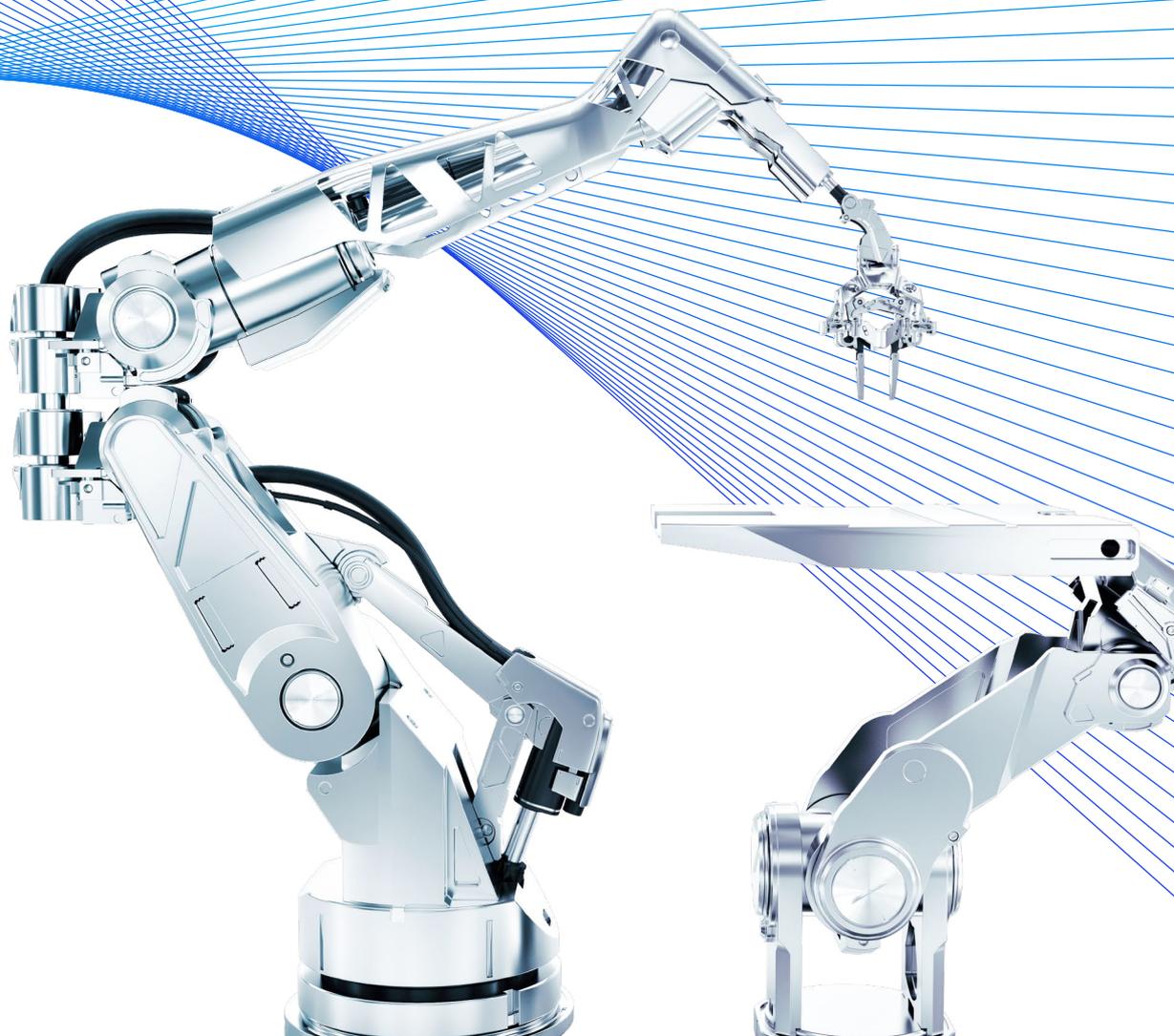


McKinsey
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Changing market dynamics

Capturing value in machinery and industrial automation



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Introduction and key insights

The global machinery and industrial automation sector has been in a well-balanced equilibrium for decades – with only small revenue and market share shifts in the low single-digit percentage range. Now things are suddenly becoming really exciting again.

This is because there seems to be a clear and widespread consensus among pundits and the sector's players that two emerging global mega-trends in their industry – shifting growth patterns and the increasing pace of digitization – will have a severe impact on strategic control points and value pools, forcing companies to rethink their business model. The trends' impact value pools are especially critical because the ability of the sector's players to hold on to the value they currently claim, capture the new value being created (or do both), as well as to "stake/maintain a claim" in the new machinery and industrial automation landscape is directly tied to their ability to occupy strategic control points along the evolving value chain.

Due to a lack of research and the complexity of the questions involved, however, very little is known regarding:

- What the resulting changes of shifting growth patterns and digitization will look like
- How they will affect the different archetypes of players
- Which archetypes/players will be the winners and the losers of the game
- How individual archetypes/players can improve their chances of capturing the opportunities and address the challenges/threats.

Currently, most established players – OEMs, automation device suppliers, and machine control suppliers – are working on strategies to cope with shifting growth patterns and the resulting mix of unexpected high demand and declining growth in more mature technologies. At the same time, these players are preparing themselves to be best positioned to claim a share of the additional value expected to be created by digital manufacturing solutions, which we estimate will double to EUR 32 billion worldwide by 2025.

At the same time, the disruptive trend of digitization is also attracting new players to participate in the market, especially in the space of software, platforms, and application providers. This diversification challenges the foothold that established players have enjoyed on strategic control points, e.g., the machine control layer in the automation technology stack. While the strategic cornerstones are often obvious and similar across players – e.g., securing core business, capturing additional value from digitization, and increasing internal efficiency – the exact chances of success of individual strategic measures and the threat from competition remains uncertain.

Against this challenging backdrop, we set out in the following to discuss and shed light on:

- The sector's status quo and key characteristics. To this end, we organize and take stock of the global machinery and industrial automation industry. The resulting overview serves as a basis for understanding why and how the industry can be expected to change.
- Where the industry is heading and what the top priorities are. To this end, we have turned to the players themselves: our insights are drawn from a financial analysis, the survey of players, and from interviews with players and other industry experts specifically conducted for this report (see Text box 1).
- How every company in this diverse set of players can best navigate the emerging new industry landscape and develop a strategy that best positions them to hold on to the value they currently claim, capture the new value being created, or both.

Text box 1: How we derive insights for this report

We utilized McKinsey's Advanced Industries Practice's extensive research, the experience of our McKinsey colleagues, as well as public data and insights from across the machinery and industrial automation sector.

At the heart of our research is a survey of sector players, which was carried out in 2018 and covered small and medium-sized enterprises as well as large multinationals active in the sector, mainly headquartered in Europe. We then analyzed the performance of 146 market players across different business models/archetypes. Because several players follow more than one business model, e.g., are active as an OEM and a supplier in parallel, we analyzed them separately by model, taking our analysis of 146 players to an analysis of 201 units. Of this total, 43 percent act as OEM or system integrator, 35 percent as component supplier (both automation devices and machine controls), and 22 percent as software, platform, or application provider. See Exhibit 1 for a description of business model archetypes and the scope of analysis.

Various big data analyses on specific industry perspectives, e.g., on M&A activity in the market along 650 transactions/deals were announced between 2015 and 2018.

Also core to our research is an analysis of the different "strategic control points" in the ecosystem that allow market participants to obtain/defend a superior position in the ecosystem (especially upstream towards direct customers) and therefore a higher share of value in the ecosystem, compared to those not capturing relevant strategic control points (for further details on strategic control points and our analyses of them, see Text box 3).

Exhibit 1

146 organizations analyzed ... running 201 distinctive business models/archetypes

Revenue 2017	No. of business model archetypes analyzed	Detailed description/scope of analysis
Lower quartile: EUR 1.0 bn	87 43% OEMs and system integrators	<ul style="list-style-type: none"> – OEMs – manufacturers of machines and robots (being sold to end customers/users) – System integrators – integrators of own and third-party components and machines to customer-specific production cells/lines
Median: EUR 1.9 bn	71 35% Component suppliers	<ul style="list-style-type: none"> – Suppliers of automation devices – manufacturers of automation devices like actuators, sensors, HMI, etc., excluding machine controls – Suppliers of machine controls – manufacturers of machine controls, e.g., PLC, DCS – Nonautomation component suppliers – manufacturers of machine hardware components, e.g., cables, housings, base (not in focus)
Upper quartile: EUR 4.3 bn	43 22% Software, platform, and application providers	<ul style="list-style-type: none"> – Management software providers – providers of process-/plant-/enterprise management software – Providers of IoT platform – IoT platform providers for third parties – (Cloud) storage providers – providers of cloud/data storage services – Business application providers – developers of business applications, e.g., predictive maintenance solutions

SOURCE: McKinsey

Our research and analyses yielded the following key insights, which will be explained in more detail in this report:

- **MIA growth is varied at the granular level.** By player type, revenue growth has ranged from 3.7 percent all the way to 6.7 percent, with margins trending upwards for some and downwards for others. Geographically, demand shifts in one region are impacting production in others.
- **Digitization is giving rise to new business models.** Software development and data analytics are supporting business models that extend beyond the production and sale of hardware. Software-enabled and as-a-service business models will go from about a third of sector revenues today to over half in the near future.
- **Relevance of control points is shifting, and ownership is up for grabs.** OEMs and system integrators own many of the key control points today. An evolving machinery and industrial automation ecosystem, however, both opens the door to players controlling them in the future and grants new strategic importance to control points that, in the past, were less critical.
- **A lack of both digital capabilities and profitable business cases are significant challenges.** Machinery and industrial automation companies will need to adopt a way of working that values, enables, and encourages customer co-creation, builds capabilities (via M&A/JV), and attracts top talent in order to capture the value of new business models.
- **No single path, but a clear guiding principle.** The forward-looking strategy for machinery and industrial automation companies will need to consider their individual aspirations and value chain positions. All companies, however, should focus on the most attractive opportunities that also align with their particular strengths and emphasize their core business.

1 The sector today

1.1 Overview: players and control points

The ecosystem of machinery and industrial automation has emerged over the last decades into a prospering, fast developing industry, supplying machinery and robotics to all kinds of discrete manufacturing sectors, e.g., automotive, electronics, machinery, aerospace, semiconductors.

These products include standard machines, e.g., for punching or bending, as well as the highly sophisticated machinery used, for example, in lithography in the semiconductor industry. The range also includes complex mechanical machinery, such as the type used in textile manufacturing, application-specific machinery (e.g., turning machines or robot arms), and sector-specific systems, e.g., packaging machinery. In addition, there is a market for automation components, delivering devices (e.g., for actuators, sensors, HMI) or machine controls (e.g., PLC) either to the OEM or end user markets.

For the purpose of this study, we clustered market participants with similar business model patterns into three business model archetypes, each with their own, distinct characteristics and corresponding subcategories. Of course, only a few players perfectly match the characteristics of a single archetype and one of its subcategories; however, nearly all the companies can be assigned to one major archetype and, in some cases, to a subcategory of that archetype. The three business model archetypes evaluated are as follows (see Exhibit 2).

Exhibit 2

Archetype	Subcategories
OEM and system integrator	<ul style="list-style-type: none">– OEMs (machines and/or robots, manufacturers of machines and robots (being sold to end customers/users))– System integrator (integrators of components and machines to customer-specific production cells/lines)
Supplier	<ul style="list-style-type: none">– Automation component supplier – devices (manufacturer of automation devices like actuators, sensors, HMI, etc.)– Automation components supplier – machine controls (manufacturer of machine controls, e.g., PLC, DCS)– Nonautomation component supplier (manufacturer of machine hardware components, e.g., cables, housings, base)
Software, platform, and application provider	<ul style="list-style-type: none">– Management software provider (provider of process-/plant-/enterprise management software)– Provider of IoT platform – provider of IoT platform (for third parties)– (Cloud) storage provider (provider of cloud/data storage services)– Business application provider (developer of business applications, e.g., predictive maintenance solutions)

SOURCE: McKinsey

OEMs and system integrators

OEMs and system integrators develop, manufacture, and sell “complete” machines and/or robots to end customers/users and, in many cases, run a substantial after-sales business related to the machines/robots sold. The providers of “standard” machines or systems with limited customer-specific adaptations, for example, based on a platform and module concept, are considered OEMs (e.g., a provider of milling machines). By contrast, system integrators design and assemble customer-specific production cells and lines according to end customer requirements, which are often vertical specific (e.g., a car body assembly line consisting of several cutting and joining applications, fully automated).

The McKinsey client survey reveals that OEMs and system integrators largely control the end customer access (74 percent), but they also cover most other “traditional” strategic control points like domain know-how (62 percent) and regulatory approval (64 percent), for example. With regard to “newly emerging” strategic control points like algorithms/data-driven insights (33 percent) and multisided/proprietary technology platforms (28 percent), however, OEMs and system integrators have not established a leading position compared to other archetypes.

Suppliers of machine controls, automation devices, and nonautomation components

Component suppliers mainly deliver components or subsystems to the OEMs or system integrators, either for the initial assembly of the machine and/or robot, or their aftermarket business. For specific components (e.g., motor spindles for turning machines), component suppliers also deliver directly into the independent aftermarket. According to our survey, component suppliers in general have a large stake in covering strategic control points of industry standards (36 percent), switching effort/cost (38 percent), and algorithms/data-driven insights (33 percent, on peer level with OEMs and system integrators).

As coverage of strategic control somewhat differs for different components, we further distinguish three types of components suppliers: automation component suppliers for machine controls (especially for PLC), suppliers for automation devices (e.g., for motion controls, sensors, HMI), and nonautomation component suppliers (e.g., for cables, housing, or base). Suppliers of machine controls have their own special position in the market, as they claim the strategic control point of end customer access for their specific component (i.e., machine PLC) directly instead of the OEM. Programming machines in a way that they produce the desired part at the desired accuracy and in the most efficient way is still an art and requires expert knowledge and many years of experience. As programming is not standardized, these experts – often very few at each manufacturing site – are specialized to one machine control (software), and thus, the end customer will always order the machine they need with exactly the machine controls their production experts are specialized in. Thus, the machine OEM needs to select the respective controls provider and has limited bargaining power.

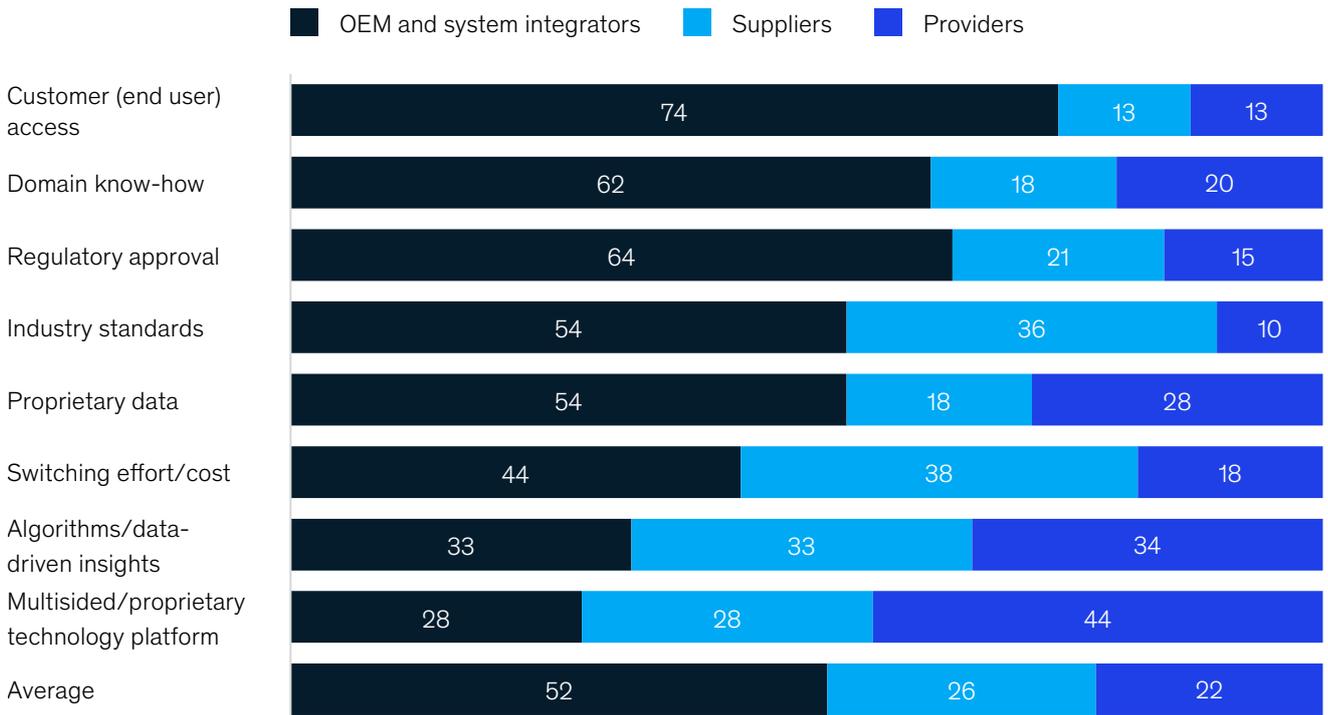
The software, platform, and application providers

This archetype covers companies that develop software and business applications for the machinery market. Hence, its subcategories are providers of management software (e.g., process-/plant-/enterprise management software), IoT platforms for third parties, (cloud) storage, and of business applications (e.g., predictive maintenance solutions). Our survey results indicate that, in general, these providers have significant shares of the strategic control points of multisided/proprietary technology platform (44 percent), algorithms/data-driven insights (33 percent, on level with OEMs’ and system integrators’ shares), and proprietary data (28 percent).

For an overview on the strategic control points and the coverage through the different archetypes, see Exhibit 3; for a more detailed explanation of the strategic control points evaluated, please see Exhibit 12.

Archetypes leading in covering each of the strategic control points

Percent



SOURCE: McKinsey Machinery & Industrial Automation survey

The ecosystem of machinery and industrial automation has evolved over the last decades into a prospering, fast developing industry. The IHS’s Comparative Industry Review put the 2017 OEM and system integrator market at more than USD 2.9 trillion in 2017 (across all types of machinery) and the market for automation components – delivering devices (e.g., for actuators, sensors, HMI) or machine controls either to the OEMs or the end user markets – at USD 0.2 trillion.

Over the last decades of growth, with the exception of a brief interruption during the financial crisis of 2007 to 2009, EBIT margins were fairly stable at around 10 percent. OEMs achieved average margins of 9.1 percent, machine controls suppliers averaged 12.4 percent, and software providers averaged 10.0 percent in 2012.

1.2 Trends and challenges

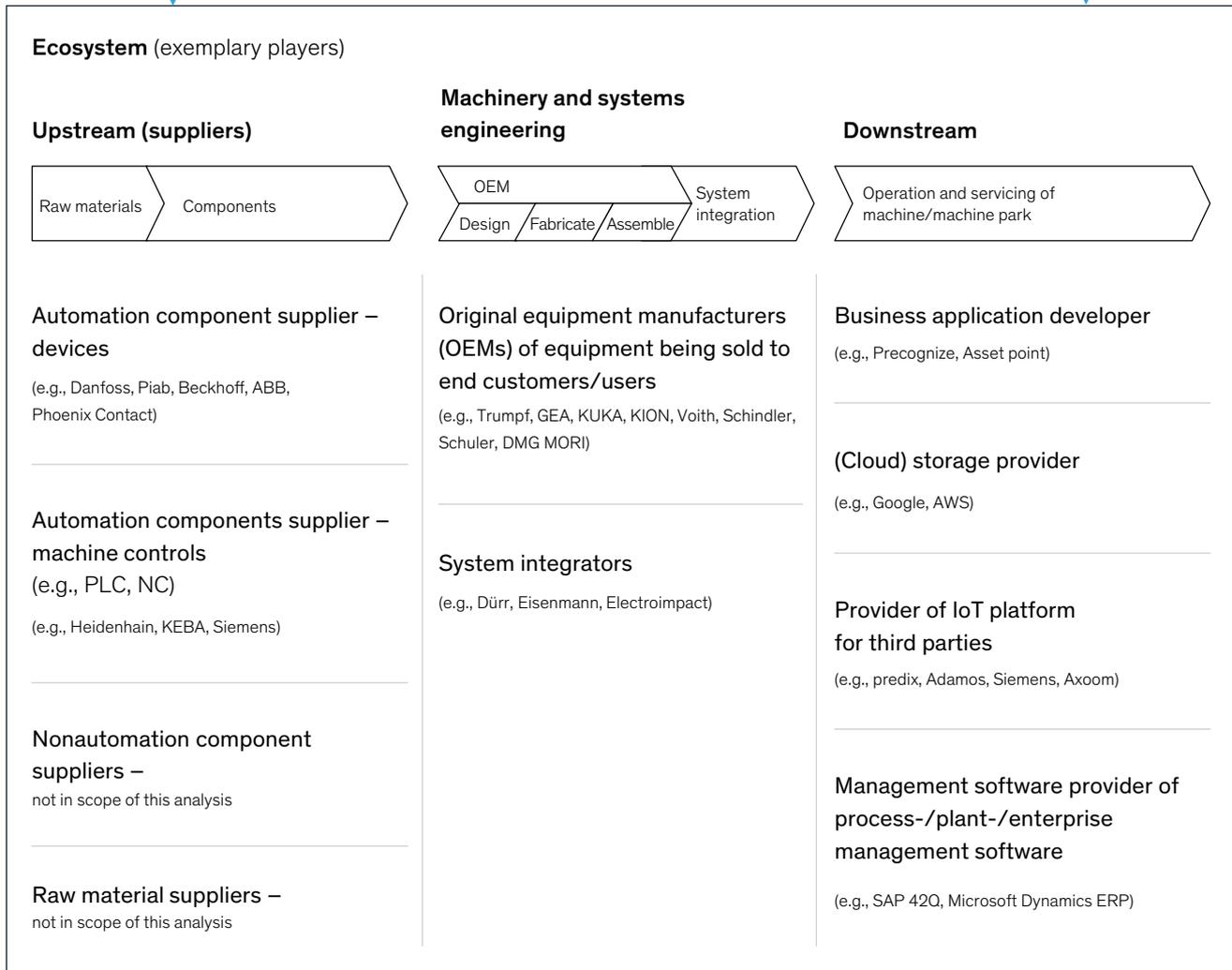
Now, for the first time in decades, the machinery industry is set to be reshaped by the emergence of five trends that affect the ecosystem of discrete manufacturing (Exhibit 4). Three of these trends are redefining how manufacturers work, adapt, and meet their customers’ needs:

- Disruptive technologies (3D printing, e-mobility, etc.)
- Organizational transformation towards flexibility and agility
- Evolving customer demands (including customization and as-a-service solutions).

The other two major trends, however, will have implications up and down the value chain and are likely to dramatically shift the equilibrium of the entire machinery industry ecosystem.

Machinery industry trends affecting the ecosystem of discrete manufacturing

Trends		Disruptive technological trends 3D printing, new materials, green revolution (e-mobility), etc.
		Organizational transformation towards more flexibility, agility, and customer cooperation
		Changing customer requirements Solutions instead of machinery, customization and intuitive machine handling, etc.



SOURCE: McKinsey/VDMA June 2016 study: "How to succeed: Strategic options for European machinery," McKinsey "Machinery & Industrial Automation" Segment

Shifting growth patterns

As automation share continuously increased in most applications over time, the whole market grew proportionally by more than 5 percent every year between 2012 and 2017, while growth rates of over 15 percent p.a. have been reached in certain niches. For example, Beckhoff, the PC-based automation system provider achieved an average annual growth rate of 15 percent between 2012 and 2017. Another example is Piab, the PE-owned Swedish provider of robotic end-of-arm tooling and vacuum grippers grew by 8 percent on average every year from 2011 to 2016 and saw an increase in its EBITA margin from 31 percent to 38 percent in the same period. However, at the archetype level, the picture is as follows (see Exhibit 5):

- **OEMs and system integrators** on average grew 4.4 percent p.a. between 2012 and 2017, which was slightly below the sector average. Margins remained constant at 9.1 percent on average.
- **Component suppliers** showed growth rates between 3.7 and 5.0 percent, depending on the subcategory. In contrast to OEMs, suppliers suffered from decreasing margins. The most significant drop in margin has been seen in nonautomotive component suppliers (i.e., from 10.3 percent to 7.0 percent).
- **Software, platform, and application providers'** average revenue growth rate was far above the sector average at 6.7 percent between 2012 and 2017. In addition, this is the only archetype for which margins increased during this timeframe. As a result, software, platform, and application providers are now the archetype with the highest margins (11.6 percent). It is likely that this development will continue: the majority of market participants anticipate the growing importance of software and services and expect its share of revenue to increase accordingly in the near future.

These recent growth developments at the archetype level are a first factor that will affect the sector's growth trajectory.

Exhibit 5

CAGR of revenue (2012-17)

Percent

EBIT margin development

Percent

		2012	2017	Change	No. of companies for analysis ¹
OEM and system integrators	4.4	9.1	9.1	→	87
Automation component suppliers – devices	5.0	11.7	10.5	↘	69
Automation components suppliers – machine controls	3.7	12.4	9.9	↘	18
Nonautomation component suppliers	4.7	10.3	7.0	↘	12
Software, platform, and application providers	6.7	10.0	11.6	↗	43

Ø 4.9

Future prospect based on survey

Increasing importance of software and services share of revenue expected by majority of survey participants

¹ Single archetypes do not sum up to total number (companies partially belong to several archetypes)

SOURCE: Capital IQ; McKinsey research

A second factor in this context for the shifting growth patterns is the likely weakening of the strong demand so far. Over the past years, the European machinery and industrial automation industry succeeded in growing faster than the economy, largely driven by a strong demand from China and other emerging markets along with the momentum of general worldwide economic growth between 2016 and 2017. A survey amongst machinery players in 2016 showed that “growing with the market” was the most relevant driver of growth in the past (30 percent of survey participants indicated so).¹

However, China in particular is changing its industrial politics in the context of its “Made in China 2025” (MIC2025) strategy, moving from an investment/infrastructure-driven economy to an efficiency/productivity-driven economy, thus reducing capex to a more sustainable level. After many years of growth, China’s gross capital formation (capex as percentage of GDP) began to plateau in 2007 at 47 percent, started declining in 2014, and is expected to further decline towards a sustainable level of approximately 25 percent in the long term – a rate at which more developed countries like Germany or the US run their economies.²

Increasing pace of digitization

The second and even more disruptive major trend is digitization, which is creating new business models and additional value for the customers. The new business models can be clustered into four major categories:

- Platform-based business models
- As-a-service business models
- Intellectual property rights (IPR)-based business models
- Data-driven business models³.

Because of its impact on business models, digitization is creating a situation in which the strategic control points within the automation and digital manufacturing industry are shifting and are up for grabs.

The business models require new technologies with a focus on software development and data analytics. Most current players recognize the growing importance and disruptive nature of digitization and have already started to react to the new market environment. In addition, new players with a history in software development are entering the sector and are competing with traditional machinery and industrial automation players. (For further evidence and details on this, see Chapter 2.3.)

¹ McKinsey/VDMA June 2016 study: “How to succeed: Strategic options for European machinery”

² The Conference Board Total Economy Database™, World Bank

³ McKinsey/VDMA June 2016 study: “How to succeed: Strategic options for European machinery”

2 The new reality

The following insights are drawn from the survey of and interviews with industry players and other industry experts specifically conducted for this report.

2.1 Software- and services-related revenues and use cases

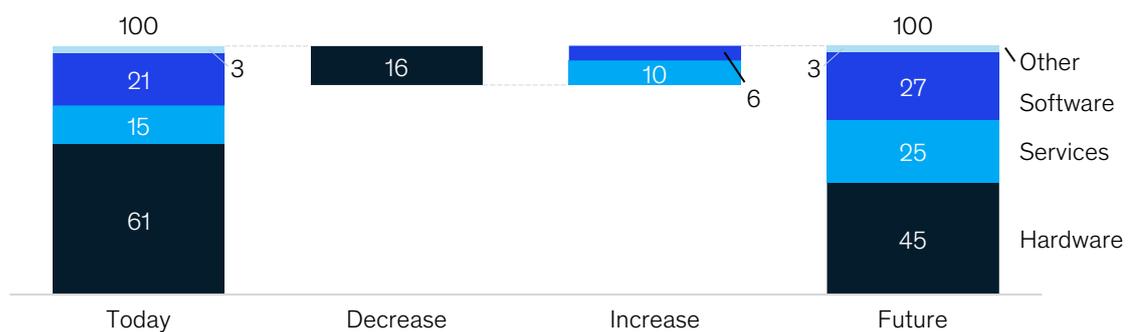
The influence of digitization is already apparent in the stronger growth rates of software, platform, and application providers compared to hardware providers (see Exhibit 5). Survey participants expect this trend to continue with the share of hardware revenues going down by about 16 percentage points and ceding that share to software and services (see Exhibit 6).

According to survey participants, almost 80 percent of customers already consider digital solutions and products to be important or very important. About 40 percent of survey participants expect that ten years from now, revenues from digital solutions and products will make up more than 15 percent of their total revenues. This share of overall revenue may seem low at first, but it means a tripling of digital's share of most survey participants' revenue. In other words, 60 percent of the machinery and automation players surveyed said that less than 5 percent of their total revenue came from digital solutions and products today (see Exhibit 7).

Exhibit 6

Source of revenue

Percent

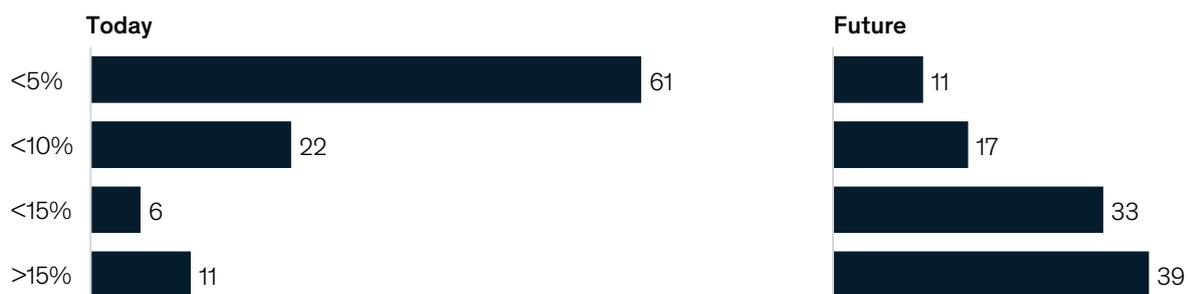


SOURCE: McKinsey Machinery & Industrial Automation survey

Exhibit 7

Revenue generated through digital solutions and products

Percent



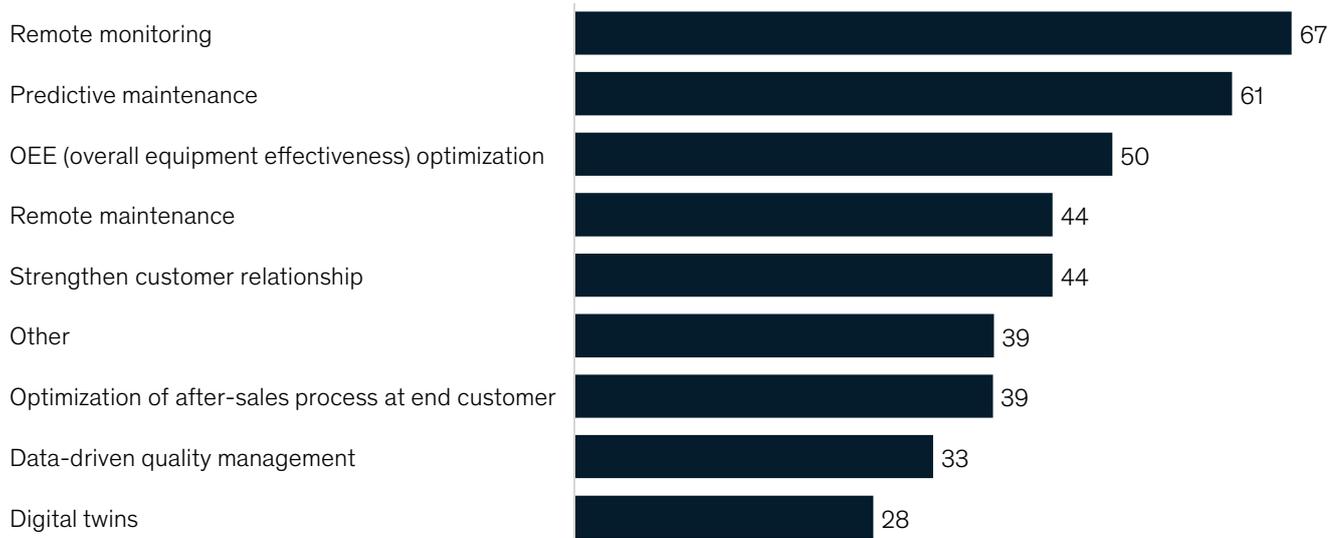
SOURCE: McKinsey Machinery & Industrial Automation survey

Digital enables a wide array of solutions, but its particular relevance to customers is evidenced by just a few use cases: remote monitoring, predictive maintenance, and OEE optimization. These are the applications considered “most important” by at least half of the sector experts we surveyed and the ones driving the growth trajectory in software- and service-related revenues in the machinery and industrial automation sector (see Exhibit 8).

Exhibit 8

What are the most important use cases from your point of view?

Percent



SOURCE: McKinsey Machinery & Industrial Automation survey

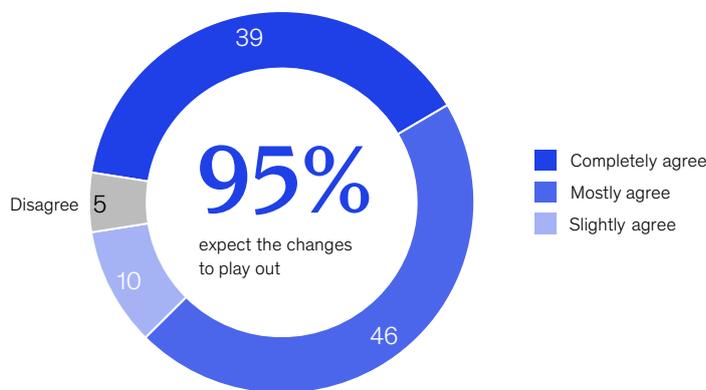
2.2 Strategic control points and market dynamics

While the ecosystem in the machinery and industrial automation sector has been quite stable during the last two decades, the changes caused by the market trends discussed here, especially digitization, have the potential to change the fundamental structure of the industry. Strategic control points that have long been owned by specific market participants are now in play, creating the potential for a shift in traditional value pools. According to our survey, 95 percent of all survey participants (across all player archetypes) expect these changes in the strategic control points and value pools in the ecosystem to actually play out (see Exhibit 9).

Exhibit 9

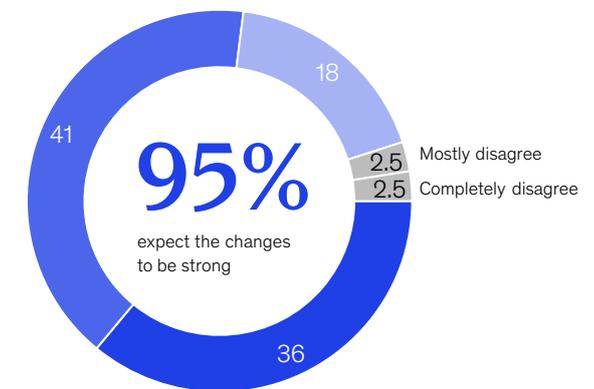
Current market trends will change strategic control points and value pools in the ecosystem

Percent



We have to adapt our business model to be successful in the future

Percent



SOURCE: McKinsey Machinery & Industrial Automation survey

In fact, not only are these shifts expected, but 95 percent of those we surveyed expect the changes to be so strong that the individual players already foresee having to adapt their business models in order to be successful in the future. This is a particularly powerful sentiment in an industry more accustomed to evolution than revolution. On the other hand, this is a message with implications, as it affects the machinery and automation segment, with all its underlying high-tech components, often considered to be the heart of the economy of several tech exporting countries in Europe and elsewhere.

This development is particularly relevant for OEMs and system integrators, as those two groups currently occupy most strategic control points in the market, including end customer access.

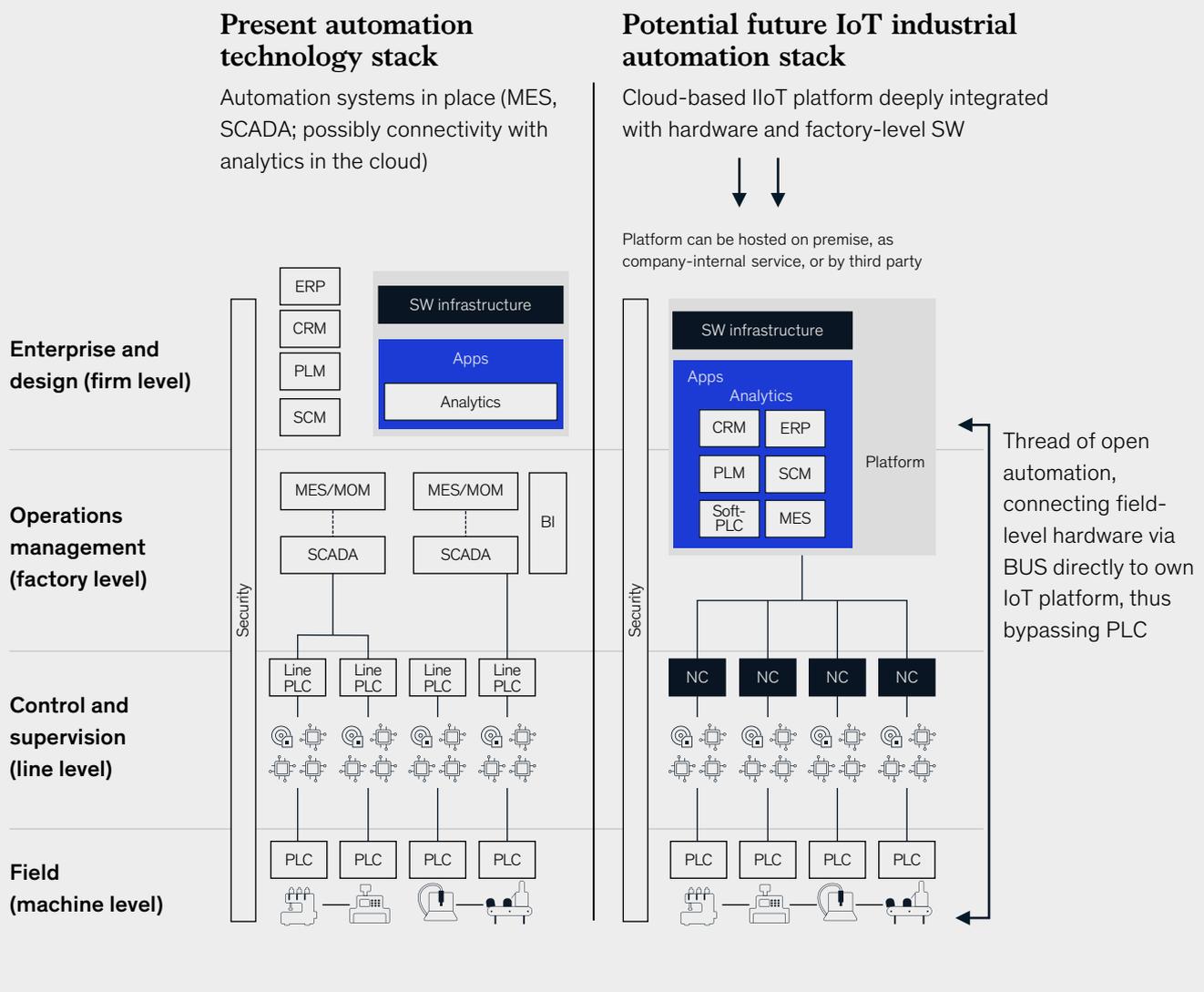
In addition to shifts among the current set of players, some control points, such as customer (end user) access, might be occupied by new entrants moving into the machinery market. Specifically, IT/IoT players are able to gain direct access to customers, an advantage that manufacturers used to enjoy alone (see Text box 2).

Text box 2: Threat by new entrants through “open automation”

A good example of strategic control points that are now threatened by new market entrants in an increasingly converging IT/OT world are the ones traditionally covered by machine control providers. Open automation is a term describing a new generation of automation systems with a distinctly different architecture than the programmable logic controllers (PLCs) that are used today for manufacturing automation.

New players from the IT side might enter the playground and aim to connect field-level devices via BUS directly with an (own) IoT-platform. By doing this, all relevant information is collected directly at the relevant hardware component where it is created (e.g., in sensors or actuators). It is then communicated via a BUS system to the IoT platform, which then connects the remote devices to user applications (or other devices) and manages all the interactions between the hardware and the application layers. The BUS system also empowers standard devices with cloud-based applications and services. By connecting field devices directly with the IoT platform, the PLC on the embedded level of the automation technology stack is bypassed. Intelligence is thereby distributed from the embedded layer/PLC to the field level and especially to the local software or cloud level. This enhancement will lead to the loss of relevance (and, potentially, value) of the PLC in the long term. However, another concept/philosophy is that all data will go through the embedded software level/PLC, thus even reinforcing the currently strong position of the machine control providers – so, there is a threat, but the battle is just about to begin.

Exhibit 10



SOURCE: McKinsey

2.3 Strategic moves and business model adaptations

As our survey results show, market participants are aware of the opportunities and risks associated with the market trends related to growth and digitization and are making various strategic moves to gain/defend strategic control points. Our analysis shows that market participants are particularly interested in gaining a competitive advantage in data- and algorithm-related control points (see Exhibit 12).

Text box 3: Control point (analyses) details

Owning “strategic control points” in an ecosystem grants market participants a superior position in the ecosystem (especially upstream towards direct customers) and therefore a higher share of value in the ecosystem, compared to those not capturing relevant strategic control points.

In machinery and industrial automation, traditional strategic control points like “customer access,” “domain know-how,” or “switching effort/costs” matter, but less obvious control points like “industry standards” and “regulatory approval” can be decisive, especially in niche markets. And, in the context of digitization, strategic control points like “proprietary data,” “algorithms/data-driven insights,” and “multisided/proprietary technology platform” gain importance as soon as digitization leads to visible value-add for the end customer with a willingness to pay for the technology. Exhibit 11 provides an overview on the strategic control points in machinery and industrial automation.

We analyze how important these different strategic control points are today, how this will change over time, and which market participants are capturing these control points today and likely in the future. We also combine the survey results with the development of financial indicators in the market, especially the development of growth and margin per player archetype over time, as well as M&A activity.

Exhibit 11

Strategic control points	Description
Customer (end user) access	Leveraging customer access to create superior negotiation power in the ecosystem, typically captured by OEMs or system integrators, but partly by suppliers, e.g., for machine controls, where expertise of the user’s machine setters defines the control(s)/supplier
Domain know-how	Proprietary knowledge of work flows in customer verticals helped achieve an original first-mover advantage up to a de facto monopoly position, e.g., Siemens SIMATIC with ~30% market share in PLC, building on deep domain know-how in customer verticals
Regulatory approval	Close interaction with governing authorities to comply with regulations/to participate in policy shaping (e.g., ITAR for military application in the US) and certification (e.g., TÜV) on topics such as security and safety
Industry standards	By ensuring the de facto industry standard market share, e.g., like de facto industry standard(s) in machine controls set by very few suppliers
Proprietary data	Access to proprietary data is the basis to develop the digital products/solutions and therefore will be a key differentiator in the future, e.g., data measured within the spindle of a tooling machine can be used for predictive maintenance applications
Switching effort/costs	High switching effort/cost, making changes on the supplier/subsupplier almost impossible, e.g., for markets with very high penetration rates (e.g., automotive), products requiring specific skills on the end user’s side (e.g., PLC), products requiring a specific certification
Algorithms/data-driven insights	Having access to proprietary data alone is not sufficient to create profitable use cases. Algorithms to create data-driven insights are key to create value-adding services/solutions, e.g., Google’s page rank algorithms outperforming competitors by 4x
Multisided/proprietary technology platform	The development of proprietary technology platforms allows for traffic-based business models (e.g., Google, Microsoft, Amazon) but also can be an advantage for machinery/automation players when it comes to setting industry standards, creating switching costs, or gaining access to proprietary data

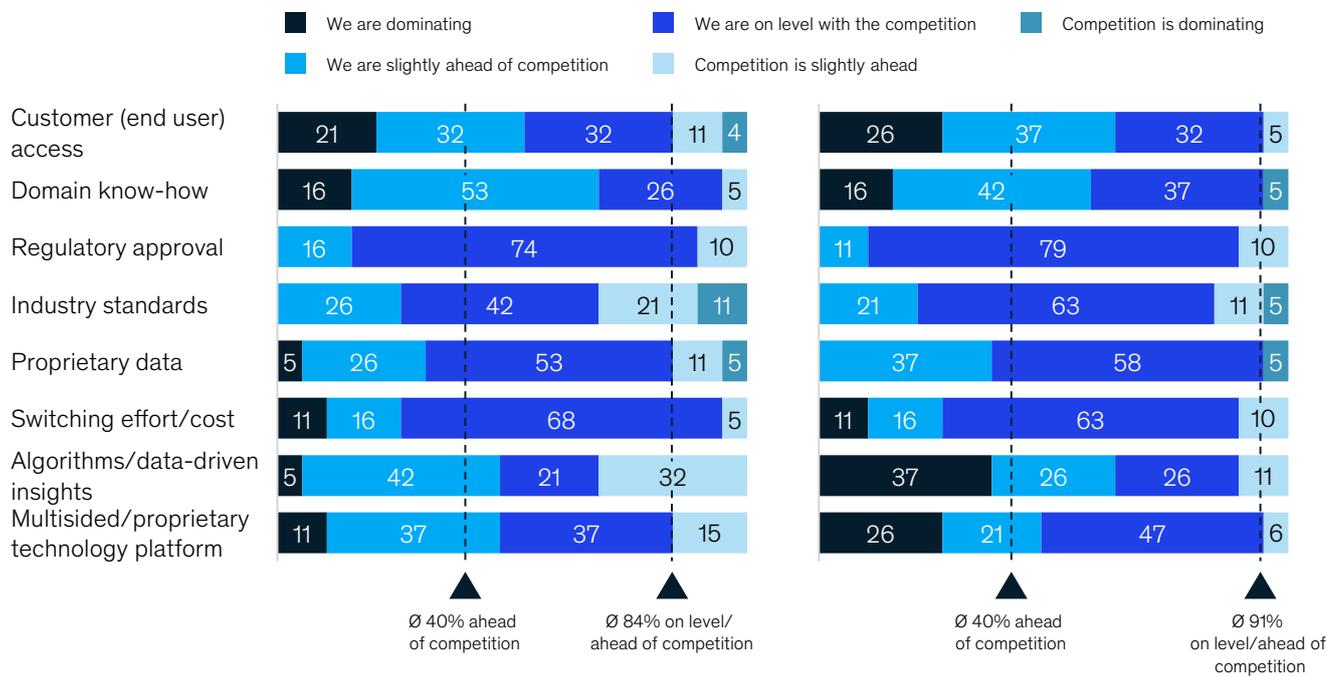
SOURCE: McKinsey

How is your organization covering these strategic control points today compared to the competition?

Percent

What strategic control points is your organization planning to cover in the future?

Percent



SOURCE: McKinsey Machinery & Industrial Automation survey

In order to gain this competitive edge, market participants plan to create a first-mover advantage and to diversify into new revenue streams, e.g., data/algorithm-based business models. A third relevant strategic move is the formation of cooperation efforts with other companies to create industry standards or platforms (see Exhibit 13).

One example of this is ADAMOS, an IoT platform founded by several machinery players. The goal of ADAMOS is to provide a global market leading IoT platform: by manufacturers, for manufacturers. Apps on the platform can be provided by partner companies as well as by third-party companies.

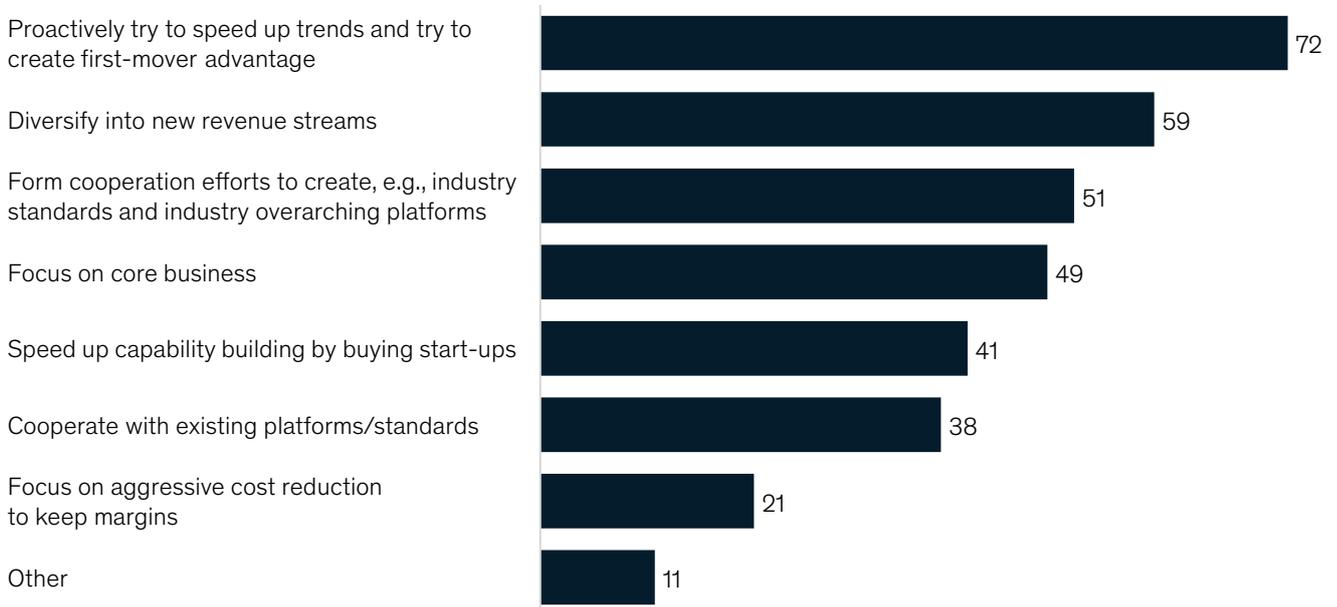
2.4 Roadblocks to digitization targets

Despite having a clear view on strategic moves to achieve digitization targets, many companies are facing significant roadblocks. Of the challenges along the road to digitization, two are experienced by at least half of all companies:

The first is the lack of digital capabilities. Nearly three-fourths (72 percent) of the machinery and industrial automation players surveyed indicated that they did not yet possess all of the requisite digital capabilities. Digital business models require completely different capabilities and skill sets compared to traditional business. Many machinery companies are still very hardware focused and are lacking software capabilities. Furthermore, the development of app-like products and solutions is also very different compared to traditional software. The struggle to build the necessary capabilities is comprised of a few key challenges:

Plans to embrace trends and benefits from shifts in industry

Percent



SOURCE: McKinsey Machinery & Industrial Automation survey

- Company-customer co-creation. Many companies are not yet used to co-creating products with customers in an MVP (minimal viable product) approach using agile sprints, scrum, and other methods. Cultural differences between employees in traditional businesses and new colleagues working on digital solutions and products also form a significant obstacle for many market participants.
- Attracting digital talent. Many companies also struggle to attract digital talent. There are several reasons for this. First of all, it is often difficult for mid-sized machinery businesses to compete with tech giants like Google or Apple and large industrial companies on the same talent. Furthermore, many locations of machinery companies are seen as less attractive by digital talent than hot spots like Silicon Valley, London, Berlin, or Tel Aviv. Many market participants are therefore considering opening hubs in those locations.
- Recruiting digital talent. Besides those structural reasons, many traditional companies are also lacking the required capabilities in their recruiting department to attract digital talent. HR departments need to understand the requirements of digital talent both with regard to the recruiting process and the expected working environment. Companies should therefore reconsider their recruiting processes and adapt them to these requirements.

The second is the ability to establish clear or profitable business cases for digitization.

Half of the respondents reported not being able to establish clear or profitable business cases for digitization. Digital products and solutions are often very different from traditional products when it comes to monetization models. While traditional products have often been sold based on onetime payments or subscription models, digital solutions are often monetized based on as-a-service models or even outcome dependent (e.g., x percent machine availability). The struggle that many companies have in developing such models derives from challenges from two key stakeholders:

- Sales departments. These new products and solutions also pose a challenge to sales departments. Sales representatives were traditionally used to selling well-established products to customers. However, digital products and solutions are often co-developed with customers following an MVP process (minimal viable product). This means that sales representatives actually need to be able to sell a product that often is not more than a concept or an idea that is not yet ready. This often leads to hesitation to contact potential pilot customers as there is a certain probability that those projects will fail, with a negative effect on the customer relationship.
- Customers. This issue often gets exacerbated when customers are also hesitant to enter into a co-creation agreement and thereby share specific risks. Therefore, companies need to consider this when updating their incentive models.

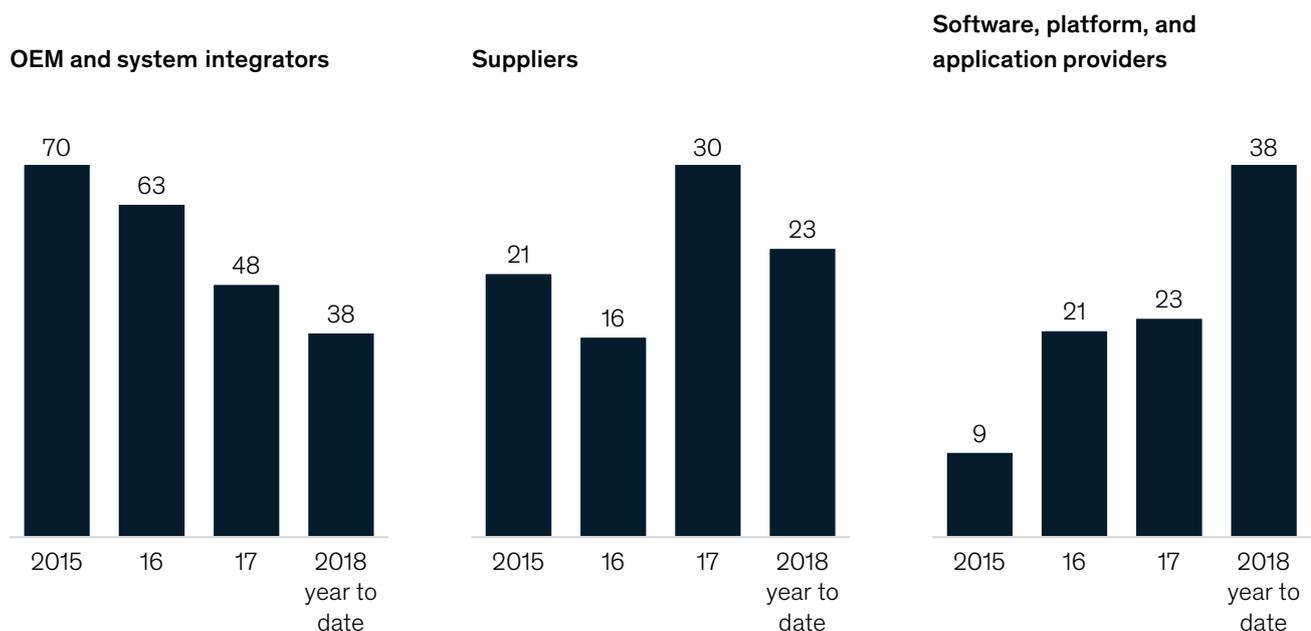
Issues related to data security and machine connectivity were seen as obstacles by just over one-fourth of respondents; a lack of technical solutions by less than one-fifth.

In order to build capabilities and gain market access quickly, OEMs and system integrators are increasingly leveraging M&A. In 2015, 70 percent of M&A deals targeted OEMs or system integrators and only 9 percent software, platform, or application providers. By 2018, those shares had equalized at 38 percent each. These deals are partly motivated from a financial perspective due to high value-creation potential, but also to a significant extent, strategically motivated (see Exhibit 14).

Exhibit 14

Archetype of target – share of total transactions

Percent



SOURCE: Capital IQ; McKinsey research

3 Outlook: preparing for future success

There is near unanimous agreement that the trends of shifting growth patterns and digitization will dramatically disrupt the ecosystem of the machinery and industrial automation sector. There is little dispute over the forecast that ownership of strategic control points will change hands, and value pools will shift.

What is also clear is that there is no one-size-fits-all strategy for success in drastically changing ecosystems. Some strategic moves may be more suited to certain player types than others, but even within archetypes there is variation, e.g., 72 percent of OEMs and system integrators are planning to pursue a first-mover strategy. Strategies need to be developed individually, considering the relevant market segment addressed, value chain, and competitive positioning, as well as the individual capabilities of the company.

That said, there is a set of principles that all companies – across archetypes – can commit to in order to prepare for this radically different future:

- **Target relevant value.** Target the most attractive opportunities out there to invest your capital. Invest in IoT/digital business building that is the most relevant, not the most popular.
- **Build on your distinctive strength.** Tackle the opportunities that align with your strengths and that your company is in a natural position to own, or at least positioned to be competitive in.
- **Focus on your core.** Build a strategy that is robust against attacks from increasing competition and against economic downturns by emphasizing and optimizing your core business.

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