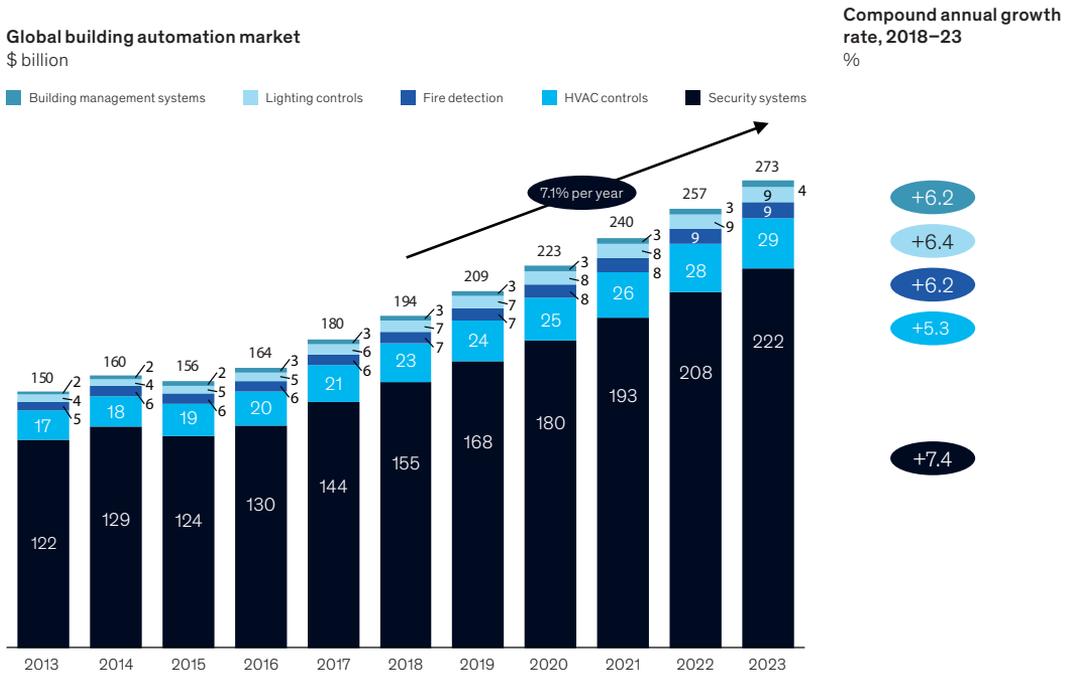
Source: Frost & Sullivan; IHS; Navigant

The strong growth in the overall market is driven by availability of new technologies, a push for energy and resource efficiency, and increasing demand for safety and connectivity. The most notable influences of technology come from the decreasing cost of IoT and cloud computing and the proliferation of low-power wide-area networks. These are speeding up the collection of big data and the retrofitting of systems, making IoT devices ubiquitous. Several companies are leaning on advanced analytics, machine learning, and big data to provide value-added services. In fact, building data analytics today is dominated by alliances of solutions providers and analytic companies.

The drive for energy efficiency is being accelerated by stricter regulation in Western Europe and, to a lesser extent, in the United States. Efforts have transformed some buildings from energy consumers into energy "prosumers," enabled by local power management, decentralized energy production, and lower-cost, higher-efficiency storage. Improving energy efficiency focuses mainly on HVAC and lighting controls; many new players entering the market offer improved efficiency.

Safety and security offerings have gained traction in innovative ways, such as remotely opening gates or accessing cameras. In addition, customers demand greater connectivity and integrated solutions to manage their surveillance, access control functionality together, and combine them with other smart building systems.

Technology-driven operational efficiency

In the area of construction technology, companies are increasingly adopting technology to increase productivity and create more value for end customers. Some of these technologies have been around for a while. However, the increasing scarcity of skilled labor and the rising costs of unskilled labor, given the demand-supply gap, is further driving the technology adoption. Six disruptive technologies have potential to address the major shortcomings and challenges of construction and drive operational efficiencies:

— Modular construction shifts 90 percent of building activities to offsite manufacturing, accelerating project timelines by 20 to 50 percent and cutting costs by 20 percent.

Start-ups in modular construction

The construction and building technology industry is observing the rise of multiple mid- to late-stage offsite construction start-ups that are increasingly pushing the modular homes space forward. These start-ups—including Katerra, Blue Homes, Project Frog, Prescient, and others—are innovating by using construction technologies such as building information modeling (BIM), robotics, and laser-cutting systems to create a variety of home styles, layouts, finishes, and prefabricated shippable building components.

For example, Katerra—the construction and building technology industry's latest unicorn—delivers housing by integrating a technology platform into the value chain. Their solutions include global enterprise deployment of SAP HANA, a proprietary market-analytics platform, and other industrial IoT tools. The model streamlines the entire building process, from concept design to the finished product, by leveraging BIM software and modular construction, allowing cost to be reduced across the entire construction value chain.

- Drones enable real-time remote data capture and monitoring, providing access to remote and dangerous areas and removing human limitations.

- Building information modeling (5-D BIM) combines 3-D modeling with schedule and budget to improve collaboration and information sharing.

- 3-D printing, an additive manufacturing process, allows for rapid prototypes, onsite parts or piping manufacture, and quick resolution of engineering issues.

- Robotics and automation (for example automatic welding and brick laying) is being deployed to predictable physical tasks, thereby increasing output and decreasing variable labor cost.

- Technologies like big data, artificial intelligence, and IoT help process large data sets into useful information to enlighten future decisions. In addition, there is virtual reality and augmented reality to enhance visualization in construction projects.
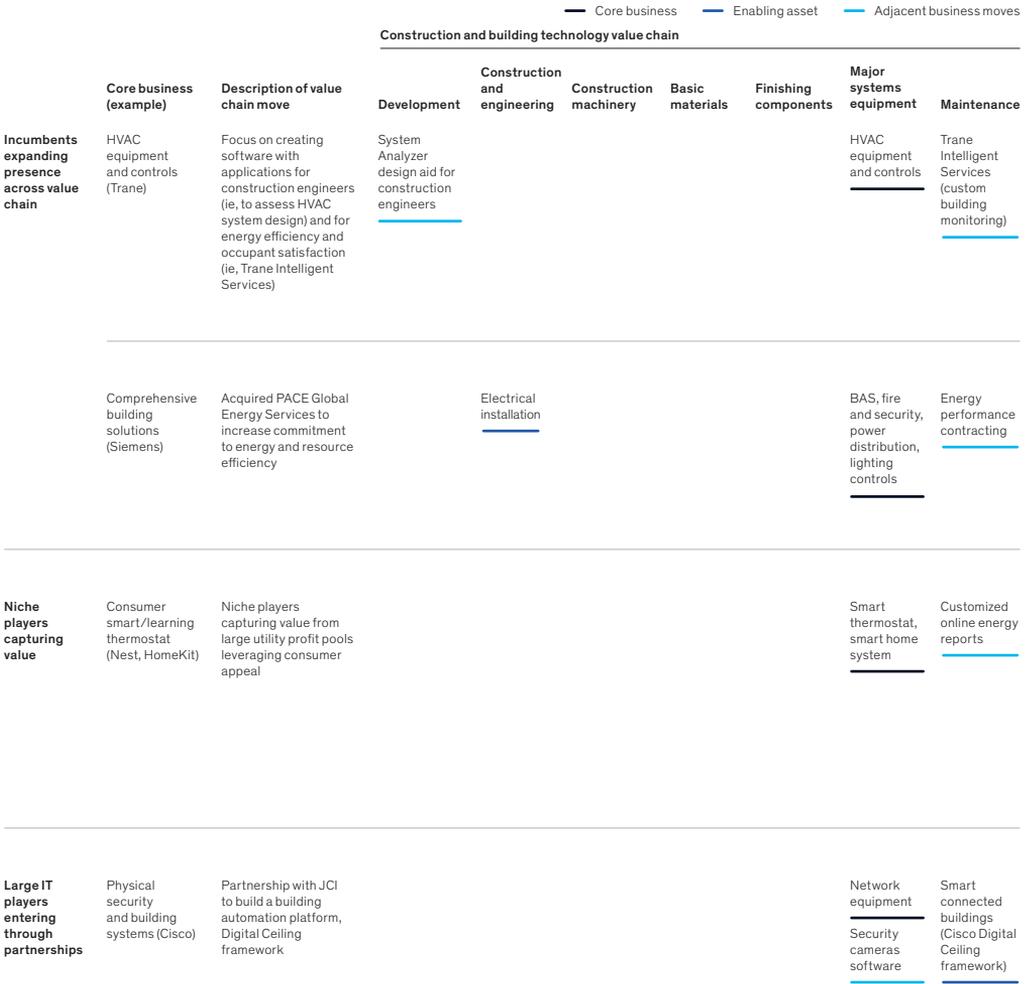
The rise in construction technology use is also helped by regulations and incentives in certain countries to accommodate more modern methods of construction and push for standardization. For example, many city authorities in the United States (for example, San Francisco, New York, Berkeley) are committing to creating affordable modular housing to fulfil their needs for creating housing faster and more cost effectively.

Energy-efficiency regulations and government subsidies in Central and Northern Europe are driving favorable growth in prefab homes.

The increased adoption of these construction technologies is fueling the market with innovation, as is evident by the proliferation of start-ups (see, for example, the sidebar "Start-ups in modular construction"). The activity is attracting a surge of VC investment in construction technologies. Investment by venture capitalists has increased about 12 times, from $183 million over the 2008–12 period to more than $3 billion in 2013–18. That represents a climb in the number of investments from 68 in the earlier period to 583 over the more recent five years.

Exhibit 22

Companies are making horizontal moves across the value chain

— Core business — Enabling asset — Adjacent business moves

	Core business (example)	Description of value chain move	Construction and building technology value chain						
			Development	Construction and engineering	Construction machinery	Basic materials	Finishing components	Major systems equipment	Maintenance
Incumbents expanding presence across value chain	HVAC equipment and controls (Trane)	Focus on creating software with applications for construction engineers (ie, to assess HVAC system design) and for energy efficiency and occupant satisfaction (ie, Trane Intelligent Services)	System Analyzer design aid for construction engineers					HVAC equipment and controls	Trane Intelligent Services (custom building monitoring)
	Comprehensive building solutions (Siemens)	Acquired PACE Global Energy Services to increase commitment to energy and resource efficiency		Electrical installation				BAS, fire and security, power distribution, lighting controls	Energy performance contracting
Niche players capturing value	Consumer smart/learning thermostat (Nest, HomeKit)	Niche players capturing value from large utility profit pools leveraging consumer appeal						Smart thermostat, smart home system	Customized online energy reports
Large IT players entering through partnerships	Physical security and building systems (Cisco)	Partnership with JCI to build a building automation platform, Digital Ceiling framework						Network equipment / Security cameras software	Smart connected buildings (Cisco Digital Ceiling framework)

Horizontal moves along the value chain

The rising demand for energy management, increasingly stringent building standards, and consumer expectations for use of smart building technology are causing players to push boundaries and make horizontal moves along the construction and building technology value chain. Incumbents are expanding their presence into adjacent areas of the value chain. New niche players are entering the market and capturing value. And players from other industries, such as large IT players, are seeking access through partnerships.

A few examples illustrate these categories of moves (Exhibit 22):

— *Incumbents expanding presence.* Traditional players with a primary play in systems equipment and controls are improving relevance in other areas of the value chain, particularly maintenance services. Trane introduced a portfolio of energy management solutions that it calls Trane Intelligent Services. This portfolio is designed to help building owners and managers transform building data into actionable insights that optimize building performance and affect business outcomes. In addition, Trane has also devised a software analysis program called System Analyzer to make it easy for construction engineers to evaluate different HVAC systems and designs in order maximize energy and economic efficiency.

— *Niche players entering and capturing value.* Technology companies are banking on their consumer appeal to make inroads into the industry, particularly in the area of smart building technology, with customized energy management applications. For example, Google's Nest generates energy usage reports for customers' households and provides feedback that encourages consumers to conserve energy.

— *Large IT players seeking access through partnerships.* Large IT players with proficiency in software are partnering with system and controls OEMs to create compelling solutions for the industry. Cisco partnered with JCI to form the Digital Ceiling framework, which offers security and motion detection along with HVAC- and lighting-control solutions in a unified, automated platform.

All these major moves are enabling traditional players to enhance their core business while introducing nontraditional or new entrants to the construction and building technology value chain through big data and consumer plays.

Future outlook

Looking ahead, the five trends described in the previous section are expected to create tailwinds that fuel healthy growth in the long term for the construction and building technology industry. The impact is already evident on a global scale. Construction-related spending is expected to grow 3.5 percent per year over the next ten years, a compound annual growth rate that would enable it to reach $5 trillion by the end of that period.

Growth forecasts by region

This anticipated macro-level growth is fueled by population and economic growth, rising urbanization, and government support for infrastructure development (including power, rail, and expressways), especially in emerging economies. However, growth rates will likely vary across regions (Exhibit 23).

China will continue to drive the lion's share of growth. Much of this will result from foreign investments, especially on mega-capital projects. Growth in Asia outside China is driven by ASEAN countries, specifically by Indonesia and Malaysia but also by developed Asian countries such as Japan and Singapore, as well as Australia.

The next-largest absolute growth will be in North America, which has a major need to refurbish aging infrastructure, especially for transportation and utilities.

In Western Europe, growth will be driven by megaprojects in major markets. In contrast, many emerging Eastern European countries with high GDP growth and urbanization will seek investments in buildings, transportation, and utilities.

Exhibit 23

The construction industry will experience healthy long-term growth

Global construction volume[1] and growth, 2018–28
$ billion (real 2018 prices)

| | 0-200 | 200-600 | 600-1000 | >1000 |
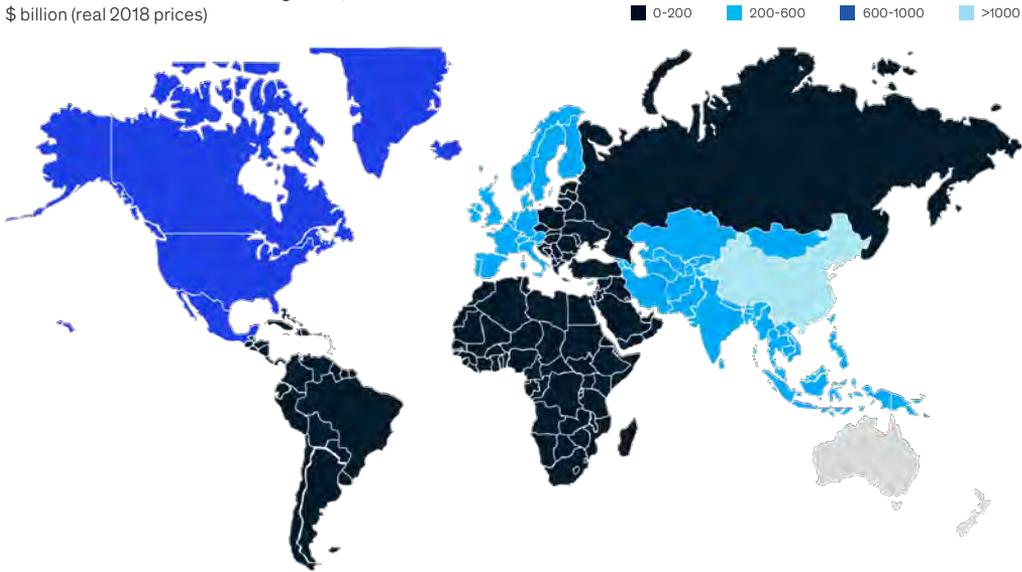
	North America	South America	Western Europe	Eastern Europe	Africa	Middle East	India	China	Rest of Asia	Global
Absolute growth, 2018–28	+633	+131	+488	+134	+39	+110	+402	+2,387	+412	+4,736
Volume, 2018	2,496	331	1,997	411	107	288	398	4,104	1,351	11,483
CAGR, 2018–28, per year	+2.3%	+3.4%	+2.2%	+2.9%	+3.1%	+3.3%	+7.2%	+4.7%	+2.7%	+3.5%

1. Capital expenditures; includes spending on infrastructure-related equipment.
Source: Global Insight; McKinsey Infrastructure Stock and Spend Database

Growth in Latin America is driven by emerging economies, with private investment expected to flow into these countries. In some countries, such as Argentina, government investment in infrastructure projects will also boost construction activity.

The Middle East continues to be a high-growth region, although the growth has flattened relative to the early years of the decade. Growth is mainly fueled by investments in major projects such as King Abdullah Economic City (KSA), Lusail City (Qatar), Oman Rail, Jazan Economic City (KSA), and Dubai Metro.

While the construction and building industry has struggled to create value in the past, the healthy growth prospects fostered by the five trends present an opportunity for the industry to thrive in the future.

Will the industry be able to turn a corner in the future (Exhibit 24)? The industry's ability to break through and create value would depend not only upon how effectively the companies will adopt and execute the ideas from the playbook of leaders, but also on an infusion of commitment to seizing the opportunities presented by the trends that are expected to act as tailwinds for the industry.

The next section provides an overview of ways to do this.

Exhibit 24

Going forward, what will it take for the industry to capitalize on the trends and create value?

Cumulative return on invested capital, %

2002–07: Growth

2008–12: Slump and slowdown

2013–18: Delayed recovery
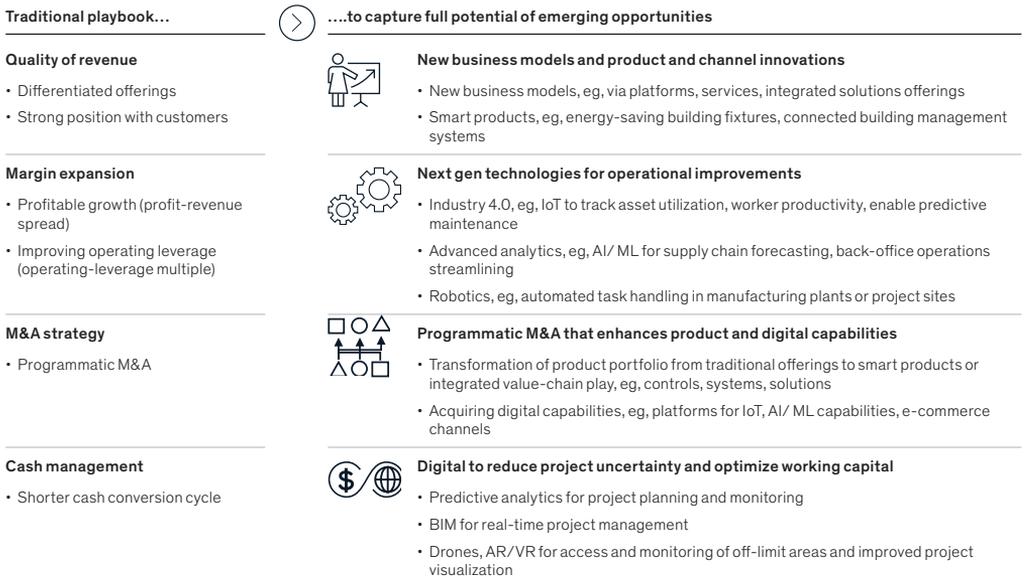
2019–?: Future
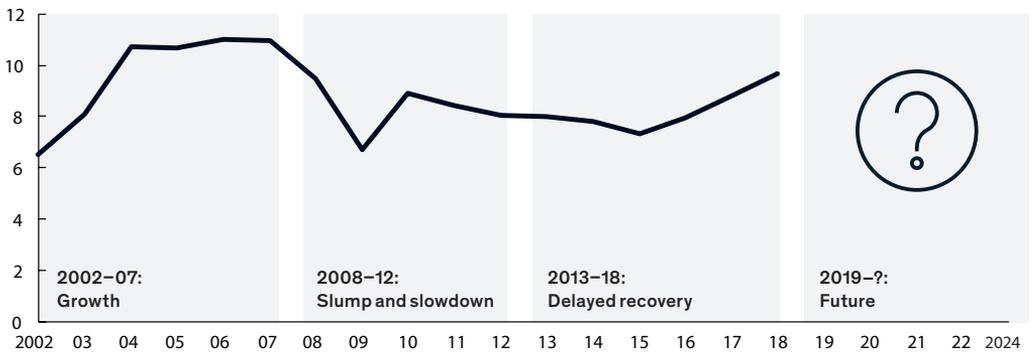
Enablers of success

As noted in the previous section, outlook for the sector is bullish and emerging trends will create a plethora of opportunities for value creation going forward. But are companies well positioned to capture the full potential of emerging opportunities?

The answer, we believe, will vary by company. Laggards have a challenge to close a sometimes significant gap with leaders by addressing strategic and operational issues while also finding ways to accelerate growth. To that end, executing on the winning playbook of leaders — driving high quality revenue, relentless focus on margin management, leveraging M&A to enter new markets or grow share in core markets and unlocking more cash—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. Laggards should resist the temptation to pursue scale for scale's sake; this "zero-calorie" growth will only distract from more critical restructuring.

Leaders will face a different challenge. Although necessary, executing on the playbook of the past 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. Success going forward will depend on their ability to enhance the traditional playbook by accelerating innovation of new products and technologies, building capabilities in areas like Digital and Analytics, and rethinking how they utilize M&A to support the overall strategy.

Exhibit 25

Traditional playbook will need to be enhanced to fully capture future opportunities

Traditional playbook…	….to capture full potential of emerging opportunities
Quality of revenue • Differentiated offerings • Strong position with customers	**New business models and product and channel innovations** • New business models, eg, via platforms, services, integrated solutions offerings • Smart products, eg, energy-saving building fixtures, connected building management systems
Margin expansion • Profitable growth (profit-revenue spread) • Improving operating leverage (operating-leverage multiple)	**Next gen technologies for operational improvements** • Industry 4.0, eg, IoT to track asset utilization, worker productivity, enable predictive maintenance • Advanced analytics, eg, AI/ ML for supply chain forecasting, back-office operations streamlining • Robotics, eg, automated task handling in manufacturing plants or project sites
M&A strategy • Programmatic M&A	**Programmatic M&A that enhances product and digital capabilities** • Transformation of product portfolio from traditional offerings to smart products or integrated value-chain play, eg, controls, systems, solutions • Acquiring digital capabilities, eg, platforms for IoT, AI/ ML capabilities, e-commerce channels
Cash management • Shorter cash conversion cycle	**Digital to reduce project uncertainty and optimize working capital** • Predictive analytics for project planning and monitoring • BIM for real-time project management • Drones, AR/VR for access and monitoring of off-limit areas and improved project visualization

### New business models and product and channel innovations

Going forward, to distinguish themselves through high-quality revenue, leaders need to focus on adopting new business models and product and channel innovations that enable a stream of low-cost, high-margin recurring revenues. These might, for example, come from platforms or services. Leaders could also look to develop distinguished offerings like smart products, for example, energy-saving building fixtures, connected building management systems, and so on. The increasing share of real estate assets is expected to offer plenty of opportunities to construction and building technology companies for such smart products.

One company that successfully achieved higher quality of revenue coming out of the previous downturn is EMCOR, which is remarkable for having been relatively lightly affected by economic cycles. Despite the poor performance of the sector as a whole since the 2008 downturn, EMCOR managed to maintain stable revenues and good cash flows. Factors that contributed to this exceptional performance include the company's portfolio of businesses in attractive markets, improved pricing, better margin management, and its focus on building stable services revenues through its building- and industrial-services segments (Exhibit 26). EMCOR has pursued long-term service contracts with higher margins (for example, fire safety, plumbing, security, heating, ventilation, refrigeration, and industrial services), thereby driving steady margin expansion. It accelerated growth through acquisitions: Ardent and RepconStrickland strengthened turnaround and specialty services in the industrial sector, while Newcomb and Company introduced superior customer capabilities and a wider array of value-added services in the building-services segment. As a result of these efforts, the company has achieved strong fundamentals compared with engineering and construction (E&C) peers, and approximately 40 percent of revenues come from recurring services business.

Exhibit 26

EMCOR built a services business to create a steadier stream of revenues and obtain higher margins

EMCOR's revenue breakdown
%, 2018

$8.1 billion

Electrical and mechanical construction — 61

Building services — 28

Industrial services — 11

2018
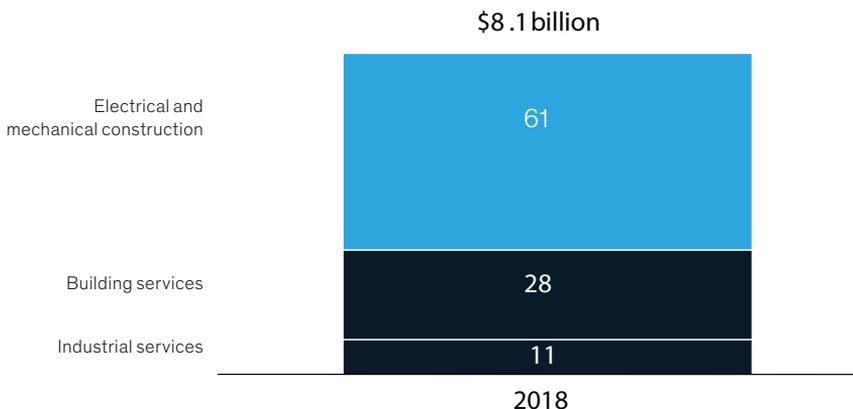
Another standout example is Securitas, which has focused on building integrated security solutions, enabling the company to differentiate itself in the security market relative to peers that offer simple guarding or security services. The integrated security solutions are curated based on a combination of three elements: people, knowledge, and technology. As result, Securitas has higher returns—about 10 percent of operating margin, compared with 4 to 6 percent for peers. It is well positioned to capture the next wave of growth and to realize its 2020 vision of being the leading intelligent-security provider.

Next-gen technologies for operational improvements

In the last downturn, companies achieved margin expansion through accelerated improvements and transformation of their cost structure. While those fundamentals continue to hold, the next wave of leaders will wield next-gen technologies for operational improvements and margin expansion. The industry is already beginning to see this surface. Companies are leveraging digital technologies—such as Internet of Things, advanced analytics (AI/ML) and robotics—in day-to-day operations.

A leading E&C player recently leveraged an at-scale IoT-enabled approach to target more than $100 million in savings. The approach combined digital with agile to enable a transformation touching 10,000 critical assets, 100,000 workers, and several billion dollars in spending on materials. The multipronged solution set involved tracking of asset utilization, worker productivity, material usage, and location of moving equipment for optimal resource utilization. The company's vision to be the world's first E&C company to adopt digital across the portfolio was backed by success factors beyond digital, including a top-down push from the CEO, a dedicated Chief Digital Officer (CDO) and digital team, and prioritization of speed over perfection for rapid development and rollout.

Programmatic M&A that enhances product and digital capabilities

Programmatic M&A to focus on closing multiple deals will continue to be crucial in the years ahead. Leaders need to reprioritize this M&A strategy with a focus on enhancing their product and digital capabilities. This will enable access to newer markets or build their strength further in core markets to unlock higher growth. Multiple companies are leading by example, and in the process, they are transforming what they are known for in the industry.

Acuity Brands, for example, made more than 15 acquisitions over the past decade. These transformed the company from a traditional lighting player to a leading provider of energy management controls and solutions. In the early part of the last decade, the company focused on adding lighting fixtures to its portfolio. More recently, its focus has been on acquiring control solutions and systems companies and adding building operations and analytics platform capabilities to deliver energy efficiency (for example, Lucid).

Another powerful example is that of Beacon Roofing Supply's rollup of more than 40 companies since its IPO to develop an integrated finishing-materials portfolio. These acquisitions accelerated growth in key product categories outside of roofing (for example Allied Building Products)—including siding, windows, doors, decking, trim, waterproofing, insulation, and solar. The company also strengthened the portfolio of waterproofing (such as sealants and air barriers) and related complementary products (for example Lowry's). Finally, they improved access to a high-quality product portfolio of siding, windows, gutters, and railings (for example Lyf-Tym Building Products) and developed customer-service capabilities.

Digital to reduce project uncertainty and optimize working capital

Leaders have traditionally achieved effective cash management through tight management of their inventory cycle and better credit terms with customers. Going forward, leaders need to adopt digital to unlock cash by reducing project uncertainty, optimizing inventory, and inducing time savings. Companies can learn from four digitization tools that have been especially popular in the industry:

— *Predictive analytics for project planning and monitoring.* IBM announced the use of AI-based systems to predict, monitor, and measure the status of engineering, procurement, and construction (EPC) megaprojects from inception to completion. Fluor used innovative tools, such as EPC project health diagnostics, to identify dependencies and provide actionable insights by fusing thousands of data points across the entire life cycle of capital projects.

Leaders need to adopt digital to unlock cash by reducing project uncertainty, optimizing inventory, and inducing time savings.

— *Building-information modeling for real-time project management.* In 2017, Finalcad partnered with Eiffage to establish widespread use of a tablet-based application for paperless project management. Computerizing quality control, deadline compliance, and traceability resulted in improved efficiency and significant time savings.

— *3-D printing technology for novel improvements to conventional methods.* Vinci partnered with XtreeE, a start-up focused on 3-D concrete printing, to test the technology in large-scale concrete structures. The production of prototypes at large scale is expected to improve layouts and environmental footprint, as well as optimize on-site manufacturing parts, tools, and piping.

— *Drones for efficient validation of work in place.* Skansa piloted drones across multiple project sites to help monitor site progress through photos or video for more detailed and reliable information on work in place. The innovation resulted in efficient and cost-effective project monitoring and augmentation of site logistics for planning.

The playbook with the enhancements discussed in this section outlines the going-forward winning recipe for construction and building technology companies. The industry offers multiple examples of players adopting these new and improved ways of leveraging the playbook that the other companies can draw inspiration from.

Conclusion

Overall, the construction and building technology industry has faced some tumultuous times in the past two decades as the industry trailed S&P 500 on value creation (measured in terms of ROIC) and profit margins (measured in terms of EBITDA). However, performance varied significantly across companies within each of the seven segments of the value chain. Leaders outperformed their peers by focusing on high quality revenue largely through uniqueness of their offerings and their strong position with customers, relentless management focus on margin expansion by achieving more efficient profit-revenue spread and increasing operating leverage, leveraging M&A more actively to either enter new markets or grow in their core, and increasing free cash flow by shortening their cash conversion cycle.

As the industry looks to the future, the outlook is bullish as several trends create tailwinds for growth. But companies must remember that the traditional playbook will not be sufficient to capture their full potential. For leaders, success in the future will also be determined by their ability to enhance the playbook to capitalize on emerging opportunities. Laggards, on the other hand, face the challenge of closing the gap to top-performers by first adopting ideas from the winning playbook.

Speed will be of the essence while doing so, especially considering that in the past, more than four in ten successful players achieved 60 percent of their margin expansion in less than two years. Companies that move quickly to double down on margin growth, tech-enabled efficiency initiatives, and flexible operations will have the edge.

An accelerated performance transformation can help in this respect (Exhibit 29).

Exhibit 29

An accelerated performance transformation can help construction players win

A ⇶

Accelerate change
46% of successful players achieved 60% of their margin expansion in less than two years

P 🏃

Drive productivity
Successful players drove 310bps EBITDA improvement coming out of the downturn

T ⇄

Transform cost base
"Fixed" costs during growth and made them "variable" during revenue decline to protect margins

Glossary

Advanced analytics

A range of analytic techniques and tools for the acquisition and transformation of raw data into information to predict future outcomes

CAGR

Compound annual growth rate; the mean annual growth rate over a number of years

Capital turns

Sales divided by average invested capital excluding goodwill

Cloud computing

On-demand delivery of computing power, database storage, applications, and other IT resources via the internet

EBIT

Earnings before interest and taxes

EBITA

Earnings before interest, taxes, and amortization

EBITDA

Earnings before interest, taxes, depreciation, and amortization

EP

Economic profit; equals NOPLAT − WACC × IC

Employee productivity

EBITA per employee

EP/R

Economic profit as a share of revenue

GM

Gross margin

IC

Invested capital

Industry 4.0

Integration of hardware and software into industrial and customer-relations processes based on cyberphysical systems and the IoT and services

Internet of Things (IoT)

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

In this report, companies that were in the top quartile of their industry segment on economic profit as a share of revenue in both the first (2002−07) and third (2013−18) time periods studied

NOPLAT

Net operating profit less adjusted taxes

Operating leverage multiple

Percentage change in EBITDA less percentage change in revenues

ROIC

Return on invested capital

Trailing companies

In this report, companies that were in the bottom quartile of their industry segment on economic profit as a share of revenue in both the first (2002−07) and third (2013−18) time periods studied

Tangible capital ratio

Average invested capital, excluding goodwill

TSR

Total shareholder returns, including capital gains and dividends

WACC

Weighted average cost of capital