

Flow control— Sector at a crossroads?

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Sector at a crossroads?

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Preface

The flow control sector provides the equipment, machinery, and solutions that help control the flow of liquids and gases in industrial applications. The sector provides highly engineered and specialized equipment and solutions to several industries, including oil and gas, food and beverage processing, power, chemical, manufacturing, and municipal. Flow control equipment is critical to the safe flow of liquids ranging from water to flammable liquids to poisonous gases in mission-critical applications such as flood prevention, oil pumping, and pharmaceutical manufacturing.

Flow control is a significant global industry that has outperformed the broader Industrials sector over the years by delivering custom-engineered solutions. However, its performance has plateaued in recent years, and as it looks to the future, the sector finds itself at a crossroads. Has the sector's performance reached a ceiling? Or can it leverage favorable secular trends of rising demand for infrastructure driven by rapid urbanization in emerging markets and an overhaul of aging infrastructure in developed markets, and of technology disruptions in areas like the Industrial Internet of Things (IIoT), automation, and artificial intelligence to break out of recent stagnation and drive the next phase of value expansion for its stakeholders?

This report provides an in-depth assessment of the sector's performance over the past 15 years, the shifting dynamics affecting its future, and how the current playbooks will need to be adapted to capture future opportunities and drive the next phase of value expansion.

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Executive summary

Flow control consists of three core segments—flow handling, flow management, and specialty equipment—which together represented a global market worth \$225 billion in revenue in 2017. Notably, the flow control sector has outperformed the broader Industrials sector over the past 15 years and has consistently maintained its position in the top four among the 13 sectors within Industrials. Our financial analysis shows that from 2012 to 2017, the flow control sector had twice the economic profit as a share of revenue (EP/R) compared with Industrials as a whole (3 percent versus 1.5 percent), which was driven primarily by high sector margins — 500 bps higher gross margin (38 percent versus 33 percent) and 400 bps higher EBITA margin (13.5 percent versus 9.5 percent) than Industrials.

Within the sector, there was a wide variance in performance across individual companies. From 2012 to 2017, top performing companies on average had 1,300 to 1,800 bps higher EP/R than the bottom performers—a significant difference. Further, our research reveals that the top companies outperformed their peers across all economic metrics—revenue growth, EBITA margins, EBITA growth, operations leverage, and capital turns. When analyzing how companies secured this winning position, we found that neither the size of the company (its starting revenue) nor its investment size (capital expenditures) could explain performance. Rather, companies succeeded by focusing on quality of revenue, which was achieved by focusing on three dimensions: operational excellence, product innovation, and business model innovation.

However, in the recent years, there is concern that the value creation potential of the traditional playbook is diminishing as the sector's performance has plateaued—top companies are seeing flat to declining EP/R, while their lower performing peers are experiencing negative EP/R. Furthermore, fewer companies (35 percent from 2015 to 2017 versus 45 percent from 2002 to 2015) are delivering above-average EP/R.

The sector clearly is at a crossroads—has the sector's performance reached a ceiling? Or can it find a way break through recent stagnation and drive the next phase of value expansion for its stakeholders?

We strongly believe that the best days for the sector are still ahead. Our optimism is driven by the accelerating demand growth and by the advent of disruptive technologies that will help the sector capture value from this growth. Demand growth is underpinned by secular trends around rising demand for infrastructure driven by rapid urbanization in emerging markets and overhaul of aging infrastructure in developed markets. We expect those tailwinds to accelerate sector demand growth up to 4 percent CAGR, up from the average of 2 to 3 percent from 2012 to 2017. Disruptive technologies—such as Industrial Internet of Things (IIoT), artificial intelligence (AI), machine learning (ML), and augmented and virtual reality (AR and VR)—will provide companies with new opportunities to improve the economics of their existing markets and drive higher-quality revenue.

These technologies will help companies further innovate across the three dimensions of quality of revenue: operational excellence, product innovation, and new business models. The companies that embrace and appropriately deploy these technologies will find new revenue streams, sidestep competition, and break through the sector's current value-generation plateau.

We are also realistic that capturing this value will not be trivial. Although necessary, executing on the playbook of the past 15 years is outdated and is unlikely to be sufficient to win in the next cycle. The winners within this sector realize that to capture growth and deliver breakthrough performance they will need to embrace new ways of working. The sector, however, is ill-prepared for change; less than one-third of executives feel that they have made significant progress in developing a playbook fit for the future.

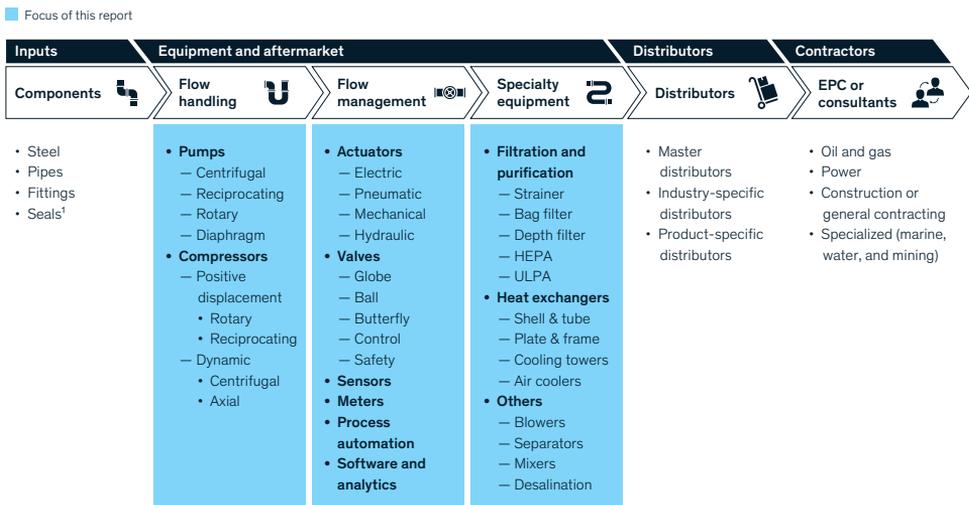
It's certainly an interesting time for the sector, one that enjoys a positive outlook but also faces a value-creation plateau. As disruptive technologies and significant secular trends take hold, flow control companies have an opportunity to embrace a new frontier of products, business models, and operational excellence. The companies that pull ahead will be the organizations willing to embrace change and focus on achieving a stronger quality of revenue.

Introduction

The flow control segment, which is part of the broader Industrials sector, consists of companies that provide products or services involving the management and control of liquids and gases. Such products include pumps, valves, compressors, meters, filtration products, and other related equipment. These are some of the most critical and prevalent components in modern industries. Within the flow control value chain, which extends from steel and pipes to various end markets, there are three core segments—flow handling, flow management, and specialty equipment (Exhibit 1).

Exhibit 1

The value chain of flow control consists of three core segments: flow handling, flow management, and specialty equipment.

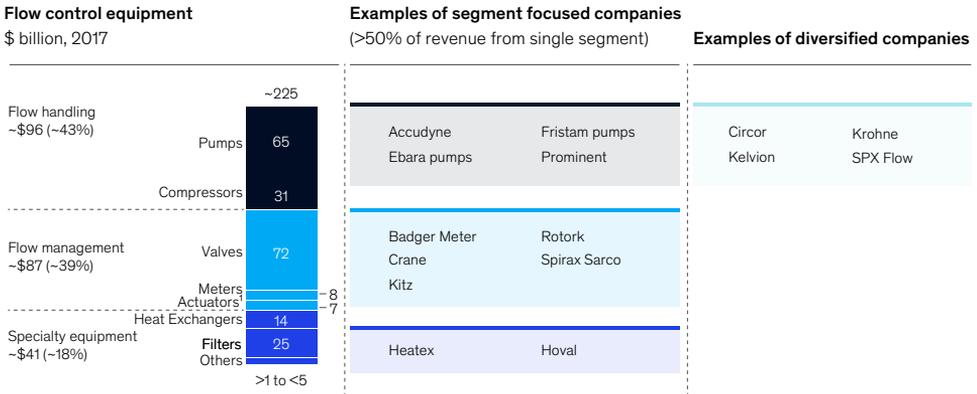


¹The global seals market was estimated at approximately \$65 billion (including automotive) in 2017.

In 2017, the flow control equipment sector represented approximately \$225 billion in global revenue, with flow handling and flow management each accounting for approximately 40 percent of the market share (Exhibit 2). Each segment represents distinct product types and technologies and has specific players, concentration, and archetypes. Further, each segment is not monolithic; rather, each is characterized by scores of microverticals at the intersection of end markets, applications, and technology.

Exhibit 2

Flow control equipment generates approximately \$225 billion in global revenue.



¹Excludes actuators for automotive and aerospace industries.

Source: E.I.F. European Industrial Forecasting Ltd.; The Freedonia Group; MarketsandMarkets Research Private Ltd; McKinsey analysis

Flow handling

Flow handling companies produce pumps and compressors. In 2017, flow handling made up approximately \$96 billion of the overall flow control market. Pumps accounted for \$65 billion (or approximately 70 percent of the subsegment) with a presence across all process industries. The primary end-user industries are oil and gas, construction, chemicals, and municipalities in water and wastewater applications. While pumps are critical to keep the flow moving at the right pace and volume, their technological complexity significantly differs. Such complexity is typically a combination of special requirements, such as corrosion, abrasion, viscosity, temperature, and purity. Depending on the degree of this complexity, pumps are categorized by three design types:

- **Engineered (designed to order):** high-performance pumps designed for a specific application. They typically feature several requirements or extreme values—for example, the ability to withstand high temperatures—and may be required to meet additional industry-specific standards, such as American Petroleum Institute (API) standards in oil and gas.
- **Customized (built to order):** tailored to a specific application while building upon a standardized product. Customized pumps may involve changes in fittings or materials and typically involve some requirements within limited ranges.
- **Commoditized (built to stock):** typically standardized products across all applications and with only limited variations in materials or parts. They do not require any significant design changes—for example, water application products are suited for either municipalities or construction projects.

Flow management

Flow management companies produce actuators and valves as well as other measurement and management devices, such as sensors and meters. In 2017, flow management made up \$87 billion of the flow control market. However, the adoption of smart sensors, particularly in the oil and gas markets, is poised to create a wave of change—for example, the application of valves and actuators in natural gas generation, crude oil extraction, and the refining process often involve remote locations and stringent temperature and pressure requirements.

In fact, valves (\$72 billion) and actuators (\$7 billion) account for 90 percent of flow management. Valves can be divided into two categories: manual and automated. Manual valves—such as residential heating applications or other simple on/off applications—dominate the market. As a result, the market share for actuators is significantly smaller. Furthermore, manual valves can be retrofitted with an external actuator for more complex applications. Automated valves, however, are self-regulated and triggered mechanically through pressure, flow direction, or changes in temperature. They can also be triggered nonmechanically through sensor-registered signals, such as those seen in control valves for fine flow control on predetermined, desirable temperature, pressure, or liquid states sold as actuator-integrated solutions.

Specialty equipment

Equipment with specific applications includes filtration and purification products, heat exchangers, and other products, such as blowers and mixers. This subsegment accounts for \$41 billion of revenue, with heat exchangers and filtration equipment accounting for the majority with \$14 billion and \$25 billion, respectively. A heat exchanger is a device that transfers thermal energy between one fluid to another fluid. There are a variety of industrial applications that require heat transfer and recovery as well as cooling. Filtration systems are used between process steps to protect equipment—for example, heat exchangers in thermal power plants or membrane systems in water and wastewater applications—or to reach the purity needed for production downstream in oil and gas and chemicals.

Sector performance

Five metrics served as the basis of our analysis of the flow control sector performance—EP/R, EBITA margin and growth, revenue growth, capital turns and operating leverage. Based on the metrics, the flow control sector has outperformed most of the other sectors and the broader industrials market on value generation. Disaggregating the sector performance reveals that companies focusing on improving ‘quality’ of revenue significantly outperformed their peers. However, recent plateauing of sector performance (even for the top performers) is raising concerns.

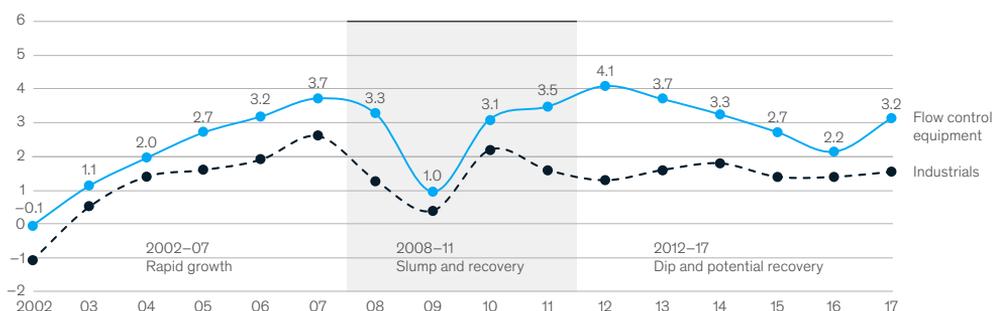
Historical performance

Overall, the flow control segment has performed well during the past 15 years, consistently outperforming the broader Industrials sector on key economic indicators. Our analysis identifies the historical performance drivers for the segment overall—high margins, capital efficiency, and revenue growth. These factors will likely continue to promote growth for the segment. The Industrials sector has demonstrated value-accretive growth through three distinct performance phases from 2002 to 2017: rapid growth, slump and recovery, and a dip and potential recovery. Throughout each phase, the flow control sector outperformed the broader Industrials sector on EP/R (Exhibit 3).

Exhibit 3

Flow control sector has consistently outperformed broader Industrials on economic profit as a share of revenue.

Economic profit / revenue for flow control equipment¹ and industrials,² %



Economic profit,³ \$, million for flow control equipment



¹59 companies in flow control equipment sector with revenue >\$50 million.

²384 companies in industrials with revenue of >\$1 billion.

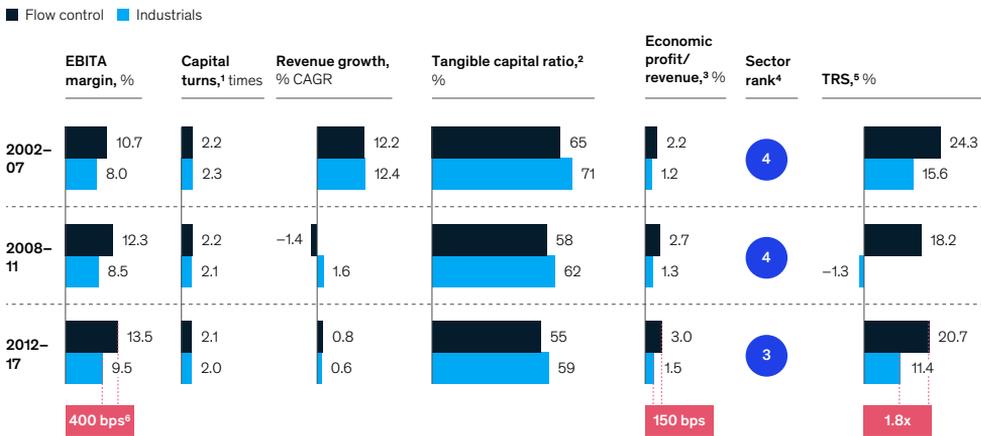
³Total economic profit generated by 59 companies in flow control equipment sector.

Source: E.I.F. European Industrial Forecasting Ltd.; The Freedonia Group; MarketsandMarkets Research Private Ltd; McKinsey analysis

Our analysis of flow control companies from 2012 to 2017 shows that flow control has outperformed broader Industrials consistently on economic profit creation, driven primarily by higher EBITA margins versus Industrials (13.5 percent and 9.5 percent, respectively) (Exhibit 4). These results have remained steady over the past 15 years, which can be attributed to the fact that a significant portion of flow control equipment is engineered specifically for an application or end customer. In addition, flow control companies have established significant market share in small end markets, resulting in higher pricing power.

Exhibit 4

Flow control sector outperforming industrials is primarily due to higher EBITA margins.



¹Revenue / average invested capital excluding goodwill over two years.
²Tangible capital ratio defined as operating invested capital/invested capital. Lower ratio typically indicates higher amount of goodwill.
³Revenue weighted economic profit as a share of revenue (EP/R) for 59 flow control equipment companies (EP/R of more than \$50 million).
⁴Rank out of 13 industrials sectors for flow control equipment companies.
⁵Weighted.
⁶Basis points.

Source: S&P Capital IQ; McKinsey analysis

These performance differentiators have had a significant impact for flow control companies. Of the 13 sectors that make up Industrials,¹ flow control has maintained a top-four position in terms of EP/R over the past 15 years (Exhibit 5).

Flow control’s strength relative to other Industrial sectors can be attributed to its higher EP/R. This reflects the sector’s high gross margin—approximately 500 bps higher than the average of broader Industrials (Exhibit 6)—and the fact that flow control products are highly specialized in nature, as many are engineered for specific or unique uses. For example, the majority of flow control equipment demand in oil and gas (such as 70 to 80 percent of pumps used across up-, mid-, and downstream applications) are either engineered or customized equipment and products are almost always made to order. Additionally, in the chemical industry, many flow control use cases—such as dosing, metering, and handling of gas and liquid mixtures—demand customized solutions.

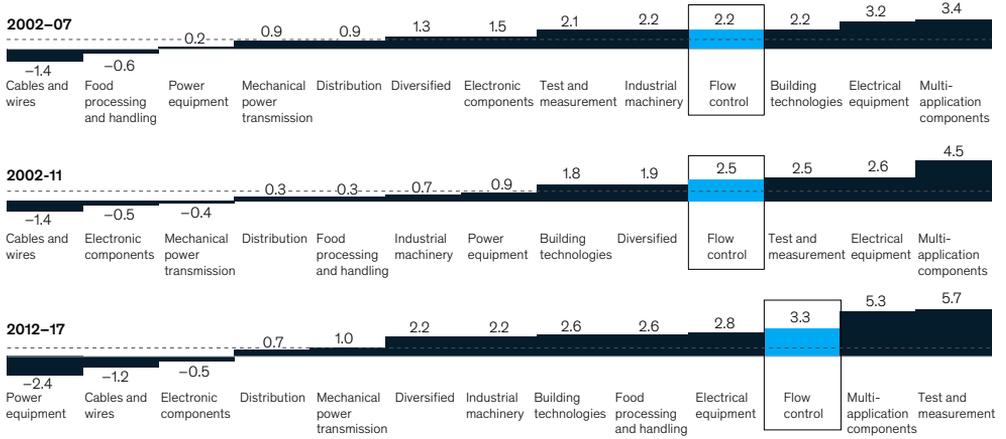
¹ The 13 sectors of Industrials include cables and wires, food processing and handling, power equipment, mechanical power transmission, distribution, diversified, electronic components, test and measurement, industrial machinery, flow control, building technologies, electrical equipment, and multiapplication components.

Exhibit 5

Flow control sector is consistently among the top four industrials sectors in economic profit.

Economic profit creation by sector

Economic profit/revenue, %



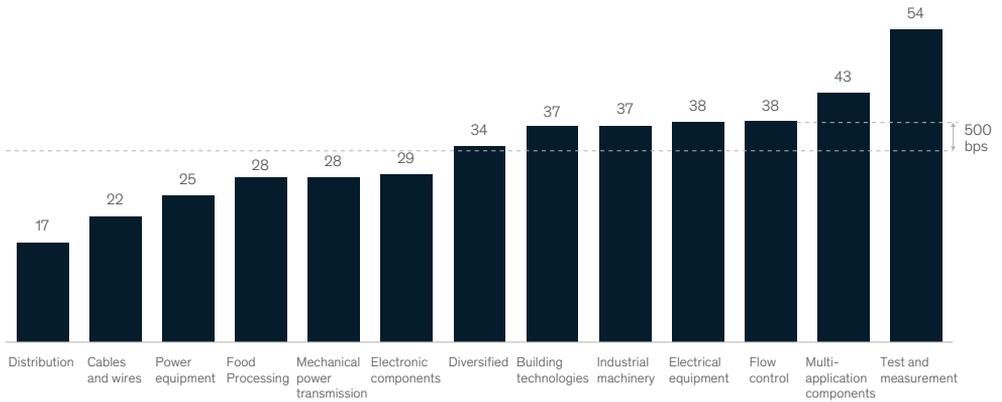
Source: S&P Capital IQ; McKinsey analysis

Exhibit 6

The flow control sector has some of the highest gross margin levels—approximately 500 bps higher than the industrials average.

Gross margin creation by sector

Sector gross margin, %, 2012-17

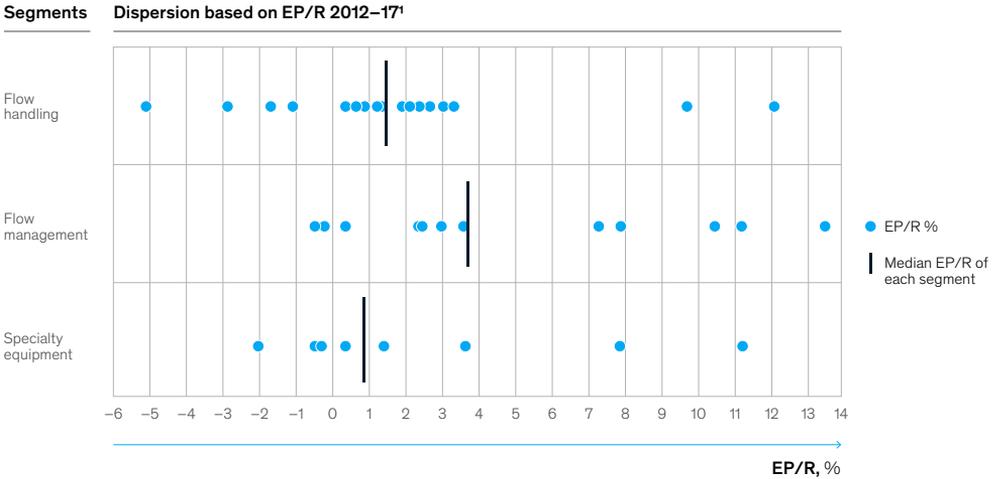


Source: S&P Capital IQ; McKinsey analysis

While flow control as a whole has notched strong performance on key economic indicators, there is significant variance in company performance within the segments (Exhibit 7). In fact, across the three segments, the EP/R performance gap between leading and trailing companies was between 1,300 and 1,800 bps.

Exhibit 7

Within each segment of flow control there was a 1,300 to 1,800 bps spread in EP/R performance across companies.



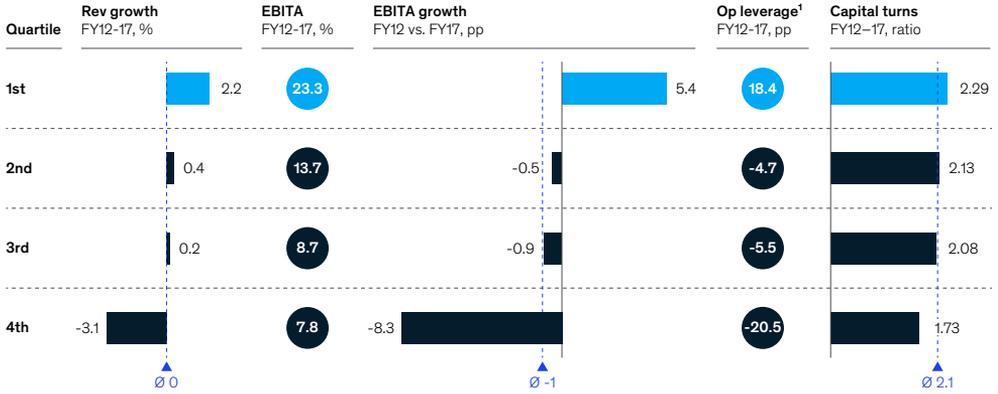
¹Includes 45 companies with data available. EP/R is calculated as a revenue weighted average of EP/R from 2012 to 2017.
Source: Corporate Performance Analytics by McKinsey; S&P Capital IQ

Furthermore, companies in the top quartile comprehensively outperformed their peers on all output metrics (Exhibit 8), delivering higher revenue growth (2.2 percent versus -3.1 percent for their lowest-performing peers), higher EBITA margins (23.3 percent versus 7.8 percent), better operating leverage (18.4 percentage points versus -20.5), and higher capital turnover (2.29 turns versus 1.73).

While flow control as a whole has notched strong performance on key economic indicators, there is significant variance in company performance within the segment.

Exhibit 8

Companies in the top quartile outperformed peers across multiple metrics including higher revenue growth, higher margins and margin growth, and better operating leverage.



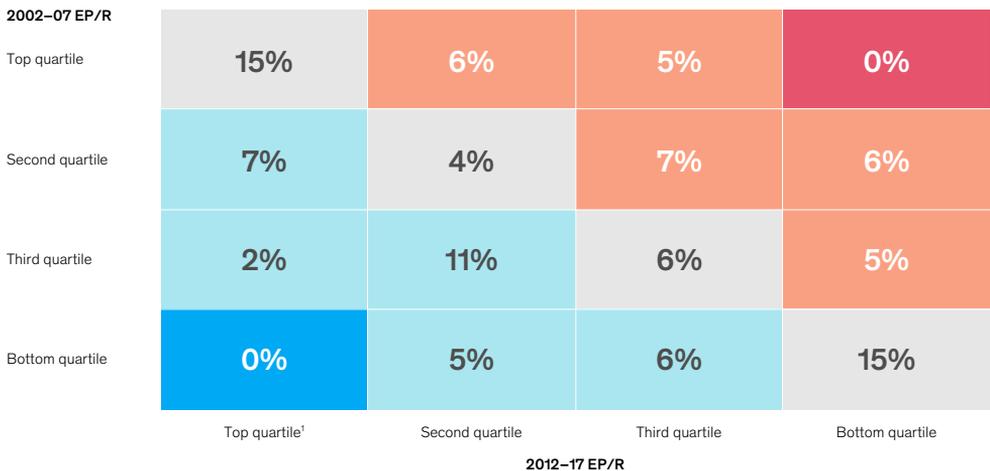
¹Operating leverage defined as % change in EBITA-% change in revenue; excluding diversified companies.
Source: Corporate Performance Analytics by McKinsey; S&P Capital IQ

Interestingly, flow control company performance has not been static. In fact, 60 percent of companies moved across quartile rankings between 2002–07 and 2012–17 (Exhibit 9). Our research shows that approximately 30 percent of players had moved up between 2002–07 and 2012–17. A similar number of companies were displaced from a higher quartile.

Exhibit 9

Flow control company performance was not static—approximately 60 percent of companies moved across quartiles over time.

■ Moved up quartile ■ Moved down a quartile



¹Flow management equipment overall quartile distributions determined by taking the sum of the individual distributions for each product segment.
Source: S&P Capital IQ; McKinsey analysis

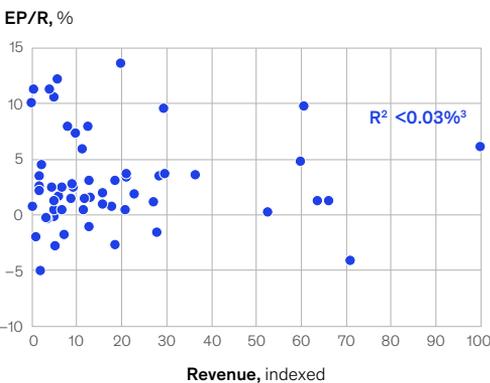
Understanding company-level performance within the sector

To determine how top-quartile companies were able to stand out from their peers, we analyzed company attributes as well as strategies. We found that a company's starting size or capital expenditures had little bearing on a company's EP/R performance (Exhibit 10).

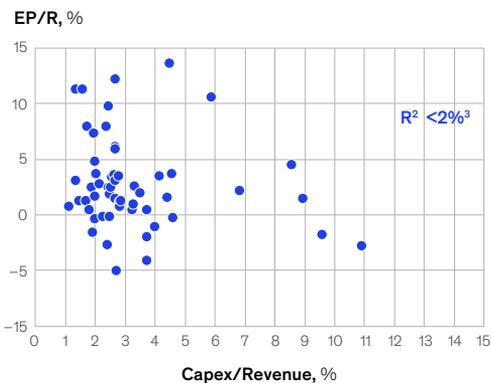
Exhibit 10

A company's starting size and starting capital expenditure were not a strong determinant of performance.

Impact of starting size¹ on performance (EP/R)²



Impact of starting capital expenditures (capex) on performance (EP/R)



¹Index revenues 0–100 from smallest to largest.

²Average of economic profit generated in 2012–17 per dollar of revenue generated in 2002–07.

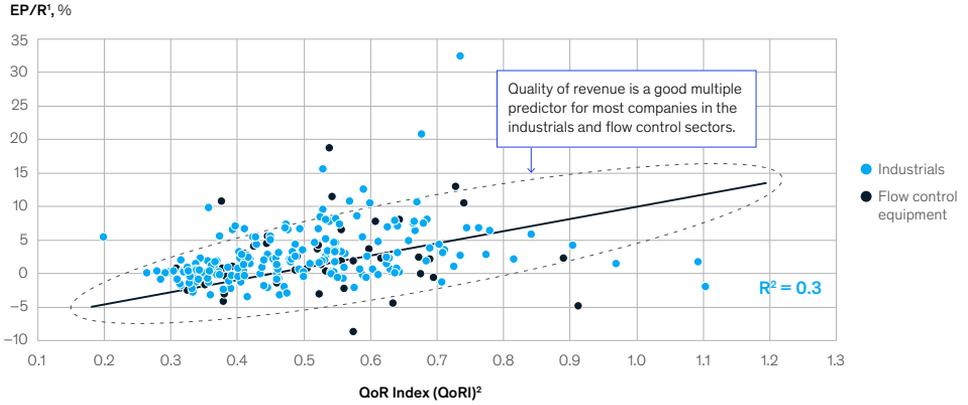
³R-square from statistical analysis between value (2002–09) and EP/R (2012–17).

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

Rather, our research indicates that companies that stayed in the top quartile or improved their performance over time did so by focusing on quality of revenue (Exhibit 11). To better understand how some companies were able to outperform their peers, we researched the actions that successful companies took to secure high-quality revenues. We concluded that successful companies typically innovated across three dimensions: product innovation, operational excellence, and business model innovation (Exhibit 12). This secured a high quality of revenue, which in turn drove higher financial returns.

Exhibit 11

Companies that remained in the top quartile or improved their performance over time did so by focusing on 'quality' of revenue.



¹2017 economic profit over revenues.

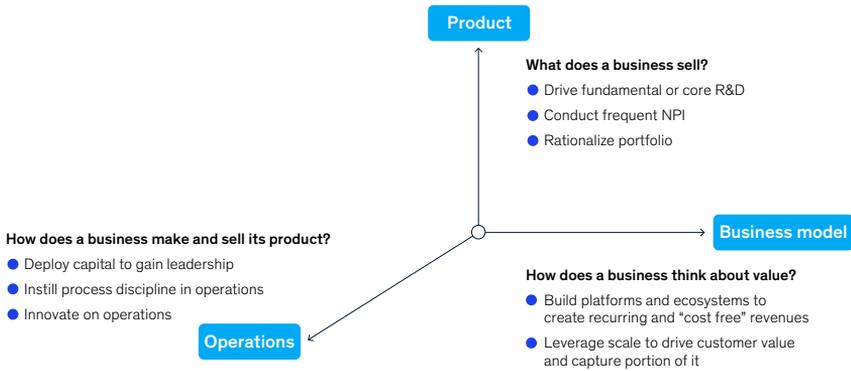
²Quality of Revenue Index calculated based on FY2016 data.

Source: McKinsey analysis; S&P Capital IQ

Exhibit 12

Companies that achieved higher quality of revenue innovated across three dimensions of the 'innovation cube'.

● Elements of the innovation cube ● Success factors



Successful companies typically innovated across three dimensions: product innovation, operational excellence, and business model innovation

Three examples of innovation across these dimensions stand out:

- An American OEM transitioned to become a water technology provider. The company identified the need for real-time decision support for municipal customers to reduce non-revenue water loss and save on energy costs at wastewater treatment facilities. Driving product innovation, it acquired companies with the technology and talent to develop solutions based on real-time analytics. As a result of these moves, the company created a portfolio of highly differentiated advanced sensing products that are now deployed across geographies.
- An American manufacturer of fluid-handling systems realized that cost efficiency was key to winning in the construction and building market, where the pricing environment is competitive. With this goal insight, the company began including value-engineering focus for all new product development and investing capital annually in automation technologies, which increased plant efficiencies and reduced recurring costs.
- A European manufacturer of steam management systems and pumps identified industry-specific opportunities in food and beverage, healthcare, oil and gas, and chemicals. The company then reengineered its go-to-market approach by restructuring sales teams—including engineers—to align with these industries.

These examples highlight the ways companies can identify and build on new sources of value when they focus on quality of revenue by innovating in operations, product, and business models. That focus will be crucial for flow control companies trying to sustain growth in a changing business landscape.

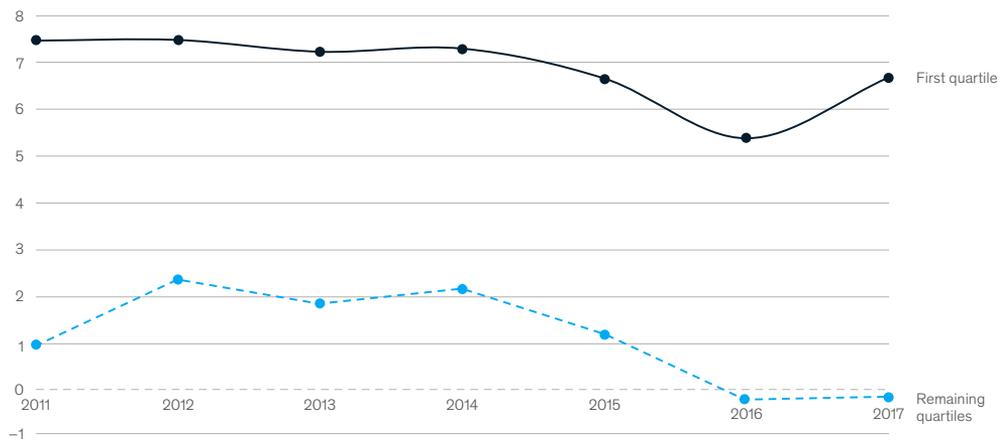
Value-creation plateau

Although the flow control sector has consistently outperformed the rest of Industrials, performance has started to plateau as EP/R has flattened and fewer companies have secured positive economic profit. This trend is prevalent throughout the sector—top-quartile companies have seen their EP/R flatten, while the remaining companies have seen a decline in EP/R and, in 2016 and 2017, a negative economic profit (Exhibit 13).

Exhibit 13

Recent performance for flow control companies has been flat, with negative economic profit as a share of revenue for companies in the bottom three quartiles.

Economic profit/revenue for flow control equipment, %



Source: McKinsey analysis

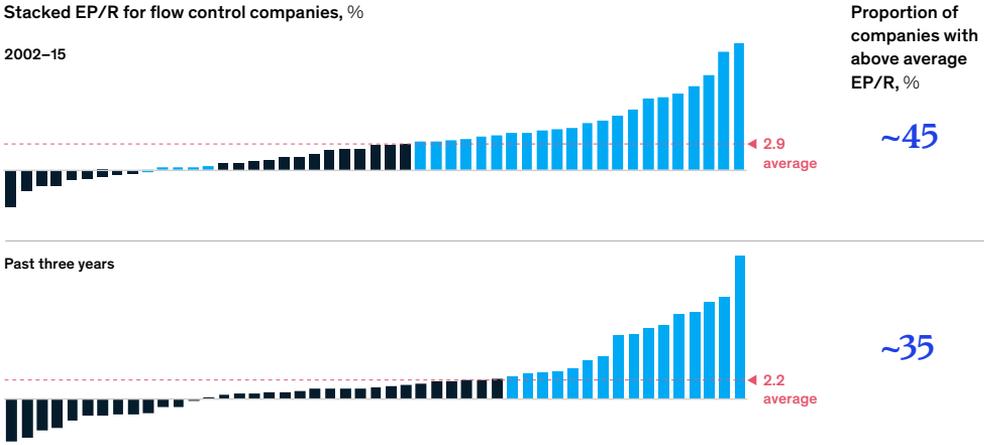
In the past three years, we have also seen concentration in the sector, with only 35 percent of companies generating above-average economic profit versus 45 percent of companies in the past (Exhibit 14). Thus, there are fewer winners and more are being left behind.

Furthermore, flow control company valuations have increased in the past few years (from a NEV/EBITDA of 11–13x in the past to 16–18x in 2016 and 2017), making it more challenging to justify driving growth through acquisitions as price premiums have gone up (Exhibit 15).

With performance starting to plateau for most companies and M&A consolidation becoming less attractive, the sector finds itself at a crossroads—will most companies in the sector return to positive value generation, or is this the new normal? In our assessment, the flow control companies that pull ahead will be the ones that recognize and embrace change, capitalize on the opportunities created by changing market dynamics, and identify new ways of working.

Exhibit 14

In the past three years, fewer companies have achieved above-average EP/R.

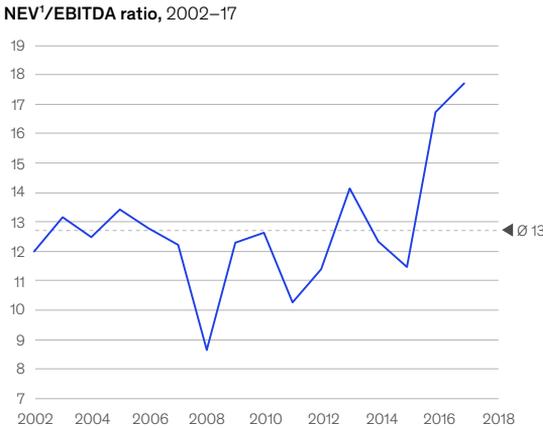


Source: McKinsey analysis; S&P Capital IQ

Exhibit 15

Increasing valuations for flow control companies have reduced the attractiveness of acquisitions and driven industry consolidation.

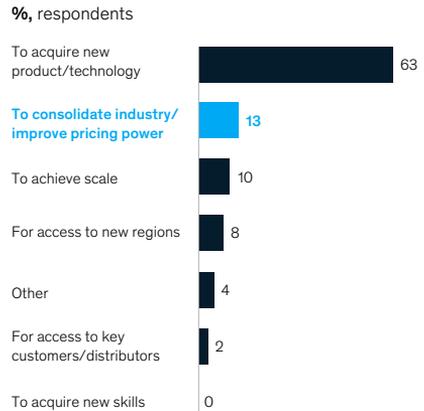
Flow control company valuations



¹Net economic value.

Source: McKinsey analysis; S&P Capital IQ; Dealogic

Resulting M&A activities



While the traditional playbook (for example, LCC sourcing, manufacturing footprint consolidation) has worked in the past, there are questions about whether it will be enough to drive future value generation. Will demand for equipment continue to grow? Will new opportunities emerge that will help companies generate additional value?

Future outlook

Future continues to be bright for the sector. Global secular trends will continue to create demand tailwinds for flow control equipment. In addition, disruptive technologies (for example, IIoT, AI, ML, AR, VR) will help companies further innovate across the three dimensions of quality of revenue (operational excellence, product innovation, and new business models) driving higher value generation.

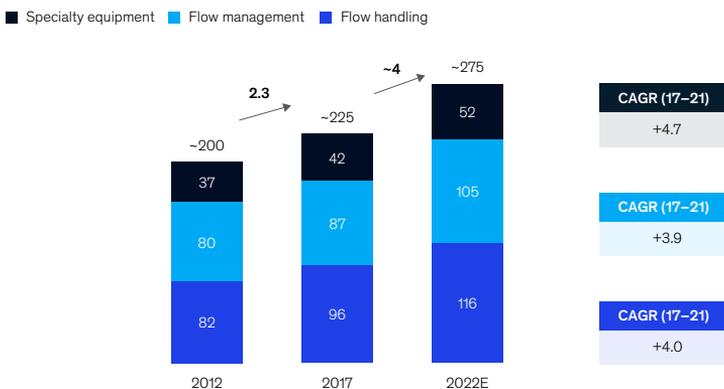
Demand growth from secular trends

Current market trends indicate that the outlook for flow control is positive. Overall, flow control companies can expect accelerated growth in the next few years as global demand for flow control equipment rises; our analysis suggests that the market will grow at approximately 4 percent per annum compared to approximately 2.3 percent from 2012 to 2017 (Exhibit 16).

Exhibit 16

The flow control sector is expected to grow across all segments at approximately 4 percent CAGR.

Global demand for flow control equipment, %



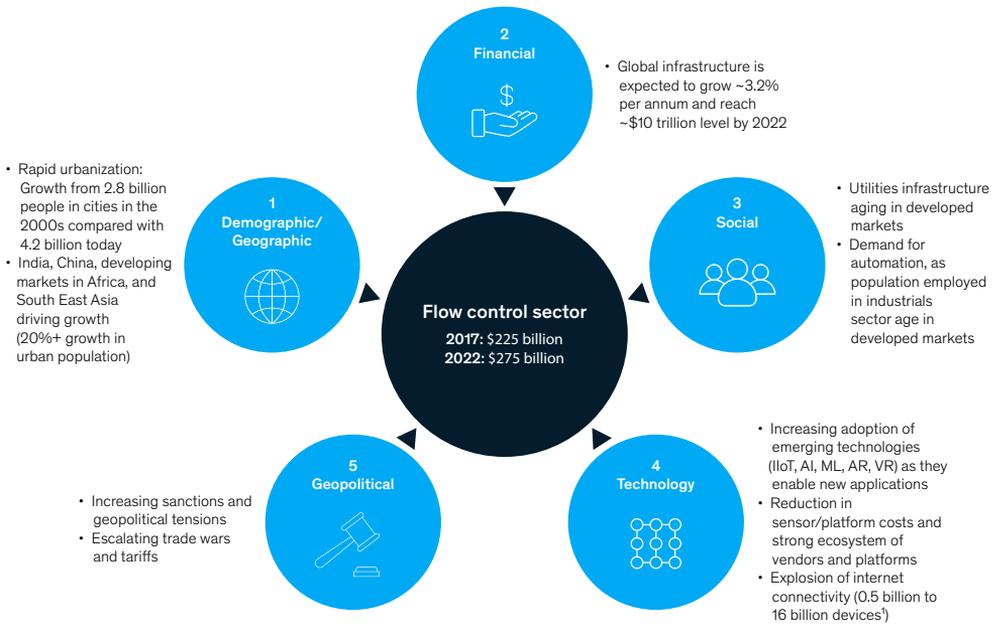
Source: E.I.F. European Industrial Forecasting Ltd. 2014 and 2015; The Freedonia Group; McKinsey analysis

Five global trends are impacting the future demand outlook for flow control companies: 1) geographic trends, including rapid urbanization in emerging markets, 2) financial trends, including global infrastructure growth, 3) social trends, including the impact of an aging population and aging infrastructure, and 4) technology trends, including disruption from new technologies and 5) the threat of sanctions and escalating trade wars (Exhibit 17). These five trends, on balance, will expand the total addressable market for flow control equipment and demand for specialized products and services.

Overall, flow control companies can expect accelerated growth in the next few years as global demand for flow control equipment rises.

Exhibit 17

The flow control equipment sector is undergoing significant disruption, driven by five macro trends.



¹ Early 2000s to today

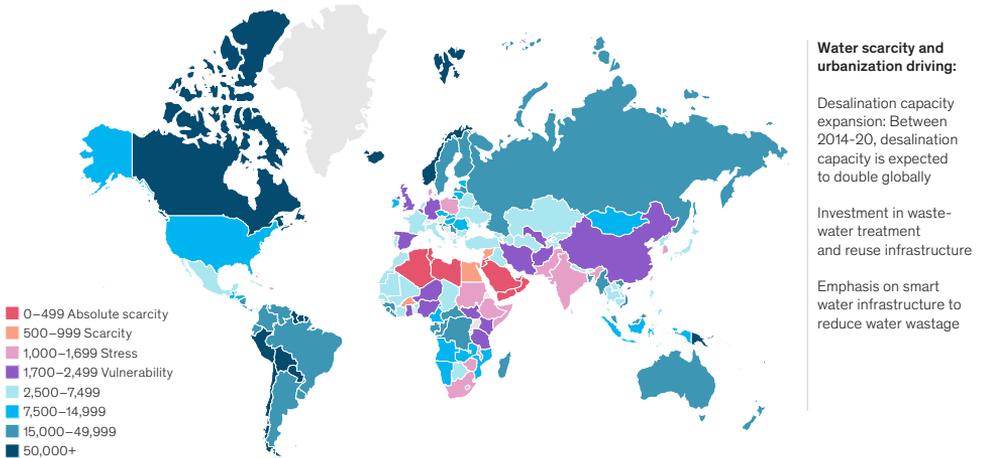
Source: McKinsey analysis; UN DESA 2012; UNESCO

1. Geographic trends. Rapid urbanization in developing economies is expected to increase the population of cities by 20 percent by 2025. This will have significant effects on infrastructure requirements in developing countries such as India and China and in regions such as Africa and Southeast Asia, creating geographic expansion opportunities for flow control companies. Needs will emerge in the oil and gas, construction, chemical, and municipal end markets; and given that urbanization is likely to occur in regions that are often affected by water scarcity, it will also change the mix of facilities with investments in wastewater treatment, desalination, and smart infrastructure (Exhibit 18). More developed and higher-income markets, such as North America and Europe, will present further opportunities for infrastructure modernization.

Exhibit 18

Rapidly urbanizing countries in Asia and Africa are facing water scarcity and a need for greater investment in waste-water treatment, desalination, and smart infrastructure.

Total renewable water resources, m³ per capita per year



By 2050, more than 40% of the planet's population will be living in areas of "severe" water stress

Source: AQUASTAT Main Database, Food and Agriculture Organization of the United Nations (2013); United Nations World Water Development Report

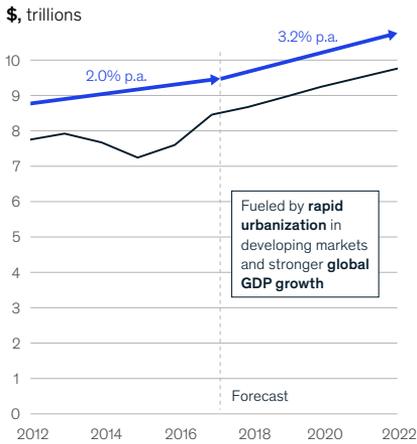
2. Financial trends. In addition to increased spending on infrastructure in developing markets, infrastructure capital expenditures are expected to grow globally by approximately 3.2 percent, reaching nearly \$10 trillion by 2022 (Exhibit 19). Historically, demand for flow control equipment has been strongly correlated with global infrastructure capital expenditures, which bodes well for flow control companies. Given the shift toward renewable energies, which require less flow control equipment compared with conventional power generation, the correlation between spending on infrastructure and flow control in Western markets may be lower. However, significant growth momentum is expected from investments in sectors such as water infrastructure and construction.

3. Social trends. In developed economies, utility and oil and gas infrastructure is aging. For example, the majority of US gas lines were built before 1970, and today the average US power plant is more than 30 years old (Exhibit 20). Overall, aging infrastructure will propel replacement and retrofit activities, which will in turn spur demand for high-margin spare equipment and maintenance services.

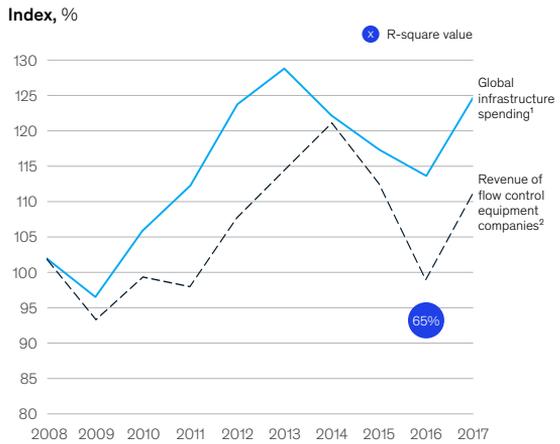
Exhibit 19

The capital expenditure of global infrastructure is growing quickly, spurring growth in the flow control equipment sector.

Global infrastructure capex to reach ~\$10 trillion by 2022



Flow control equipment revenue strongly correlated to global infrastructure capex



High infrastructure spending will create tailwinds for the flow control equipment sector.

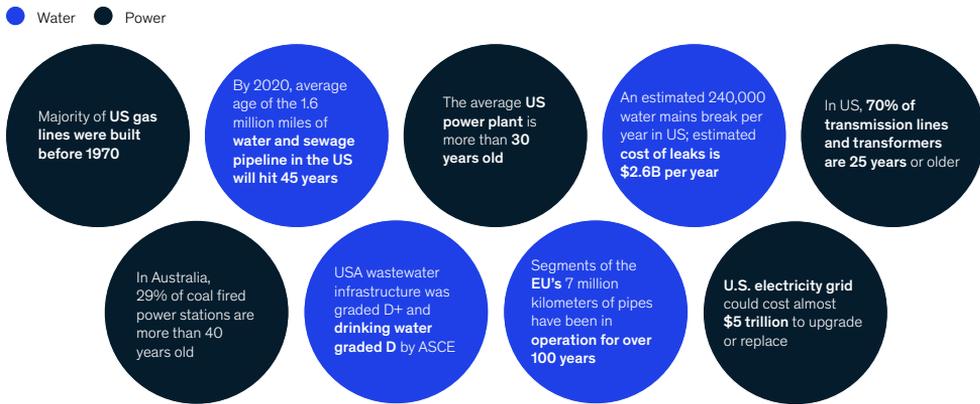
¹ For sectors: oil and gas, chemicals, power, water and water treatment, manufacturing and mining; excludes transportation, telecom, and social infrastructure.
² Fifty-nine public companies included in analysis.

Source: African Development Bank; Asian Development Bank; Country National Accounts Excludes transportation, social infrastructure and telecom sectors; excludes transportation, telecom, and social infrastructure; IHS Global Insight; Global Water Intelligence; International Transport Forum; MEED; Moody's Analytics; World Bank; World Energy Outlook; McKinsey analysis

Exhibit 20

In developed markets, aging utilities infrastructure will drive higher spend on repairs and upgrades.

Aging water and power infrastructure in developed markets



Aging infrastructure in developed markets is driving aftermarket business for flow control sector
 Will drive higher spend in retrofit/brownfield expansion

Source: ASCE, McKinsey Flow Control Executive Survey; \$300 Billion War Beneath the Street: Fighting to Replace America's Water Pipes by Hiroko Tabuchi; Time to Invest in Europe's water infrastructure by Klara Ramm; US Department of Energy

Meanwhile, an aging workforce will create new skills gaps for companies, particularly in the oil and gas and power and utilities sectors, where hiring younger, digital-savvy workers is already a challenge. In the United States alone, 74 percent of companies predict a shortfall of qualified, skilled trade workers. Positions that will be most affected in the next five years include construction, industrial machinery mechanics, and mechanical and industrial engineers.

While automation will help companies address this skills gap, moving from manual processes to automation will require companies to invest in long-term solutions. Many flow control companies possess long-term domain knowledge and are critically involved in those end markets; they will therefore play a crucial role in this transition. The key will be improving in-house capabilities and unlocking additional product and aftermarket sales. However, the more typical, traditional connection between industrial automation and controls may allow for quicker integration of smart devices, operational and information technology (OT-IT) infrastructure, and data analytics, allowing the scope to expand beyond the core business.

Exhibit 21

Disruptive technologies are enabling new internal and external applications for flow control equipment and industrials.

| | Internal applications | External applications |
|--|--|--|
|  Industrial IoT | <ul style="list-style-type: none"> • Asset tracking • Inventory optimization | <ul style="list-style-type: none"> • Predictive maintenance • Remote monitoring and management |
|  Artificial intelligence or machine learning | <ul style="list-style-type: none"> • Pricing optimization • Demand forecasting • Lead scoring | <ul style="list-style-type: none"> • Predictive maintenance |
|  Virtual reality/augmented reality | <ul style="list-style-type: none"> • Product development (and engineering) | <ul style="list-style-type: none"> • Remote maintenance/technical support |
|  Additive manufacturing | <ul style="list-style-type: none"> • R&D rapid prototyping • Tooling/assembly | <ul style="list-style-type: none"> • Direct-production parts |
|  Advanced robotics | <ul style="list-style-type: none"> • Manufacturing automation | <ul style="list-style-type: none"> • Collaborative and context-aware robots |
|  Blockchain | <ul style="list-style-type: none"> • Supply-chain traceability • Data security | |

Many industrial companies are starting to experiment with these applications.

4. Technology trends. Industry 4.0 and the IIoT have completely reshaped market expectations, vastly expanding the amount of connectivity and data the industry requires to make decisions and automate processes (Exhibit 21). As these technologies mature, the Industrials sector and flow control companies have the potential to create new internal and external applications, and these applications will then enable new value creation. For example, predictive maintenance combined with virtual- and augmented-reality capabilities could allow for remote maintenance and technical support without requiring technicians to be physically on-site, making repairs less frequent and less costly. At the same time, companies will be able to optimize their internal operations and use data, analytics, and automation to improve decision making and productivity and conduct cost and pricing optimization activities, among other initiatives.

Analysts estimate that by 2020, more than 30 billion devices will be online. As these technologies become cheaper—for example, the cost of flow control sensors is trending downward—and use cases become clearer, more and more industries will start adopting technology-enabled solutions, and flow control companies and their customers will apply an increasing number of IIoT technologies to improve productivity across the value chain. Additionally, a strong ecosystem of platform providers has emerged, giving OEMs the flexibility to either increase their share in selected verticals or invest in growth along the stack (Exhibit 22).

Exhibit 22

Strong ecosystem of platform providers have emerged that give OEMs flexibility to either increase share in selected verticals or invest in growth themes along the stack

| Technology stack | | Description |
|--|---|---|
| Artificial intelligence and machine learning | | Advanced analytics based solutions that can aggregate, analyse and display data from millions of nodes to extract insights |
| Enterprise level (full stack) | | Complete technology solutions (across all layers of platform stack) that manage the entire value chain for an activity for the end-user |
| Work center level (manufacturing execution system) | Visualization and human-machine interface | Information systems that connect, monitor and control complex manufacturing systems and data flows on the factory floor with the main purpose of ensuring effective execution of manufacturing operations |
| | Analytics | |
| Control device level (programmable logic controller or distributed control system) | PC-based automation | Controls that are programmed on a windows computer and typically used to communicate with and monitor material handling systems |
| | Supervisory control and data acquisition | A control system architecture that is used to monitor and control infrastructure that is spread out over multiple sites |
| | IOT Platforms | A multi-layer technology that enables straight forward provisioning, management, and automation of connected devices within the IOT universe |
| Basic plant level | | Platform that enables companies to get real-time visibility and actionable insights for parts, machines and production line in a manufacturing unit |
| Field device level | Sensors and devices | Broad set of offerings that include board level components (sensors, procesors, storage), networking hardware (routers, gateway), on-device firmware (Device OS, SDK) and packaging (e.g., custom packaging for harsh environments) |
| Network connectivity | | Protocols and services for long-haul (over 4G/LTE, GPS), short-range, and machine-to-machine communications |

5. Geopolitical trends: Increasing sanctions and geopolitical tensions as well as escalating trade wars and tariffs will require companies to navigate new and frequently complex terrain, assessing new opportunities as the industry landscape evolves. If tariff threats escalate into a trade war, GDP growth could slow. Further strain for flow control companies could be caused by a decrease in spending on infrastructure, slowing activity in construction, or another drop in oil and gas capital expenditures. Finally, an increasingly unpredictable political landscape will require players to aggressively maintain their competitive edge and business continuity without taking on any additional or unnecessary constraints or long-term commitments, which can threaten innovation and growth.

Value generation from disruptive technologies

Disruption 2.0 technologies—such as artificial intelligence, machine learning, IIoT, autonomous driving, and blockchain—are expected to change how industries approach their operations and business models. This phase of disruption will be characterized by automated activities, a step change in productivity, and new types of interactions with machines (Exhibit 23).

Exhibit 23

Disruption 2.0 will be game-changing for productivity and enabling new experiences.

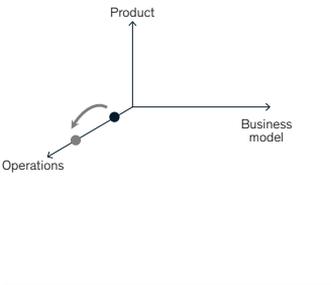
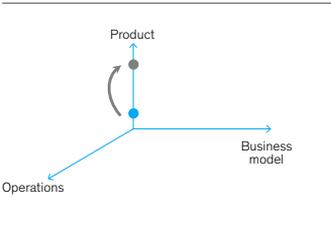
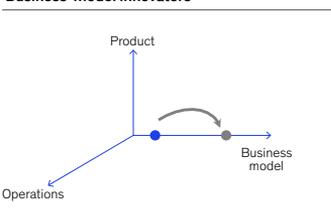
Do things differently

| | Disruption 1.5 People aggregation | Disruption 2.0 Productivity leap |
|--|---|--|
| Disruption 1.0 Information aggregation  Mobile internet  Search  Social networks <ul style="list-style-type: none"> Codified information Made information accessible <p>Google Facebook LinkedIn</p> |  Sharing economy  E-commerce <ul style="list-style-type: none"> Connected people Facilitated transactions, eliminated the middleman <p>Amazon Airbnb Uber</p> |  Artificial intelligence/machine learning  Augmented reality/virtual reality  Autonomous driving  Blockchain/fintech <ul style="list-style-type: none"> Automate activities Improve productivity Enable new types of interactions |
| <p>Disruption 2.0 will also provide companies an opportunity to improve their QoRI by enabling breakthroughs in product and operations, as well as in their business model.</p> | | |

Exhibit 24

Disruption 2.0 will provide significant opportunities for flow control companies to take new leaps along the innovation cube.

■ Enabled by disruption 2.0 technologies

| Operations champions | New applications |
|--|--|
|  | <ul style="list-style-type: none"> <li data-bbox="434 405 1087 473">  Advanced analytics: use AI/ML to improve operations (eg, in pricing or discount optimization, supply-chain forecasting) <li data-bbox="434 473 1087 540">  Next-gen manufacturing: adoption of Industry 4.0 to drive major change in productivity and cost reduction <li data-bbox="434 540 1087 608">  Product portfolio optimization: rationalize SKUs, active product life cycle management, DTV/DTC <li data-bbox="434 608 1087 710">  Production footprint optimization: improve utilization, reduce costs, reduce network complexity |
|  | <ul style="list-style-type: none"> <li data-bbox="434 710 1087 801">  Smart products: enable operational improvements for customers (eg, predictive maintenance with smart pumps) <li data-bbox="434 801 1087 966">  Technology-based new offerings: move up the stack to offer software and real-time analytics-based solutions |
|  | <ul style="list-style-type: none"> <li data-bbox="434 966 1087 1052">  Portfolio of business: refocus efforts on microverticals that are attractive and in which company has inherent ability to win <li data-bbox="434 1052 1087 1130">  New monetization models: shift from selling equipment to services (eg, subscription for predictive maintenance) <li data-bbox="434 1130 1087 1193">  Go-to-market approaches: optimize channel structure, drive sales-force effectiveness (eg, 3-D printing to disrupt spare and maintenance value chain) |

Disruption 2.0 technologies are creating opportunities for companies to improve the economics of their existing business as well as secure a step change in growth. Flow control companies are no different. With their own operations, product portfolios, and business models stand to gain if they embrace Disruption 2.0. Companies that embrace disruption will be able to take leaps and innovate in each of those areas, ultimately creating higher quality of revenue and supporting in the next phase of growth (Exhibit 24)—an important goal for a sector that is experiencing a plateau in value generation.

Companies that have already advanced on all three dimensions—operations, product, and business model—secured the highest quality of revenue and broke away from their peers in terms of financial performance. Progressing on all three dimensions is rare; most companies focus on one dimension to be recognized as an operations champion, product leader, or business model innovator.

Operations champions

In the flow control sector, we've identified four applications, or use-case scenarios, that can enable companies to achieve higher operating performance: using advanced analytics, deploying next-generation manufacturing techniques, optimizing existing product portfolios, and rationalizing their production footprint.

Using advanced analytics

When done well, advanced analytics can provide valuable insights that allow flow control companies to make smarter decisions about their supply chains and pricing models, including dynamic pricing. Using advanced analytics for both customer-facing service lines and internal improvements requires a focus on data management and infrastructure—for example, organizing high-quality data from multiple sources in a data lake and enabling the architecture and tools to process and visualize that data.

In one example, a global provider of advanced flow control equipment and systems developed a machine learning–based dynamic pricing model to provide real-time price recommendations. The machine inputs encompassed vast amounts of data, including internal sources (transaction history, customer information, and win/loss data) and external data (such as competitive intelligence and commodity price trends). The model then estimated optimal prices for each quote, significantly reducing manual time to produce quotes and layering more business intelligence than the company had been able to do previously. The result was a 9 percent uptick in return on sales across the organization, versus the 2 to 3 percent it had previously captured.

Organizations need to be prepared to invest heavily in data and analytics capabilities and align all stakeholders and top management in buy-in, adoption, and culture change. The pricing model was successful for the flow control equipment and systems provider because of the company's

Organizations need to be prepared to invest heavily in data and analytics capabilities and align all stakeholders and top management in buy-in, adoption, and culture change.

agile approach to testing and refining the model, the hands-on role of top management, and a willingness to invest. While flow control companies have not moved into this space previously, the return on investment can be significant.

Product leaders

Another approach that companies have taken to improve their quality of revenue is to innovate consistently in their product portfolio to drive more value (and hence margin) generation and create stickiness with customers. Disruption 2.0 technologies give flow control companies the ideal opportunity to rethink their product portfolios and focus on smarter products and portfolio diversification. With the declining cost of sensors, innovation in faster and more resilient hardware, the existence of multiple platform providers, and improvements in data management capabilities, companies have the ideal launch pad to develop and launch their next generation of products.

Smart products

Investing in smart products with embedded sensors will both enable operational improvements for customers and provide flow control companies with vast amounts of data on usage and performance. Flow control companies can then use that data to guide decision making in real time, as can the customer.

For example, a leading industrial pump OEM discovered that smart pumps (enabled with sensors and appropriate back-end infrastructure) allowed it to roll out predictive maintenance capabilities that had the potential to reduce equipment downtime by 30 to 50 percent and save 10 to 40 percent on maintenance costs, making these pumps a better investment for customers. Smart products also enable other value-add applications that can be deployed in the future—such as remote monitoring, throughput optimization, and automation—to help flow control companies capture greater market share.

Furthermore, flow control companies need to rethink how they move up the stack to offer software and real-time analytics-based solutions. As their product mix changes, those that take advantage of the data and hardware-software connectivity will be able to provide customers with a full solution that includes data and insights. Additionally, these solutions provide companies with a source of recurring revenues that is valued much more highly by investors.

Business model innovators

The business model is one of the most difficult areas for innovation because changing the business model requires both a significant shift in existing and established ways of working and a change in culture throughout an organization. Flow control companies can be business model innovators in two ways: refining their “where to play” (focusing on end market, application, and technologies where they can secure a winning position) and redefining their “how to serve” (adopting a newer monetization model and refining go-to-market activities).

When rethinking business models, companies that shape their business portfolios to systematically maximize the quality of revenue typically choose microverticals (defined as the cross-section of end market, application, and product technology) based on attractiveness (size, growth, margin) and ability to win (competition, technology advantage). These companies also tend to focus on partnering with or acquiring companies that can improve their ability to compete in their focus markets, thereby extracting maximum value.

As flow control companies bring applications from new technologies to their end-customers, the “how-to-serve” will become increasingly important. The traditional business models of selling equipment and spares through a mix of direct and distributors will fall short when companies want to monetize their analytical and predictive capabilities. This requires a fundamental shift in the sales motions to prepare for a shift from selling equipment to services, from one-time revenues to a recurring revenue stream, and from waiting for customer/channel demand signals to predicting end-customer needs. Companies that deploy the appropriate business models will secure a large share of value that the disruptive technologies will create for end-customers.

Refined GTM motion as a source of competitive advantage

A multinational industrial pump OEM has built a geographically concentrated service network to create competitive advantage in capturing an end market. This included opening multiple service centers, recapturing revenue and margin that had previously gone to distributors and service teams. The close proximity of the centers allowed the company to provide more robust service level agreements, which were particularly important for customers who were risk averse and wanted immediate service in the event of a pump going down. The speedy service and highly trained personnel at the centers allowed for efficient recovery, building customer loyalty and permitting the company to provide the service at a premium cost. At the same time, the company increased its product offerings and expanded into more diverse revenue sources, allowing it to maintain profitability even as capital expenditures on new projects fluctuated. As a result, the company outperformed the market in revenue growth, particularly in oil and gas, and earned a reputation among executives for the high quality of its service and products.

In the near future, 3-D printing is also expected to disrupt traditional service models. Traditionally, flow control distributors have devoted an entire business line to repairs. Plants send a signal to distributors when parts need repair, prompting a distributor to travel to the plant and repair or replace the faulty part. The distributor would charge the plant for parts and labor. With on-site 3-D printers, however, plants will be able to replace faulty parts on their own within a short period of time. Distributors, then, need to consider their role in this new process and look to new business models to create value.

While demand growth and value-generation potential exist, will flow control companies benefit from these opportunities? Do the companies have the right enablers in place? If not, do companies have the funds to invest in the right technologies? Do they have a plan on which opportunities to prioritize?

Sector pulse check: Executive survey

To understand the pulse of the sector, we surveyed over 40 executives from the flow control sector, focusing on their outlook for the sector, upcoming opportunities for growth, and their preparedness to secure these opportunities. We've distilled the results into four key findings.

1. Flow control leaders are optimistic about the sector's future

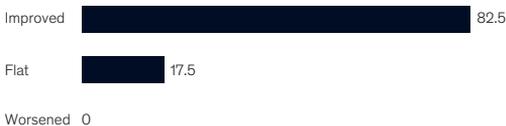
More than 80 percent of the executives we surveyed think that flow control performance sentiments have improved in the past year, and almost 60 percent believe the sector will grow faster than GDP (Exhibit 25).

Exhibit 25

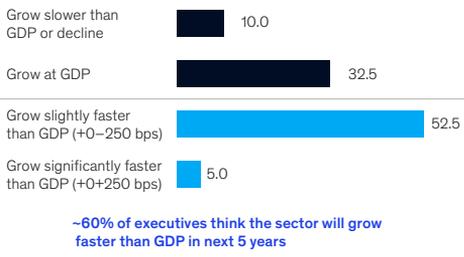
The majority of flow control executives surveyed believe that sector sentiments have improved in the past 12 months.

Sector sentiment growth, % of respondents

*In your experience, how were the last 12 months?
Sentiments have:*



How do you think the flow control sector will perform relative to the broader economy?



Source: McKinsey Flow Control Executive Survey; McKinsey analysis

2. New technologies and geographic expansion will provide new growth opportunities

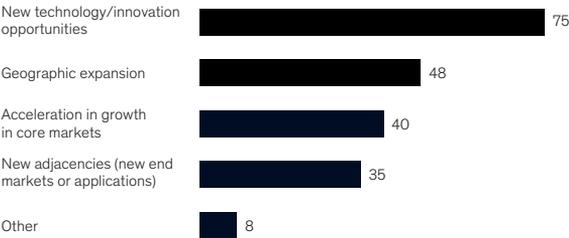
75 percent of our survey respondents agreed that new technologies offer the biggest opportunities for growth (Exhibit 26). Traditionally, flow control companies have lagged behind in their adoption of technology and reactions to new trends as most companies have been able to thrive on high margins and specialization. Now, however, executives recognize the need to embrace change and make moves in new areas. Additionally, the percentage of overall revenue from software and new solutions and services is expected to nearly double (from approximately 10 percent in 2017 to approximately 18 percent in 2027) in the next ten years (Exhibit 27). Growing interest in technology and innovations is also demonstrated by increasing acquisitions of IoT, data analytics, and software start-ups among large flow control companies.

Exhibit 26

Flow control executives recognize that new technologies and geographical expansion present the biggest opportunities.

Largest opportunities, % of respondents

What do you see as the biggest opportunities for companies in the industry?

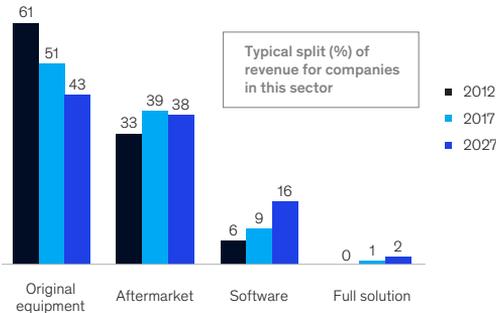


Source: McKinsey Flow Control Executive Survey

Exhibit 27

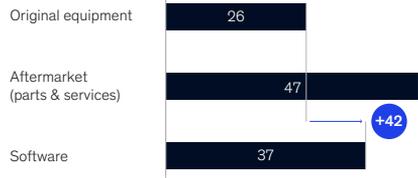
With-in product categories, Software and Full solution as % of total will grow, while original equipment will decline.

Flow control executive survey, % of total



Source: McKinsey Flow Control Executive Survey

Gross margins by segment, Wt. average, %



Aftermarket and software are more profitable businesses than original equipment.

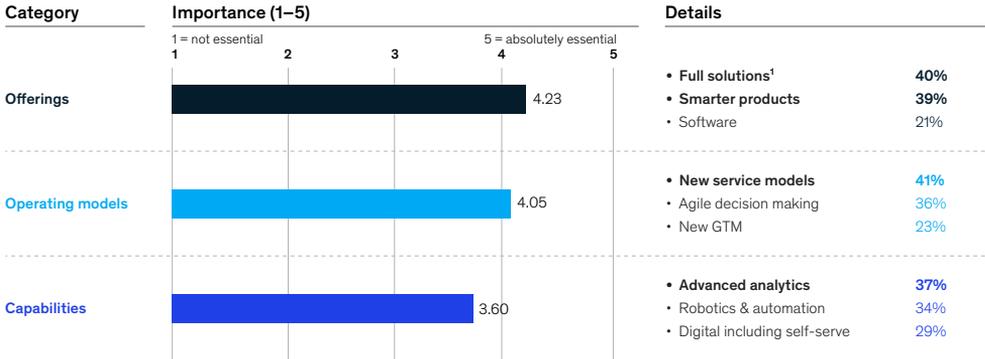
3. Executives know what they need to do—but they feel unprepared

Most executives agreed that they need to expand their offerings, particularly by focusing on smarter products; offer a full solution for their customers; and improve their capabilities by incorporating advanced analytics into their approach. These changes in turn require them to make different operating-model choices so they can be more agile both in their own decision making and in serving customers (Exhibit 28).

While executives recognize that they need to take advantage of new opportunities, few feel ready. In our survey, only a small percentage of companies (10 to 15 percent) had made significant

Exhibit 28

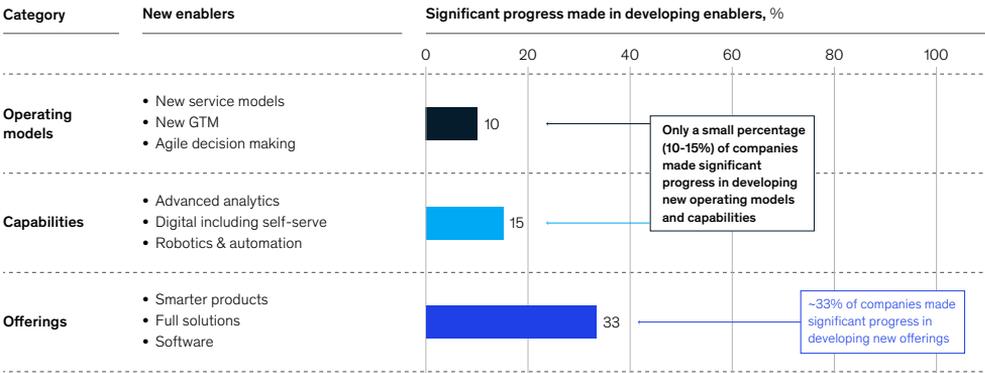
To capture new opportunities, executives believe they will need new enablers, especially ‘smarter’ or IoT-enabled products, full solutions, and new service models.



¹ Built around smarter products.
Source: McKinsey Flow Control Executive Survey

Exhibit 29

While the sector growth will provide significant opportunities for growth, industry executives feel underprepared to capitalize on these opportunities.



Source: McKinsey Flow Control Executive Survey

progress in developing new operating models and capabilities. More executives (33 percent) responded that they'd made significant progress in developing new offerings, but the number is still fairly low given the potential of the opportunities (Exhibit 29).

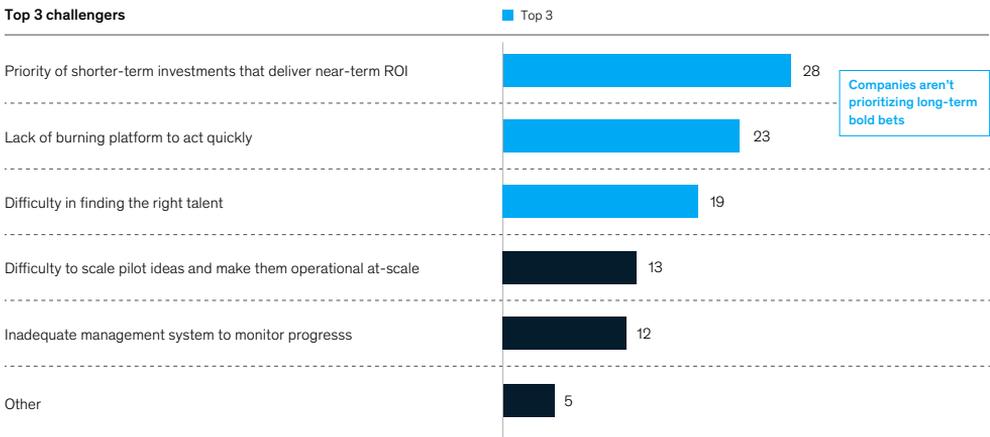
4. Focus on short-term investments, lack of a burning platform, and difficulty finding the right talent are proving to be this sector's Achilles' heel

When asked what's holding them back, executives said the greatest challenge comes from companies' reluctance to make bold bets—28 percent suggested that shorter-term investments are taking a higher priority, 23 percent cited the lack of a burning platform to act quickly, and 19 percent found it difficult to find the right talent to drive the priorities (Exhibit 30).

Exhibit 30

The greatest challenge for flow control companies attempting to develop new enablers is prioritizing long-term bold bets when short-term investments provide quicker returns.

Greatest challenges for companies in developing new enablers, % respondents



Source: McKinsey Flow Control Executive Survey

Key imperatives for a winning play

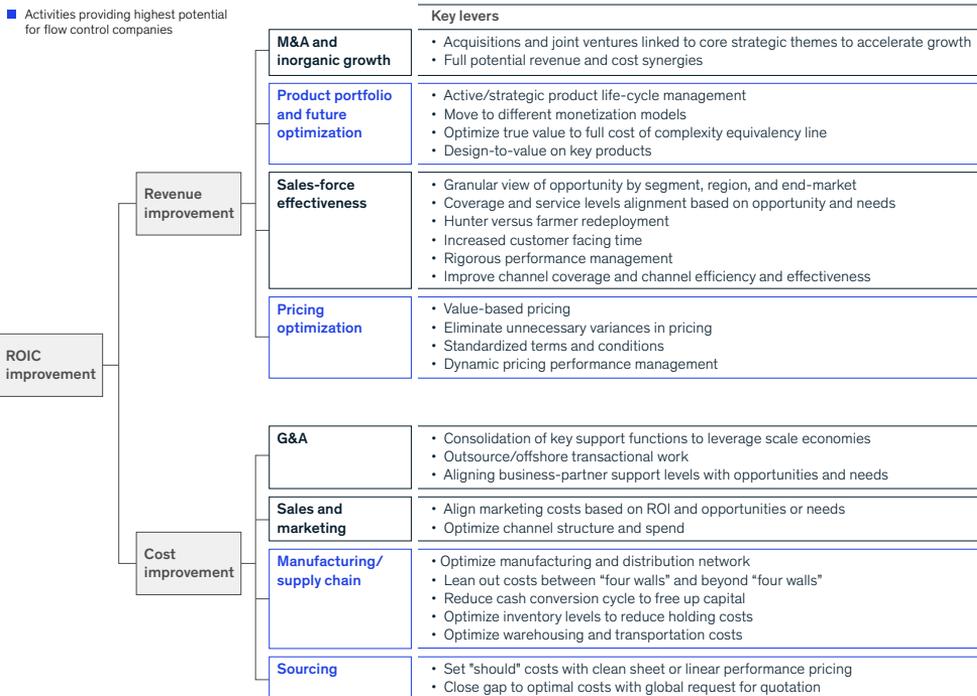
The tailwinds driving the flow control sector will provide ample opportunity for companies equipped with the right enablers to outperform their peers and accrue value. However, companies that maintain status quo will be left behind as the market changes. With innovation disrupting the sector, the old playbook will no longer suffice. Conversely, capturing value from these innovations will not be trivial. Going forward, companies must address four key imperatives to develop a winning strategy and scale up: close the operating performance gap to free up capital, establish a pragmatic game plan to use disruptive technologies to drive higher quality of revenues, broaden the M&A mandate to acquire new technologies and talent, and establish a strong governance and performance-management backbone.

1. Close operating performance gap to free up capital

New technologies and solutions are critical to success in the new environment. However, technological development requires a significant investment in capabilities, infrastructure, change management, and talent. Flow control companies can free up cash for these investments by looking across the ROIC tree for opportunities such as product portfolio and feature optimization, pricing, supply chain optimization, and sourcing (Exhibit 31). As the business landscape changes

Exhibit 31

Adopt a ROIC lens to identify full revenue and cost improvement potential to free up cash to invest in value creation opportunities from Disruption 2.0.



and new opportunities emerge, those investments will be crucial for growth. Flow control companies are likely to see the highest potential for margin improvement with pricing optimization and cost reduction in their manufacturing, supply chain, and sourcing.

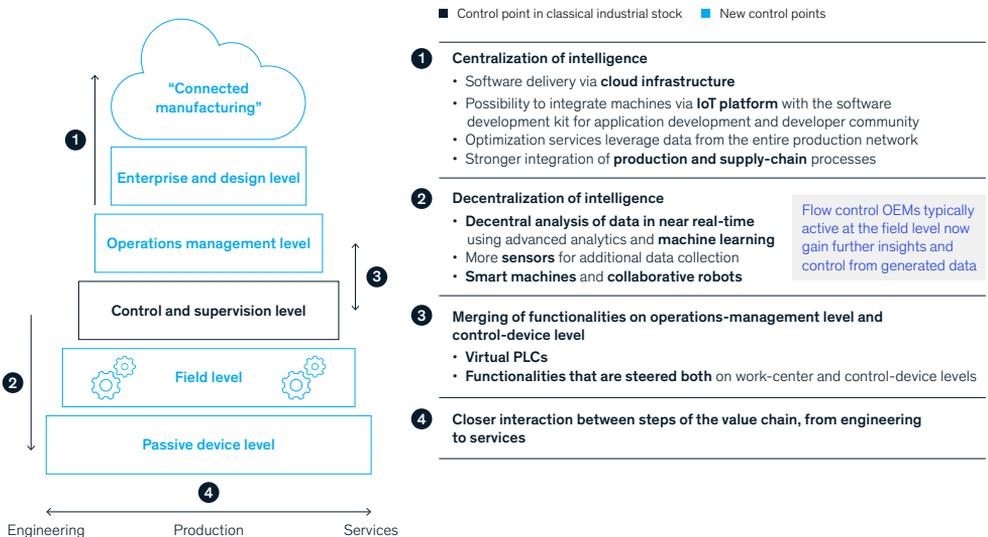
2. Establish a pragmatic game plan to use disruptive technologies

Innovation can be expensive. Disruption 2.0 technologies can help flow control companies improve quality of revenue by focusing across the axes of product innovation, new business models, and operational excellence—meanwhile, the associated investments are significant. A pragmatic game plan is necessary to ensure the highest ROIC.

Product innovation through a defined play in the technology stack. A deliberate and targeted action in the technology stack is critical as flow control companies look to bring new capabilities to their existing customers. For example, predictive maintenance requires equipment with sensors to collect data, communication layers to transfer the data, and infrastructure to analyze the data and generate insights. The highest value will be created through a complete solution that provides insights rather than a sensor-enabled product that only collects data. However, most flow control companies don't currently have capabilities across the entire stack, so they will need to identify the control points in the stack where they can secure the highest share of value (Exhibit 32). This

Exhibit 32

Disruption 2.0 technologies will shift industrials control points along the automation stack, providing new opportunities for OEMs.



Changes are driven by **reduction of cost** for data storage (USD 0.03 per GB, -32% CAGR), **computation** (USD 0.01 per million transistors, -36% CAGR) and **connectivity** (USD 0.63 per mbps, -37% CAGR).¹

¹ Costs in 2015 and CAGR from 2000 to 2015.

Source: McKinsey

will require a clear understanding of the company's key competencies and the new capabilities that need to be developed, bought, or secured through partnerships.

Each company considering a play across the technology stack should deliberate through the following structural questions: What solutions can be enabled by using technology disruptions? What are the key components of the technology stack for each solution? How much value is generated and how does it break out across the stack? What control points will be critical to own to capture this value? What is the investment required and the expected ROI? Should I build versus buy versus partner with?

New business model innovations. Companies that deploy new business models will capture more of the value generated for the end customer through the new technology-enabled solutions. As companies move up the stack, traditional business models of equipment sales alone will not suffice. In a more intricately connected world, customers will be looking for solutions, and flow control companies should determine how to provide and price those solutions. Companies thinking through new business models should contemplate a few key questions: What are the various business model options available for monetizing new solutions? What are the pros and cons for each model? Which is the right option for each new offering or solution? What should be the approach to testing and launching these models? What will be the value proposition to the potential customer? And finally, what are the overall economics of the model?

Innovating in operations. Among the three axes of the innovation cube, improving operations through innovation has garnered the highest attention. Most of the recent progress has been on using advanced analytics in deal scoring and in automation in manufacturing. This is primarily because upside is easier to quantify (cost savings, topline growth) and impact to existing end customers is minimal since most changes are to internal operations. Nevertheless, a comprehensive approach that identifies all use cases enabled by disruptive technologies, evaluates impact of each, effectively prioritizes balancing for return and risk, and finally utilizes the right approach to build and implement these use-cases is necessary.

Companies that deploy new business models will capture more of the value generated for the end customer through the new technology-enabled solutions.

3. Broaden the M&A mandate

Traditionally, M&A activities in flow control have focused on sector consolidation. For companies to pull ahead and capitalize on new trends and Disruption 2.0, they should broaden focus of their M&A mandate to also fill gaps in technology and capabilities. M&A can provide a faster route to product portfolio diversification, new business models, and technologies and capabilities such as advanced analytics. The alternative—growing these business functions organically—can be time-consuming and costly.

4. Establish governance and performance-management

Closing operating-performance gaps and delivering on investments in innovation is a multiyear transformation. Such undertakings field a high risk of going directionless and compromising significant capital. As flow control companies embark on this journey, they should reflect on three questions: Have we defined appropriate near-term milestones that will help us gauge progress against the end-state objectives? Are we agile in our decision making so that we can reprioritize if our initial bets are not successful? Have we reserved sufficient senior management attention to the cause?

Conclusion

Flow control companies have enjoyed strong performance over the past 15 years, and growth is expected to continue as global forces accelerate demand for flow control products around the world. The future is bright, and executives are optimistic that the sector will outpace broader economic growth in the years ahead. However, with this positive outlook comes the recognition that traditional sources of value are likely to peak, and value is accruing with a smaller number of players in the industry; to break through the value-creation plateau, flow control companies will need to embrace disruption and a changing landscape. Flow control companies must keep pace with Industry 4.0, the IIoT, and machine learning, and robustly engage with the changing demands of the global market.

As innovation disrupts the sector, the old playbook will not suffice. Companies that take a disciplined approach and focus on quality of revenue are most likely to pull ahead. Going forward, companies must address four key imperatives to develop a winning strategy: close the operating performance gap to free up capital, establish a pragmatic game plan to leverage disruptive technologies, broaden the M&A mandate to acquire new technologies and talent, and establish a strong governance and performance management backbone.

Flow control companies that make the right moves stand to gain significant advantage in an exciting period of growth and disruption. Others might get left behind.

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 describes the mean annual growth rate over a number of years

Capital turns

Sales divided by average IC excluding Goodwill

Cloud computing

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

Earnings multiple

NEV divided by/as a share of EBITA

EBIT

Earnings before interest and tax

EBITA

Earnings before interest, taxes, and amortization

EBITDA

Earnings before interest, taxes, amortization, and depreciation

EP

Economic profit = NOPLAT – WACC x IC

Employee productivity

EBITA per employee

EP/R

Economic profit as a share of revenue

IC

Invested capital

Industry 4.0

Integration of hard- and software into industrial and customer-relation processes based on cyberphysical systems and the IoT 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 (2002–07) and third (2012–17) cycles

NEV

Net enterprise value

NOPLAT

Net operating profit less adjusted taxes

Operating leverage

Percentage change in EBITA less percentage change in revenues

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 (2002–07) and third (2012–17) cycles

Tangible capital ratio

Average IC excluding Goodwill:average IC including Goodwill

TRS

Total return to shareholders, including capital gains and dividends

WACC

Weighted average cost of capital

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