Platform Economics in Mechanical Engineering

Challenges – opportunities – courses of action

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Roland Berger

THE SUCCESS OF PLATFORMS – AN EXAMPLE FOR MECHANICAL ENGINEERING TO FOLLOW?

Platform companies such as Amazon and Google have changed many B2C markets from the ground up. As they now penetrate the B2B segment, German engineering companies too are joining the fray. Though the corresponding ecosystem is still a work in progress, the trend is clear: In the industrial environment too, platform-based applications are becoming the key factor of differentiation.

That, however, confronts the corporate sector – especially small and medium-sized enterprises (SMEs) – with huge challenges. Further barriers to entry are raised by the complexity and diversity of the platforms currently available and the question marks that still hang over business cases, not to mention the need to acquire completely different knowledge and skill sets compared to the industry's traditional core business.

For this study, Germany's Mechanical Engineering Industry Association VDMA, trade fair operator Deutsche Messe and Roland Berger investigated the platform economy in the German mechanical and plant engineering sector. The 15 VDMA members that took part in a series of workshops and discussions include firms of all sizes and at every link in the value chain – from midcaps to blue chips, from traditional mechanical and plant engineering companies to providers of factory automation and software solutions. At the time of the study, all these companies had already gained relevant experience with platforms – building them, using them or engaging in early-stage operation – and each was therefore able to contribute varying perspectives. The workshops focused primarily on the companies' platform applications, bringing together and analyzing crucial experience accumulated "by practitioners for practitioners" in order to learn new insights and develop recommendations on how to get the most out of platforms.

Building on the questions discussed and the outcomes arrived at by the group, this study addresses the following aspects:

> What are digital and IoT platforms, and what does the platform landscape of relevance to mechanical engineering look like?
> What new business models and models for success are there?
> How can companies position themselves successfully in the platform economy?
> What obstacles and challenges should be expected?
> What criteria should be applied when choosing a platform?
> And just as importantly: How will the platform economy continue to evolve going forward?

The study you are reading is the first comprehensive analysis of the structures of platform-based business models in the B2B segment in general and mechanical and plant engineering in particular. As well as making it easy to understand the role played by the platform economy in mechanical engineering, it also provides valuable guidance for business decisions.

SETTING THE SCENE: PLATFORMS' TRIUMPHAL MARCH

Platform companies rank among the most influential and the most valuable enterprises in the world. The seven biggest ones – Apple, Alphabet/Google, Amazon, Facebook, Microsoft, Tencent and Alibaba – have long since surpassed the value of all the firms listed in the Euro Stoxx 50 (which includes the likes of Allianz, Bayer, Daimler, Sanofi, SAP and Siemens). → 01

So, what is their recipe for success? Compared to the traditional market leaders in the market segments they have targeted, platform companies possess revolutionary core competencies and competitive advantages. In place of physical assets and the associated value creation activities, they devote themselves entirely to the matchmaking function that brings the supply and demand sides together. Platforms thus operate as intermediaries, using digital technology to forge links between two or more market players. They simplify traditional business interactions between connected participants by handling transactions on the platform itself. More than that, they facilitate completely new interactions that would be inconceivable without the platform.

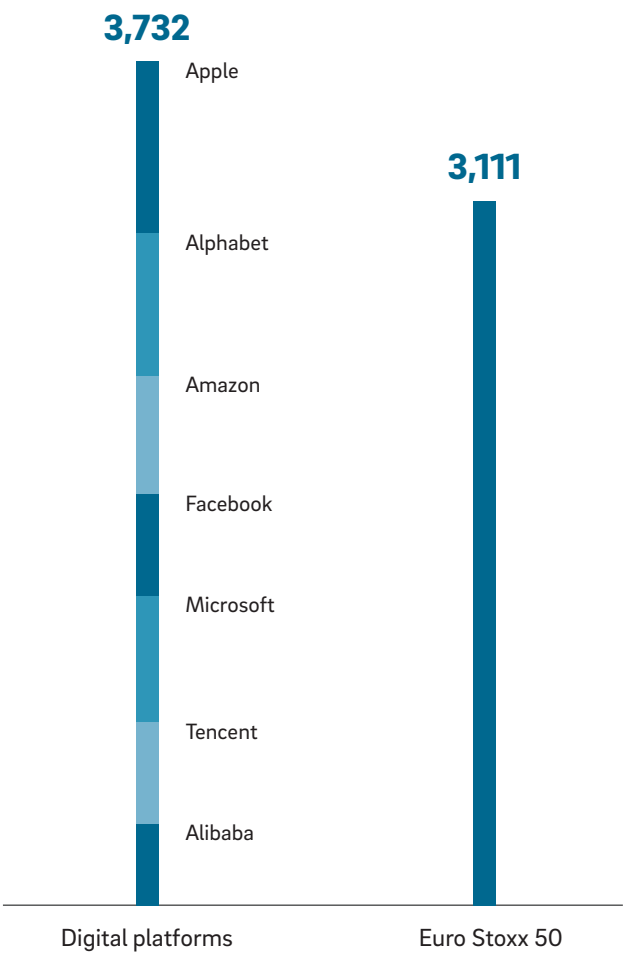
Platforms thus add value in three main ways. First, they reduce **transaction costs.** That is partly a side-effect of simplified interaction via a common technology platform. But it is also partly the result of specific platform services. Typical transactions include matching supply and demand, providing data and automating the handling of contractual and payment processes. Platforms cut transaction costs by standardizing communication and contractual elements, minimizing the effort involved in coordination and creating a coordinated ecosystem. They also create an ideal environment in which to find the best offerings to meet specific individual needs.

The second way in which digital platforms add value is through scale or **network effects.** Supply and demand stimulate each other, so every extra participant makes the

01: Digital platforms

The seven biggest B2C platforms compared to the Euro Stoxx 50

Market capitalization of the world's top seven digital platforms compared to the Euro Stoxx 50 [EUR bn] – Data from January 2018



Sources: Bloomberg, Roland Berger

Examples of successful B2C platforms

Mobility: Whereas a traditional car hire firm like Europcar owns a fleet of around 200,000 vehicles, mobility brokers such as Uber have no vehicles of their own. Instead, they focus exclusively on bringing vehicle owners together with sources of demand for transportation. In 2017, Europcar had a market value of about USD 2 billion – against Uber's valuation of roughly USD 70 billion.

Hospitality: The Hilton hotel chain has something like 800,000 rooms on offer worldwide. Compare that with intermediary platform AirBnB, which offers no accommodation facilities of its own, but instead matches the supply of beds and rooms in privately owned homes to demand for the same. Hilton had a market capitalization of approx. USD 22 billion in 2017, AirBnB about USD 30 billion.

platform even more attractive. The more people sign up to AirBnB to offer accommodation, the more people with corresponding demand will consider this platform as an accommodation agent and ultimately book stays via AirBnB instead of approaching hotels directly. As more and more rooms and beds are successfully brokered, the platform in turn becomes more attractive to additional providers of accommodation – a self-propagating effect known in the trade as a positive network effect.

Depending on their design, platforms also generate very **specific customer benefits.** To take just one example: They open up the possibility of transactions that would never occur if platforms did not exist or were not used. This circumstance allows them to satisfy hitherto latent, unserviced and/or completely new customer needs. In other words, a platform provides services based on large volumes of data that are bundled, analyzed and put to new uses on the platform – usually in anonymous form. Data processing capacity, analytical capabilities and the platform's "intelligence" thus lay the foundation for specific services. It is they that enable certain customer needs to be met in the first place. In so doing, they open the door to additional (digital) services, new business models and operational efficiency gains.

After rolling up the B2C segment, a number of established B2C platforms – alongside newcomers to the arena – have for some years also been setting their sights on potential corporate customers. In China, Alibaba has ranked as one of the leading B2B trading hubs since its inception in 1999. US rival Amazon has likewise cast its net wider. In the shape of Amazon Business, it claims to have acquired more than 150,000 customers in Germany alone in its first year, including everything from small businesses and the self-employed to multinational corporations and DAX 30 enterprises. Google too is investing on a massive scale to get a foot in the cloud computing door. To this end, the company is building data centers around the globe and snapping up start-ups such as US cloud provider Orbitera and, very recently, software company MobileIron.

PLATFORMS IN MECHANICAL AND PLANT ENGINEERING

Skeptics argue that you can't compare a heavily segmented, indeed fragmented and highly specific industry such as mechanical engineering with the big, wide world of end-customer business that sells books, overnight stays and passenger transport. Nor, they say, do platforms command the same importance in this line. That is probably the reason why the market volume addressed by platforms in the B2B environment will indeed never reach B2C-like dimensions. Nor can the scale effects be usefully compared.

That said, the disruptive potential of the platform economy has long since been discernible in mechanical en-

gineering too, even if it is still in its early days here. Interestingly, while the industry as a whole engages in lively debate about the Internet of Things, Industry 4.0, digitalization, predictive maintenance and other assorted buzzwords, the many smaller firms in this line in particular remain decidedly critical and/or (still) see platforms as comparatively irrelevant to their business.

Yet it is important also to see the opportunities and possibilities from a customer's eye view – and to grapple in good time with the nature, scope and possible timing of an entry to platform-based business models.

In the mechanical and plant engineering sector, two categories of platforms are of general relevance:

DIGITAL MARKETPLACES FOR INDUSTRIAL GOODS AND SERVICES. Physical goods from the manufacturing industry are offered for sale and transactions are processed on digital marketplaces. Such marketplaces have been around since the earliest beginnings of the Internet economy. The best-known include Mercateo, SAP Ariba, Wucato (a Würth Group subsidiary) and Zamro, an online shop for tools and technical components. The principal new developments in digital marketplaces are the huge expansion of transaction volumes in the B2B segment, the growing number of marketplaces and the marginalization of traditional forms of purchasing – especially of C parts and indirect goods.

INDUSTRIAL "INTERNET OF THINGS" PLATFORMS. IoT platforms supply the digital infrastructure and standards needed to connect customers to the cloud. At the same time, they create the chance to use both their own and third-party services in the cloud, to offer these services on an online marketplace and thus to develop new ways of cementing customer loyalty and entirely new business models. This study concentrates on the growing number of IoT platforms that are of relevance to mechanical engineering companies.

APPLICATIONS FOR AND CUSTOMER BENEFITS OF IOT PLATFORMS IN MECHANICAL ENGINEERING

In conjunction with IoT technology, digital platforms make it possible to interconnect plant and machinery and to harness scale effects in the use of digital services. The resultant platform landscape and, in consequence, the growing number of successful applications will give a powerful boost to the digitalization of mechanical and plant engineering. Why? Because new services will be cheaper and easier to deploy, and because it will be possible to give customers greater benefits more quickly. Market research institution IDC believes that, among the major providers, platform business will already dominate the industry about two years from today, accounting for as much as a third of their income.

When debating the value and benefits of the platform economy in the mechanical engineering context, a fundamental distinction must be drawn between **two perspectives:** OEMs' perspective as providers of machinery and components on the one hand, and the demand-side or users' perspective represented by factory operators on the other.

Digital platforms give **manufacturers of plant and machinery** the chance to get to know and understand their customers far better. For example, analyzing user data clearly reveals what demands shape customers' everyday routine and how one's offerings can be adapted accordingly. Beyond that, providers can draw on their in-depth knowledge of the field in which they work and their intimate knowledge of customer and product requirements to develop new digital services, market them via the platform and thereby tap additional revenue streams. Further possibilities are created by the data and information transparency to which the platform leads, by new forms of collaboration with suppliers and customers, by the reassignment of individual links in the value chain, and by new business models. As in the B2C uni-

Platform types in mechanical and plant engineering

The marketplace **Mercateo** has two different digital platforms. One is the Mercateo Shop, a marketplace for B2B trading in the context of industry that centers primarily around C components. Thanks to complementary functions such as integrating the platform in customers' procurement processes and even the option of automating certain processes, the platform adds benefits for the customer and lowers transaction costs. In parallel to this traditional marketplace, Mercateo also began operating the Mercateo Unite platform in spring 2017. This modified marketplace model focuses on digitalizing existing portfolio business and relationship-based business. On the platform, merchants can sell their goods in separate markets. Access to this online shop must be granted and approved by the provider. The model thus maps the "physical" existence of individual business relationships onto the digital realm, paving the way to typical B2B services such as consulting and individual pricing.

In the shape of its subsidiary **AXOOM,** TRUMPF has built its own IoT platform with a focus on the sheet-metalworking industry. The machines running in a factory can be connected to each other via this platform. A variety of services – from IoT device management to condition monitoring to edited performance dashboards – are offered on the modular, open-structured platform, all with the aim of raising machine efficiency for the machine operators.

verse, mechanical engineering too sees the benefit that IoT platforms bring to the supply side in digital services and business models that would not be possible without such platforms. As a result, platforms play an essential part in customer retention. New services can also be delivered directly as finished products via the platform: They no longer have to first be developed together with the customer on a project basis. Scale effects can be realized as a consequence.

Factory operators benefit above all from digitally based services in the form of specific applications. These generate benefits that were hitherto unthinkable on this scale – benefits that depend heavily on the underlying industry segment and the specific application. The range extends from cutting or avoiding costs to possibly increasing revenues to improving the quality of internal processes and products.

These opportunities for optimization are in turn rooted in the ability to **monitor the condition** of plant and machinery and of other operating resources in the course of production. Both status and dynamic data are collected from factory operations in real time. That includes data on the consumption of raw materials and media such as energy, water and compressed air, for example, but also on machine runtimes and downtimes, the unit volumes produced, ambient conditions such as humidity and temperature, aspects of product quality and so on.

Moving on to the next step, this condition monitoring can be ramped up into **process optimization or plant deployment optimization,** for instance. By using specific analytical methods to aggregate and evaluate the data thus generated, it is possible to control numerous parameters in production and factory operations. Ideally, the algorithms used will also be able to draw on data from completely different sources and use this too for the purpose of optimization: data about fluctuations in raw material and energy prices, say, about the traffic situation (especially in relation to logistics and supply chain management), and about the weather (e.g. in the case of wind turbines). If value-added partners such as suppliers and customers are also linked in via the platform, it is even possible to develop multi-level win-win situations.

The ensuing improvements in production processes and production input factors can be put to good use in all kinds of applications to realize specific operating tar-

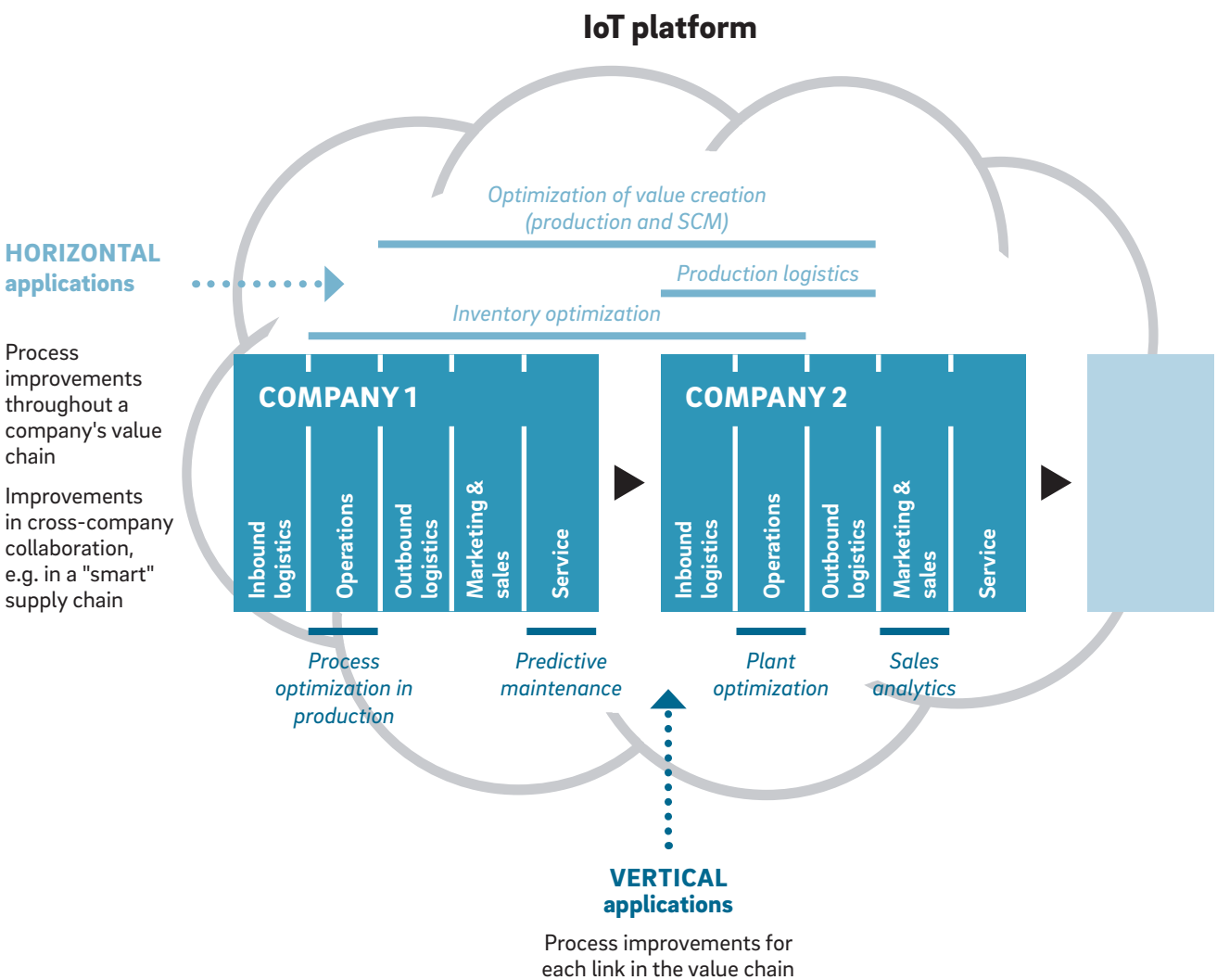
gets and constellations in the factory. For the purpose of **categorization,** an initial distinction can be drawn between horizontal and vertical applications. **Horizontal applications** focus primarily on cross-functional process optimization. Typically, they can deliver improvements in resource input, capacity utilization and information transparency at the interfaces between different functions and spheres of responsibility, and between companies and their suppliers and/or customers. Examples include aspects of inventory optimization and supply chain management in general. **Vertical applications** are designed to optimize specific functions at a given link in the value chain (such as production or distribution) and in areas like maintenance and quality management that do not add value directly. Examples here include applications in production where production is the key link in the value chain, and in maintenance where this is a vital secondary function. A closer look at this topic is provided below. → 02

Numerous applications throughout the entire **production** cycle can be identified for IoT platforms: from production planning to the scaling up of production to production control. One pivotal application here is **digital twinning,** which facilitates the virtual simulation, validation and optimization of a production system. Digital twins can, for example, be used to test which production processes, machine types and levels of automation and machine connectivity are best suited to manufacture and assemble products and their modules and components. When planning to start and scale up production, the lead times for new products can be shortened as a result. There is also more flexibility to make changes to the product at short notice.

Other significant applications include all kinds of **performance enhancements during live production operation.** Monitoring the condition of certain dynamic and status data for the connected machinery and assemblies enables processes to be optimized in terms of machine configuration and connectivity, the alignment of machine cycle times across different machining stations, and improvements in set-up times, for example. Beyond that, it is also possible to monitor process stability and various parameters such as production quality – even for the discrete product that is currently being manufactured, or for the batch being produced in the process industry. In the event that damage occurs, it is thus possible to intervene in ongoing production immediately. Depending on the defined objectives, parameters such as machine availability, machine capacity utilization and hence overall equipment effectiveness (OEE) can be optimized, as can the quantitative and qualitative output of the production process and energy efficiency in production.

Maintenance is another function that is currently generating considerable interest in relation to platform applications. Expectations are high that vast potential can be tapped in this area. While the discipline traditionally bases preventive machine maintenance on time and performance parameters, condition monitoring based on real-time status data enables what is known as **predictive maintenance,** as the status of a given component can be predicted. This approach in turn allows optimal use to be made of machine component service lives. Data on factors such as vibrations, temperature and lubricant statuses is recorded during machine operation in order to anticipate imminent damage to parts in the form of cracks or wear and tear. The main challenge is to use large volumes of data and algorithms to identify correlations and patterns that, with sufficient reliability, can be used to forecast outages and/or calculate the remaining service life of certain components.

02: Horizontal and vertical applications for IoT platforms



Source: Roland Berger

Great importance is also attached to **digital plant and machine résumés,** which provide end-to-end documentation of operations, including the load histories of individual machines, fault reports and the scope of maintenance, all of which is kept available for analysis at any time. The effects platform applications will have on maintenance include superior availability, longer operating times during machine lifecycles and better availability of spare parts, as well as optimized working capital and improvements to the management of maintenance activities.

The potential afforded by such applications should not be underestimated. Every year, unplanned outages cost the world's process industry alone around USD 200 billion. It follows that overall equipment effectiveness (OEE) and predictive maintenance have a direct bearing on profitability: first, by optimizing the performance of a machine or plant and avoiding outages throughout its service life, and second, thanks to the concept of hardware as a service (HaaS). Although the latter is still in its early days, more and more OEMs are equipping their products with big data analysis tools and indeed offering hardware as a service. HaaS is similar to the subscription model known as software as a service (Saas). Like the latter, HaaS swaps the cost of capital for operating costs, gives companies greater flexibility and offloads risk: Whereas users bore the full risk in the past, this constellation places the risk of outage on the provider's shoulders. In other words, users only pay for the performance they actually use, which allows them to significantly improve their planning.

All the optimization measures we have looked at could be used as powerful competitive USPs and to further cement customer loyalty. What is needed is a legal agreement between the machine operator, who is the owner of the generated data, and the machine/application producer regarding the use of and/or sovereignty over the data. Another essential prerequisite is a technical infrastructure that provides suitable bandwidth and data transfer rates in the factory.

Killer apps

Applications such as condition-based maintenance, predictive maintenance and KPI cockpits in their assorted variants are repeatedly touted as "killer apps" with a glorious future. With condition monitoring, the machines have connectivity, but the only thing that gets monitored is their status. In the context of predictive maintenance solutions, both the status and the machine data are constantly being analyzed. Forecasts about when this or that part is likely to fail can then be made on this basis. The use of artificial intelligence also facilitates prescriptive maintenance, where connected machines themselves issue recommendations on what parts should be serviced or replaced now in order to reduce repair costs in the future. Other applications that add value for specific segments of the industry have yet to be developed or become established. They could conceivably be either vertical (linking physical objects together) or horizontal (linking processes together within a company or between multiple companies in the same segment of industry). One thing is for sure: The better companies understand the specific needs of their customers, the better their chance of transforming an application into a "killer app".

The specific customer benefits of IoT platforms

Above and beyond general-purpose horizontal and vertical applications, there are also a whole raft of potential segment-specific and company-specific applications. A few examples illustrate the point:

thyssenkrupp has fitted more than 180,000 elevators with special sensors and hooked them up to its MAX platform. The sensors record real-time data about things such as elevator movements, operating data and error codes, which is analyzed on MAX. Predictive maintenance services can then be offered, raising the efficiency of the provider's own service technicians and optimizing maintenance intervals. This arrangement also cuts outages almost in half for elevator users and operators.

Sigma Smart Air is compressed-air provider **Kaeser's** predictive maintenance application, which it operates on a specially developed platform. Via the same platform application, operating, service and energy data is also made available in real time and cross-machine management is on offer. The application thus serves not only to optimize OEE, but also to support the efficient use of operating resources.

Back in the 1990s, **operator models** were already seen as modern business models. At the time, however, they were unable to gain a lasting foothold. Pilot applications originally targeted paintshops in automotive production, for example. In the age of digital platforms, the technical prospects for the success of operator models have improved substantially. These models have indeed already become firmly established in the form of IT-heavy applications such as infrastructure as a service (IaaS) and software as a service (SaaS). In mechanical and plant engineering, this kind of concept is still the exception. **TRUMPF,** for example, provides operator models based on the principle "pay per use/pay per meter of welded seam" for its laser welding machinery.

More transparent procurement with myOpenFactory

Procurement is a good example of how a company's internal processes can be improved. myOpenFactory – a platform solution that is also effectively an EDI standard – already provides connectivity between more than 800 companies in Germany. Developed several years ago by the VDMA, the Mechanical Engineering Industry Association, RWTH Aachen University and a consortium of ERP manufacturers and mechanical engineering firms, this EDI solution forges a seamless link between procurement transactions across the different ERP solutions operated by customer and supplier. Relevant staff members are notified only if deviations are flagged for volume, price or delivery date. The powerful streamlining effect of these solutions gives the companies involved the capacity to engage in strategic purchasing.

PARAMETERS AND POSSIBLE PLATFORM DESIGNS IN MECHANICAL ENGINEERING

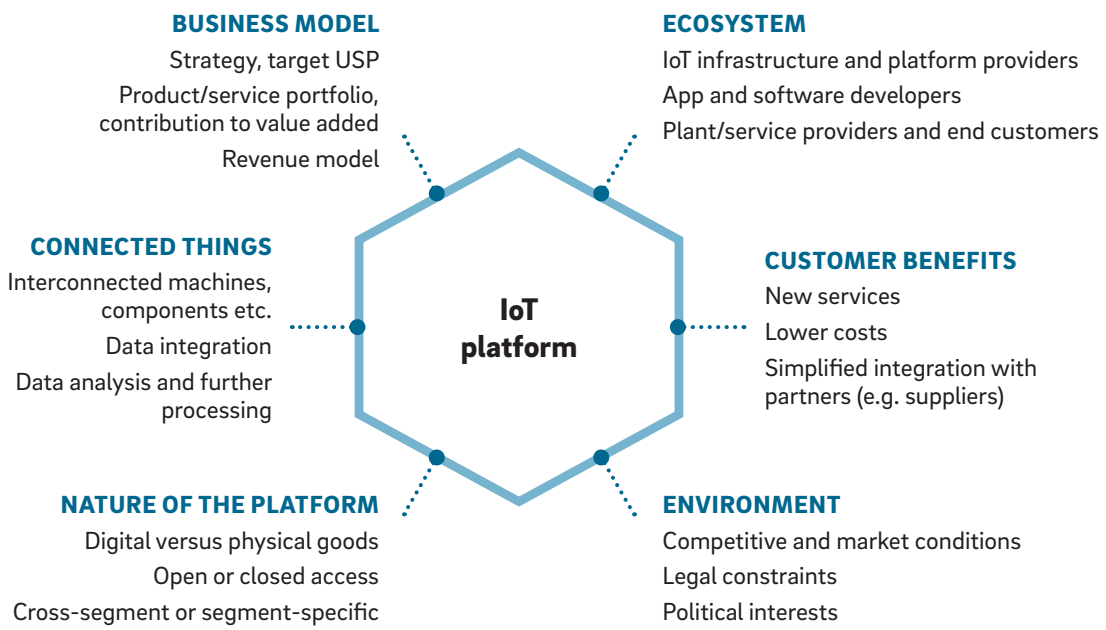
Depending on the choices made for six key attributes, platforms can be classified according to their business mission and the form of collaboration between transaction partners, for example. The way in which the platform is integrated in the ecosystem and the platform type are the anchor parameters that stake out the framework for three further parameters: customer benefits, business model and the things to be connected. Together, these five parameters are anchored within the conditions of the given environment, which is the sixth parameter. → 03

The **platform ecosystem** – the first main parameter – can be depicted in terms of five clearly delimited levels or roles on the Internet of Things. It is here that computing power and storage capacity are made available, for

which providers such as Amazon Web Services, SAP, Google/Alphabet and Microsoft have invested billions. At the same time, providers like Alibaba and Huawei are also playing an active and very dynamic role in this market. This level has already experienced very considerable consolidation and features only a handful of keenly competitive players. In addition, this level accommodates the various technologies needed to connect things to the Internet, e.g. via landline, wireless LAN, 3G/4G and/or LPWAN standards such as SigFox, NB IoT, LoRa and others.

On the second level from the top we find the IoT platforms that form the object of this study. They allow digital connections to be set up between physical objects on the Internet of Things. They also facilitate the transactions based on these connections. Below this level, we find the application and software developers who provide the software and solutions that run on the platform on level 3. Plant manufacturers and other hardware and service providers are on level 4, while factory operators and end customers – from the perspective of machine makers – occupy level 5 based on the machinery and plant they run. → 04

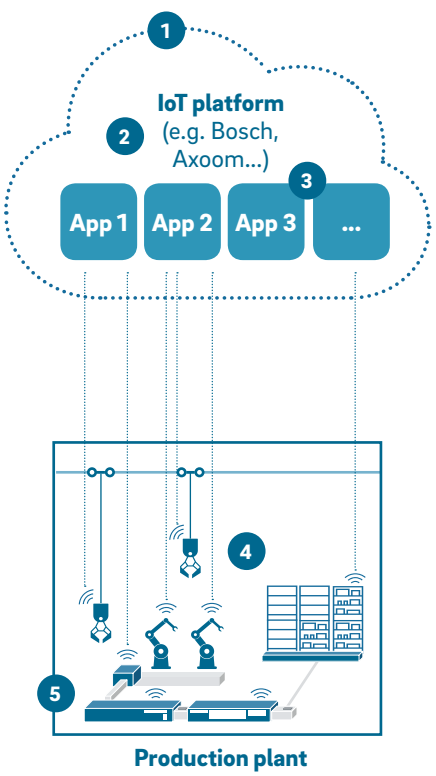
03: The six parameters of an IoT platform



Source: Roland Berger

The different **platform types** – the second key parameter – are determined by the nature of the transactions that take place on the platform, access to the platform and the platform's focus. As with digital marketplaces, transactions may relate solely to physical goods. As in the case of content distribution (for instruction manuals and construction plans, say), they may be of a purely digital nature. However, it is usual for IoT platforms to cover both kinds of transaction – for example with digital transactions that trigger physical transactions. Where the condition of a plant is monitored over an IoT platform, for instance, the intervals and optimal times for the replacement of parts are determined, leading to a spare parts transaction between the plant OEM and the plant operator.

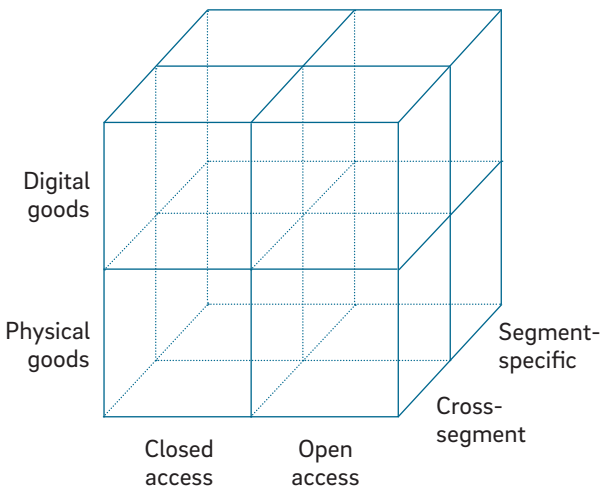
04: Levels in the IoT ecosystem, with examples of actors



		Players (excerpt)
1 **IoT INFRASTRUCTURE PROVIDERS**	Providers of data centers, cloud services and telecommunications	Amazon Web Services, SAP Cloud Platform, LoRa, Microsoft Azure
2 **IoT PLATFORM PROVIDERS**	Providers of platform solutions that supply apps and software	ADAMOS, MindSphere, Bosch IoT suite
3 **APP AND SOFTWARE DEVELOPERS**	Developers and providers of software solutions	iTAC software, KONUX, BSQUARE
4 **PLANT AND SERVICE PROVIDERS**	Engineering OEMs and other hardware and service providers	TRUMPF, KUKA, Bosch Rexroth
5 **FACTORY OPERATORS**	Customers with machinery who are using IoT solutions through the platform	BASF, Daimler, Henkel

Source: Roland Berger

05: Platform types with examples of platforms



PLATFORMS PROVIDED BY STUDY PARTICIPANTS

Digital, open, specific	DKE agrirouter, ADAMOS, ZF Openmatics
Digital, open, cross-segment	Bosch IoT Cloud, Siemens Mindsphere
Digital, closed, specific	Kaeser Sigma Smart Air, thyssenkrupp MAX, Voith IIoT
Digital, open/closed, cross-segment	SAP Asset Intelligence Network, KAMPF the@dvanced
Physical, closed, specific	thyssenkrupp SteelOnline, thyssenkrupp Professional Spare
Physical, open, cross-segment	Mercateo

Note: Platforms in the categories "Physical, open, specific" and "Physical, closed, cross-segment" were not represented at the workshops.

Source: Roland Berger

A platform may also be freely (openly) accessible to po¬tential transaction partners. It may either restrict access on both the supply and demand sides or link access to certain conditions (making it a closed platform). Platforms may focus on certain industry segments, as in the case of the Tapio platform launched by Homag for the wood industry. Alternatively, they may be cross-segment platforms. ADAMOS – a cooperative venture run by Dürr, Zeiss, Software AG and other consortium partners – is an example of the latter. Ultimately, a cubic option model features eight platform types. In isolated cases, a platform can thus cover several segments of this cube model in parallel. → 05

The third parameter is the **value added from the customer's perspective.** The benefits we talked about right at the start – benefits such as lower transaction costs, network effects and, in particular, customer-specific services – are the principal drivers of platform-based business in any shape or form. Other areas in which value can be added for customers relate to the usability/user-friendliness of a platform, the scope of integration and the possibilities for collaboration between partner companies that operate on the platform.

The **business model** – the fourth parameter – largely follows corporate strategy, which may target innovation, cost or quality leadership, for example, or express itself

in strategic goals such as a certain competitive positioning. The framework established by corporate strategy fleshes out a company's business model by establishing definitions at the next level of detail. Key elements of a platform business model include the specific product and service spectrum to be mapped onto the platform, the customer groups to be serviced, the corresponding revenue forms to monetize the platform, and the necessary skills, capabilities and value-added activities.

The fifth parameter is made up of the **objects interconnected on the Internet of Things.** The nature and scope of links between machines and machine components, tools and tool carriers, workpieces and workpiece carriers, bulk containers, driverless transportation systems and many more objects used in factory operations must all be defined here and fitted with the right sensors and actuators. These links are fundamental to the integration, analysis and processing of status and dynamic data and, hence, to the optimization of all factory operations.

The sixth and final parameter for digital platforms consists of the **conditions that frame the corporate environment,** all of which influence the platform economy. In particular, these conditions include statutory provisions and constraints, political interests and current market and competitive conditions.

Platforms can be positioned at different hierarchic levels in the context of factory operations. Some cross-industry platforms, such as MindSphere, are open not only to mechanical and plant engineering firms, but to the manufacturing sector in general – including the chemical industry, for example. Moving one hierarchic level lower down, we find platforms that cover aspects and/or customers of mechanical engineering firms, such as discrete production operators. One example is AXOOM. The hierarchic level below this one brings us to the platform the@dvanced, for example, which specializes in the machinery segment for cutting and winding technologies. By contrast, a fourth platform category exclusively targets specific areas of modules and/or components within production settings. Sigma Smart Air, the platform run by compressed-air manufacturer Kaeser, provides services relating to the supply of compressed air to factories. → 06

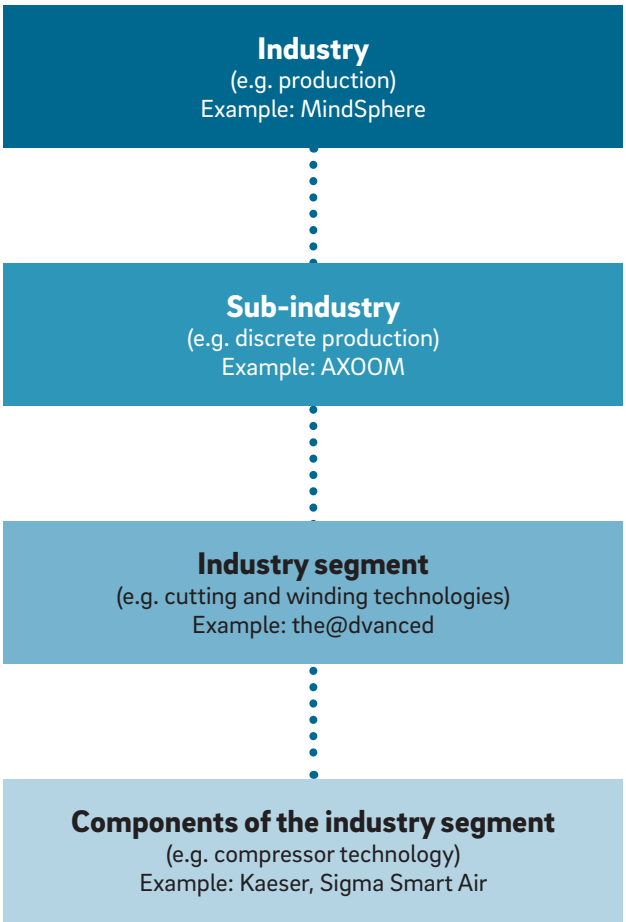
POSITIONING IN THE IOT ECOSYSTEM AND PLATFORM SELECTION FOR MECHANICAL ENGINEERING FIRMS

Based on this system of relevant parameters for mechanical engineering platforms and where they fit into the Internet of Things ecosystem, it is possible to classify and describe platforms, but also to distinguish them from each other and set them apart. That helps potential users and platform participants to perform qualitative assessments of those platforms that are worth considering, and ultimately to make a choice. For their part, the orchestrators or operators of platforms can continually adjust and realign their models on the basis of these parameters.

However, at least three factors make it hard to come up with a simple answer to the question of the "right" **role for a mechanical and plant engineering firm** in the IoT ecosystem, and of which platform is best suited to its purposes. These three factors are: first, the heterogeneity of the mechanical and plant engineering industry, with all the different requirements it places on platforms; second, the fact that some players may cover more than one level of the IoT ecosystem; and third, the dynamics of platforms themselves. Here, the term "platform journey" has become a common way to describe the continuing development of individual platforms over time.

One characteristic feature of the German mechanical and plant engineering industry is that it is not a monolithic block, but a very **variegated industry and corporate landscape** that embraces different kinds of

06: Platforms can be built on different levels of hierarchy within factory operations: Levels of the IoT ecosystem and selected players



Source: Roland Berger

business and segment-specific aspects. This fact affects the various options that are available in the platform economy. Distinctions must be drawn between component manufacturers and OEMs and, within the OEM cosmos, between discrete and volume manufacturers. Given their heterogeneous target group and often complex product portfolio, component manufacturers, for example, tend to be more interested in industry-wide (i.e. cross-segment) platforms that are of use to their entire product spectrum in the international arena. Among the OEMs, discrete manufacturers that roll out individual products in response to customers' wishes will gravitate toward the individualization of services on a platform, easy ways to adjust platform processes and the ability to quickly integrate new products. On the other hand, volume manufacturers are likely to opt for standardized platform usability with a wide range of service options and the ability to integrate various processes and value chain links via the platform. For large-scale plant providers, the ease with which subcontractors can be integrated and usability for all kinds of different projects are important considerations.

Additionally, individual companies within the ecosystem may assume **multiple roles** and thereby cover more than one level of the IoT ecosystem **at the same time.** The roles at the IoT platform and applications/software levels in particular can be filled by companies from every conceivable background. In theory, all kinds of different market players – from IoT infrastructure providers to mechanical engineering OEMs and (large) factory operators – could find themselves competing with each other and providing various services from a single source.

The majority of German mechanical engineering firms are currently (still) positioned as traditional OEMs or suppliers on level 4. This group includes hardware providers and companies with an integrated portfolio cov-

ering the IoT ecosystem and hardware and software solutions. These companies have hardware with Internet connectivity, automated processes and full data sovereignty. However, some of their services – applications they themselves or their partners have developed – also give them an active presence on level 3. It is already apparent that, at the platform level, widely differing market players step up as platform founders or orchestrators. They range from blue chips to midcaps, from machine manufacturers to factory automation specialists, from module providers for plants and software suppliers to multinational corporations that put all these offerings together under one roof. That said, traditional midsized mechanical and plant engineering firms are likely to be more interested in penetrating the application level, where they can bring their expertise and understanding of customers' needs to bear and successfully ward off the advances of other providers. To do this, they can of course also use existing platforms. They don't necessarily have to build new ones from scratch.

The **rapid pace** at which many providers are pushing in the direction of apps and software (level 3) is the third aspect of the complexity of platform landscapes, and has a simple explanation: the prospect of lucrative new revenue sources and/or the possibility of differentiating their products and services. True, the infrastructure level is likely to remain firmly in the hands of a handful of large providers for the foreseeable future. Nevertheless, an ever larger share of revenue is likely to gradually migrate from level 4 to levels 3 and 2. Primarily small and medium-sized enterprises therefore need to decide whether to go it alone in broadening their portfolio or have recourse to a network of partners. The ability to adapt to a changing environment and seize opportunities to develop and improve the platform or the provider is normally the sign of a successful platform.

CHALLENGES IN THE NEW ECOSYSTEM

The platform landscape in place today is evolving at a frantic pace. Around the world, several hundred platforms were in operation in the past year alone, with more to come. At the same time, the industrial Internet of Things is itself an extensive playing field that opens up any number of entrepreneurial options. Mechanical and plant engineering companies that are keen to play an active part but also want to be prudent about investing their limited financial and human resources thus find themselves confronted by enormous challenges.

While it is still difficult to see where many developments in the still-youthful platform economy will lead, one thing is for sure: The share of value added and the share of revenue will increasingly shift toward digital services and business models. This may result in losses for traditional business – due to the introduction of predictive maintenance, for example. If maintenance only takes place when it is really needed, revenue from maintenance services will decrease. Heated debate still rages regarding the overall monetary effect of predictive maintenance, even though growth expectations usually exceed concerns about the cannibalization of existing (and generally lucrative) servicing business. For example, an April 2017 study by the VDMA, Deutsche Messe and Roland Berger found that 80% of respondents expect (in some cases considerable) growth stimulus for their servicing business. Only 20% were more worried about the risk of losses, albeit only on a comparatively modest scale.

Since predictive maintenance also means fewer machine outages, further losses could also be incurred in the spare parts business. On the other hand, the added benefits to the customer reinforce customer loyalty. It then becomes less attractive for customers to forage for spare parts from third-party suppliers, where this is even possible in the first place. The coming shift is also changing the way companies collaborate with custom-

Platform constellations: Self-initiative or cooperation? Large corporate or midcap?

Companies can set up their own platforms or launch them in collaborative consortiums. Even medium-sized organizations can design and operate their own platforms. Three conceivable constellations are outlined by way of example below:

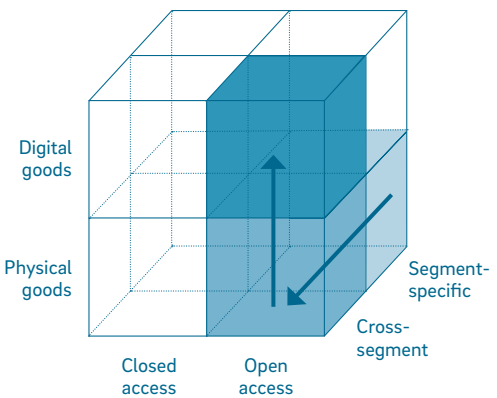
1. Global players: MindSphere from Siemens
MindSphere is an open, cloud-based IoT operating system with which the Siemens Group is positioning itself as a platform provider for an array of industrial segments. It has a broad spread of protocol options for device and enterprise applications, industry applications, extensive analytics and an innovative development environment. Siemens is incorporating an interface in its latest automation generation to ensure secure connections to machines. For retrofitting purposes, a "nanobox" is available that interlinks machines and MindSphere. In the industries targeted by Siemens, the MindSphere Application Center (MAC) is being used intensively to work on new applications, digital services and business models. The group is thus active on levels 2 through 4. Siemens sources the cloud infrastructure (level 1) as a service from partners, e.g. SAP, AWS and Microsoft.

2. Midcaps: the@advanced from KAMPF
KAMPF's "the@dvanced" platform clearly shows that mid-sized firms too can build platforms for their own specific area of application. the@dvanced is an integrated platform that the manufacturer of cutting, winding and special machinery uses to interconnect its own machines with partners' components and parts that need machining. Data consolidation opens up new areas of application. For example, "digital résumés" can be drawn up for end products, manufactured batches can be traced back to their origins and product quality can be assured and sustained. Information about maintaining and using various machines can also be accessed via the platform.

3. Cooperation: ADAMOS
At ADAMOS (ADAptive Manufacturing Open Solutions), companies such as machine tool manufacturer DMG Mori, automotive supplier Dürr, enterprise software provider Software AG, measurement systems expert Zeiss and semiconductor and electronics group ASM PT all work together. The aim of this strategic alliance for the forward-looking topics Industry 4.0 and the Industrial Internet of Things (IIoT) is for ADAMOS to become established as the global industry standard, and also to recruit additional mechanical engineering firms as partners. ADAMOS is specially tailored to the needs of mechanical and plant engineering companies and their customers. The open IIoT platform is vendor-neutral and combines state-of-the-art IT technology with industry knowledge. It allows mechanical engineering firms to offer customers proven solutions for digitally connected production, and that at little expense. Mechanical engineering companies, their suppliers and their customers all benefit, as ADAMOS – the platform service provider – opens up access to leading software solutions while maintaining complete data autonomy.

Continuing development of a platform: Amazon Web Services/Amazon business

The example of Amazon illustrates the many and varied ways in which a platform can evolve. Focused initially on selling books, it started out as an open, segment-specific platform for physical goods. Gradually, Amazon extended its assortment of products and continually added new categories to its marketplace. The company was also able to sign up merchants who would sell their product portfolio via Amazon, which thus morphed step by step into an open, cross-industry platform for physical goods. After successfully establishing itself in the B2C sector, the company is now targeting B2B customers in the shape of Amazon Business. From basic office supplies to capital goods, the digital marketplace covers virtually every category that might be of relevance to commercial customers. And besides these platforms for physical goods, Amazon is now also operating a platform for digital services: Amazon Web Services, complete with its cloud service. Although Amazon Web Services is primarily a provider of infrastructure services, it is increasingly also penetrating the market for IoT platforms.



The cost of using a platform

Three components normally determine the cost of using a platform:

Data connectivity: The infrastructure needed for data connectivity must first be set up. Essentially, that means buying and installing gateways and, where necessary, local servers to partially preprocess data collected from the machines and sensors in the factory and then forward it to the platform.

Monthly license fee: On top of this initial investment, there is frequently a standard monthly charge to use the platform. The license fee varies depending on the number of accounts and users with access to the platform. There are also basic monthly fees for the right to use certain applications, although this component may be included in the standard monthly charge, depending on the platform. Costs will also be incurred for any additional applications, most of which are usually made available on the platform by third-party providers.

Operating costs: Actually using the platform also costs money. This charge is calculated using a data-based model, although the concrete basis for assessment varies from platform provider to platform provider. In many cases, operating costs can themselves be split into fixed and variable cost blocks. The fixed costs are mostly based on the number of connected machines and data points that are to be analyzed on the platform. The variable portion of operating costs is calculated from each machine's use of the platform services: the number of API accesses, the frequency of data transmission, the volume of data transferred and the computing power used are just a few of the assessment bases that are currently used. Depending on the platform operator and the application(s) used, the monthly license fee for the application is sometimes waived in favor of pay-per-use billing.

ers. Providers of digital services are targeting the interface to the customer and seeking to occupy it, at least in part. If they forfeit direct contact with their customers, mechanical and plant engineering firms run the risk of losing the ability to influence them.

Another factor of uncertainty in the platform economy surrounds **customers' willingness to pay and the pricing mechanism.** As things stand, it is difficult to know how much value customers might attach to and what they will be willing to pay for new services, many of which do not even exist yet. Some services at least allow initial estimates about the substitution product. Here again, predictive maintenance is a useful example: For the purposes of a rough initial calculation, the costs incurred hitherto when a machine went down and the resultant servicing, maintenance and spare parts costs can be set against the savings on servicing work (fewer spare parts, fewer machine outages etc.). Predictive maintenance services themselves come at a cost, of course – both for the service itself and for the initial investment in suitable infrastructure. For the supply and demand sides alike, a positive business case in terms of the cost/benefit ratio will therefore be of crucial importance. It also remains unclear at what price independent third parties might offer the same service. A pure-play software provider (level 3) that specializes in predictive maintenance may, under certain circumstances, be able to provide this service at a substantially lower cost.

For many machine builders, **new knowledge requirements** raise a further barrier to entry to the platform economy. Up to now, building and operating machinery has been their core competency. Although more IT expertise has admittedly been accumulated in recent years too, this has concentrated above all on system control. Logically, then, the industry is facing a massive shortage of digital service experts. At the same time, digital business models differ fundamentally from previous business models. Plugging this knowledge gap is anything but a trivial matter, especially as other industries that are often perceived to be more attractive are likewise vying for the affections of good developers. Away from the major conurbations, mid-sized companies in particular need more than just innovative recruiting ideas and good employer branding: Their entire organization must rise to the challenge of developing and introducing a sustainable, forward-looking employee and corporate culture.

Nor does the **complexity of the current B2B landscape** exactly make it easier for companies to nail down their own IoT strategy. Right now, new platforms are springing up for every conceivable area of application and almost every subsegment of the industry. The question is: Which platforms and which services have the potential to become established for the long haul? And how can you be certain you are backing the right platform? How can suitable options be developed for each company in order to at least minimize the risk of making the wrong decision? The market is still comparatively young and in a state of constant flux, so reliable forecasts are a tough task. Consolidation of the platform landscape is definitely on the way, but no one yet knows when and how that will happen. Given so many uncertainties, decisions to invest in the platform economy should above all be based on analysis of which platforms best fit your strategy and business model, and which applications are of the greatest benefit to your existing customer base. At the present time, it also often makes sense to back a number of platforms in parallel in order to target as wide a target customer group as possible.

Beyond that, the need for a changing knowledge profile means that, in the future, it will only be possible to provide certain services in the context of **partnerships.** All players in the ecosystem are potential candidates: from infrastructure providers who provide computing power to hardware vendors who supply the required

network technology to software engineers who craft the new digital services. More so than in the past, however, the challenge will be to first build and later coordinate the overall ecosystem. Several questions must be addressed: How attractive is your ecosystem to potential partners and the developer community? How do you ensure compatibility between partners? In the platform economy, mechanical engineering firms thus stand on the verge of a far-reaching transformation process. Simply put, they have to transform themselves from hardware manufacturers to managers of a specific ecosystem.

The platform economy and the services associated with it present tempting new ways to set your company apart. It is nevertheless a safe bet that **competitive pressure** – within the industry, yes, but also from new players – will further increase. At its core, mechanical engineering has to do with high-quality and highly complex physical goods – capital goods – that are difficult for players in other industries to substitute. In-depth domain knowledge likewise puts the industry in a favorable starting position. External providers can nevertheless acquire this knowledge for themselves. And the industry knowledge they need to play the role of platform provider tends to be more manageable, meaning that outsiders can certainly (and successfully) enter this market. The less companies need vertical expertise and a network to match, the greater will be the pressure from companies from other industries. At the same time, economies of scale play a central role in the platform economy – and horizontal players are much better placed to exploit them.

Many mechanical engineering companies will seize the opportunities now arising and launch corresponding initiatives. If their next moves supersede – and in some cases replace – what has been on offer to date, that will accelerate the transition and could also shift the balance of power in the industry. Potentially, not only traditional rivals within the industry but also new players – including digital groups from Silicon Valley and China – could play a part. Confronted by such a confusing, unpredictable situation, probably the stiffest challenge to machine builders is to adopt a clever strategic position that is as open as possible to what the future may bring.

DEVELOPMENT SCENARIOS IN THE PLATFORM ECONOMY

Forceful dynamism and rapid development have been the hallmark of offerings in the platform landscape since its earliest days. These trends will remain unbroken in the medium term, giving rise to four main scenarios for what lies ahead. Some of these scenarios could materialize simultaneously, and it is likely that varying constellations will predominate in different industry segments. → 07

SCENARIO 1

The infrastructure providers dominate

This scenario sees the (mostly large) infrastructure providers taking charge. Their platform technology is already out in front in terms of connectivity and analytics. Since customers can source extensive functionality with these players on attractive terms, this scenario leaves no room for an extra level for IoT platforms. The ecosystem populated by companies from the industry is less important here than the issue of technical platform capabilities.

SCENARIO 2

End-customer-specific platforms dominate

In scenario 2, major factory operators with heavily integrated value chains and extensive vertical integration shape the platform landscape. These enterprises are not willing to simultaneously use a mixed bag of platforms from different suppliers and third parties, so they will

instead build their own integrated, group-specific platforms. They have sufficient market power to ensure that applications from OEMs and service providers are both integrated in their group-specific platforms.

SCENARIO 3

Industrial platforms dominate

In this scenario, various IoT platforms make the breakthrough, each with its own ecosystem comprising users, developers, applications and microservices for individual industrial segments. The crucial factor here is that, for their individual segments, the industry platforms each come up with a specific, high-quality solution based on an in-depth understanding of the processes in their segment, and that they succeed in establishing a high-grade ecosystem of developers, providers and customers. In the end, a limited number of established IoT platforms could successfully rule over a series of industry segments.

SCENARIO 4

Numerous connected platforms coexist

If segment-specific requirements turn out to have a formative influence on the future platform economy, the IoT platforms run by players who are already actively involved in the market will be able to position themselves successfully. All these platforms will be interconnected to make up for any lack of critical mass and guarantee a sufficiently large ecosystem. However, providers' medium-term strategic objective in this scenario should be to cooperate with other platform operators in the given industry in order to remain compatible with future scenarios.

WHICH SCENARIO IS THE MOST LIKELY?

The probability of the four scenarios we have outlined becoming reality is determined by various factors of influence, some of them powerful, some of them less so.

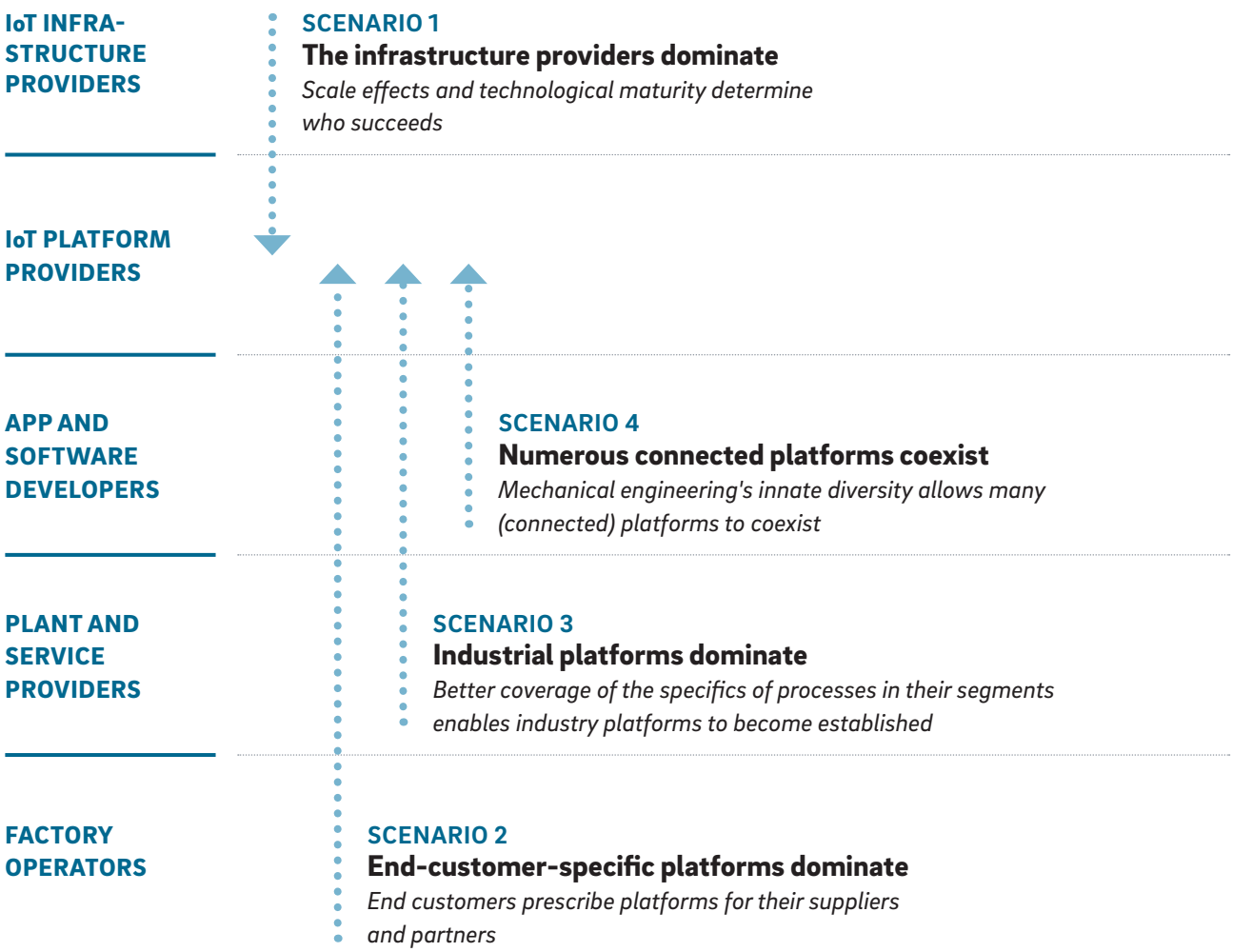
Both the general dynamics of change and the tendency to form rival camps mean that consolidation of the platform landscape in the direction of scenarios 1 and 3 is likely.

Similarly, the desire for **less complexity and proper coordination of the ecosystem** suggests that, in the medium term, only a handful of platforms – or in certain segments of industry maybe only one platform – will stay the course, assuming a coordination function and serving as the interface to customers. Platforms and applications from other providers would be integrated in such a platform, ultimately leaving only a small number of platforms for the whole vertical area of application. One conceivable example of this kind of scenario would the IoT-based automation and control of buildings. Here, different applications such as energy management, predictive maintenance, lighting control etc. cover different components such as elevators, heating, ventilation and air-conditioning (HVAC) systems, lighting and the power supply. To simplify handling for building operators, a platform for full control of all these aspects could ultimately take root. Over time, it could become established as a central platform that integrates and connects a host of function-specific platforms (e.g. for elevators, lighting and so on).

The **structure of the customer industry** is another weighty factor of influence. The fewer end customers there are, the greater is the tendency that only more general, cross-segment platforms will stay around in the long term. In contrast, the **end customer's vertical integration** is the critical variable for the occurrence of scenario 2. The greater its vertical integration, the more likely it is that a wide range of different machines will be in use. Depending on the application and the size of the provider, the end customer is likely to build its own platform to control its production. Theoretically, large end customers such as BASF and Daimler could develop their own platforms for internal use to control and optimize production and asset management.

07: Four platform economy scenarios in mechanical engineering

Providers on various levels gain a foothold in promising platform business



Source: Roland Berger

One key variable in scenarios 1 and 3 is the **share of value added in an industry segment.** The manufacturers of machines whose involvement in value creation is only secondary (e.g. measuring devices in quality assurance) only possess a small share of the value added in a given industry segment. In the long term, it therefore makes little sense for them to build their own platforms. It would be more advisable for them to have a presence on as many other companies' platforms as possible.
Essentially, we believe that the platform landscape can be expected to consolidate markedly in the near future. Initial signs are already pointing in this direction. At the end of this development, we will probably be left with a mix of the different scenarios: Isolated end customers will have their own special solutions. Certain segments will need their own vertical platforms, while other industry segments are served together by an infrastructure provider.

EIGHT STEPS TO AN IoT PLATFORM STRATEGY

Depending on where a company is coming from and where it wants to go, a wealth of insights gained from corporate practice in relation to building, operating and using IoT platforms has allowed us to distil eight main recommendations for action to ensure successful entry to the platform economy. These recommendations can also help companies expand and structure their business activities in relation to platforms. These recommendations follow the logical sequence depicted below: → 08

1. Put the platform strategy on the CEO agenda

IoT platforms create all kinds of opportunities and possibilities for providers and users alike, could have a huge impact on revenues and/or cost positions going forward, and can thus play a crucial part in a company's strategic competitive positioning and its business success. The sheer number of possible options, the pace of technological and economic development in the platform economy and the complexity of this topic add up to numerous challenges, but also give rise to risks. As with every issue of great strategic importance, an IoT platform strategy demands the full attention of top management and incorporation in the company's strategy. Once activities have been defined, the management or executive board must then actively manage and sustain their impact on profitability. Accordingly, decisions on such matters should not be confined merely to digital and IT strategies: It is imperative to place them on the desk of the CEO and the top management team.

2. Set strategic goals

The current IoT platform landscape may be extremely heterogeneous, but so too is the spectrum of potential business objectives within the platform economy. Should platforms be vertical and yield internal optimization? Should they be horizontal and facilitate integration with external suppliers and/or customers? Should they perhaps be both? Is the company pursuing more direct sales and growth targets via new service offerings? Or concrete cost reduction targets in its own factory operations, for instance? Or is it, for the time being, pursuing qualitative strategic goals such as an additional form of customer retention or a (more) innovative image? Or should a given competitive position be occupied for strategic purposes? Depending on the broad sweep of a company's strategy and the time frame it is looking at, there can be huge variations in approaches and design options relating to platform operation, platform use or a combination of the two. Any systematic attempt to tackle the issue of platforms must therefore be preceded by the definition of relevant goals and clarification of possible links to and interdependencies with other strategic aspects and activities within the company.

08: Eight steps to an IoT strategy

Source: Roland Berger

3. Define relevant use cases

As discussed above, the right applications are ultimately what add value for most companies. We see the development of a large number of applications that add no perceivable value for the customer and therefore harbor no genuine business potential. Identifying the right applications and crafting the right business models is therefore pivotal if a company is to do good business in the IoT platform economy. For which applications and potential applications does demand genuinely exist in the company and among customers? What problems will these applications remedy (or at least alleviate) from the perspective of external and internal customers? What benefits can be realized? What conditions must be put in place in the company, and what obstacles must be overcome? A focused and efficient approach is possible only if genuinely promising applications are clearly prioritized. If (too) many applications are rated as attractive, experience shows that successive waves of implementation are the best way to go.

4. Conduct a realistic audit of the situation at hand

When the goals of a company's platform commitment have been clarified, the applications prioritized and the time frame staked out, the next step is a reality check for the defined strategy. That means objectively assessing whether and how the strategy can genuinely be implemented for the company in question. The issues that must be addressed in this context include a comparison of the actual and required financial budget, an examination of personnel resources and other relevant conditions as the company sets out along the road to the platform economy. In many cases, the proposed strategy will have to compete for resources with the company's other strategic and investment projects. What is known as the level of digital maturity – the company's experience and skills in dealing with the Internet of Things – is especially important here. A benchmark test against objective, standard-

ized criteria such as Roland Berger's IoT Readiness Check quickly reveals the real picture. That in turn lays a firm foundation for a plan of action and the definition of milestones so that any gaps identified can be closed as the company launches out into the platform economy.

5. Observe market activity

Looking outward and analyzing conditions and activities in the company's environment is just as important as examining what is going on inside the firm. Again, a number of questions must be asked: What platforms are worth considering given the company's targeted positioning and planned activities? What distinguishes the various platforms – and what individual strengths and weaknesses do they exhibit relative to competitors? How are current and potential users reacting to the platforms, and what is the competition doing? Technical details concerning seamless platforms and portability are equally critical, as are legal matters such as the national and international legal framework regarding data ownership and data sovereignty. These and other questions demand absolute transparency about where the company is at right now. But they also require ongoing analysis as the relevant issues continue to experience dynamic development. In addition, a knowledge of the surrounding environment usually delivers valuable insights regarding the successful timing of the company's own activities: the period available to develop its own offerings, say, or the timing of actual market entry with various offer components. Other significant matters concern closely monitoring current and potential future technologies, assessing their relevance and gauging the maturity of the market for each prioritized application.

6. Develop options and scenarios

The objectives, prioritized applications and internal and external transparency worked out in the above steps ultimately prepare the ground on which to build specific options to position the company in the platform economy. The first question here is: Which level(s) in the IoT ecosystem are to be covered by the company's targeted position in the platform economy? This is where the optional positions we have already explored – that of orchestrator or participant in a platform – come into play. The customer benefits to be delivered must be further specified and fleshed out at this point. That will normally involve reviewing and adapting the business model, i.e. aspects such as core and add-on services, value-added activities and the possible level of internal vertical integration, as well as questions surrounding the revenue model – revenue forms and the pricing strategy, for example. This review must be posited on a realignment of the core competencies that will need to be covered in the future, but also on an understanding of existing and possible future value-added networks with external partners. The important thing is that whatever position is adopted with regard to platforms, it must complement or at least be compatible with the company as a whole – with its traditional portfolio, its skills and its delivery channels. In the final analysis, however, it is vital to be able to think in terms of scenarios, given that there is no way of predicting exactly how technologies, customers' needs and competitors' activities will pan out.

7. Keep control of the interface to your customers

One of the most important aspects relating to the options and scenarios outlined above is the issue of customer access and the interface to the customer. Experience shows that this is the point where companies' reservations about platforms often come to a head. In many cases, mechanical and plant engineering firms see "industry outsiders" pushing their way in between themselves and the factory operators who are their customers as a threatening scenario. And it is a fact that, whatever individual strategy is adopted, control over

the interface to customers should never be given away. Since companies design customer-specific applications on their own, or at least have that done under their control by partners or service providers with restrictive contractual ties, they can also stay in control of first-hand customer access, complete with direct feedback and the communication of preferences and problems. In principle, extensive domain knowledge and an in-depth understanding of customers leave mechanical and plant engineering companies well equipped to continue to control the customer interface. However, they must also fill this space with suitable offerings: applications and services that add benefits for the customers. If they fail to do so, another industry-internal provider, or maybe even an external player, will sooner or later come along and attempt to develop or buy in the skills the machine builder lacks at the customer interface.

8. Choose suitable partners in the IoT ecosystem

We have already repeatedly touched on this point: Mechanical and plant engineering firms, especially if they are midcaps, should not and do not have to do everything themselves or develop all the skills they need to adopt their targeted position in the IoT ecosystem. In most cases, time, skill and resource constraints would prevent them from doing so anyway. It is therefore all the more important to define the company's own role and level of vertical integration on the basis of a realistic assessment of where it is at to begin with, and then to seek out and select suitable partners with whom to collaboratively shape the IoT ecosystem. Aside from technical issues and deciding whether it wants to play the role of orchestrator or supplier and participant in the ecosystem, it is important that potential partners should, at least to some degree, fit the company on a cultural and personal level. Relevant aspects include pursuing the same or similar goals and visions with re-

Platform dominance – What mechanical engineering can learn from the B2C sector

Growth orientation: In end-customer business, those offerings that targeted rapid scaling have enjoyed particular success. As soon as one provider was able to realize substantial network effects, it was scarcely possible for competitors to take the place of the market leader. A similar picture will emerge in mechanical engineering: Once the first set of platforms have become "the standard", the followers have little chance of success. Mechanical engineering firms should therefore take action swiftly, before other players occupy attractive market positions. Offerings must always be scalable.

Customer orientation: Successful B2C platforms have one thing in common: They focus unconditionally on the needs of their customers. Every application must add value for the customer. This philosophy is also deeply embedded in the providers' organizations. Any company stepping into the platform arena must therefore rethink its approach, getting away from technology-driven issues and asking itself how and with what offerings customers can be convinced of the benefits.

Agility: We live in a volatile, uncertain and complex world. Customers' and segments' demands and requirements change ever faster. Again and again, successful B2C platforms have taken advantage of changing market conditions and new technical possibilities to rethink and, if necessary, adjust their business model. Since it is hardly possible to envisage what requirements will predominate and which applications will have become established ten years from today, the mechanical engineering industry too needs to be agile. Companies must build organizations and functions that allow them to respond to changes as quickly and flexibly as possible.

gard to platform economy activities, compatibility at the level of corporate principles and company processes, and also the formulation of a win-win strategy for every party involved.

OUTLOOK

In the mechanical and plant engineering industry, the platform landscape is currently in an early phase of its lifecycle, so everything is in flux. All kinds of players are stepping in and entering the market. Portfolios are being differentiated with tremendous dynamism, and the offerings available to potential users are accordingly heterogeneous. Many providers are still experimenting as they look for sustainable business models, durable ways to monetize their services and USPs to set themselves apart from competitors. In the opposite corner, many potential users still hesitate to sign up for a specific platform. They too are watching, waiting and testing the various options that emerge. At the same time, recent months have seen a rise in merger and acquisition activities – a trend that can be interpreted as the first sign of nascent consolidation in the platform landscape.

Given the myriad factors of influence and possible directions in which developments could move, there is as yet no way to say which scenario or combination of scenarios will make the cut in the medium to long term for the future of the platform economy in the mechanical and plant engineering industry. What is certain, however, is that, like the developments we have seen in numerous B2C segments, the platform economy will usher in a new era in mechanical and plant engineering too. Potential differentiators will arise for OEMs and component vendors alike thanks to the value that can be added by digital services, business models and specific applications. On the other hand, by picking and choosing the applications that are of the greatest relevance to them, factory operators can realize attractive competitive gains in terms of costs, but also revenues and qualitative aspects.

Irrespective of the digital maturity it has already attained, a clearly defined platform strategy is therefore a must for every company. For businesses with little prior knowledge of the platform economy, it may make sense to start out purely as a user, for example by purchasing C parts on online marketplaces. In this way they can gather initial experience of dealing with platforms without any sizeable investments. For digital services too, there are less complex entry-level options. Long-term strategic competitive advantages will not be realized in such constellations, however. By contrast, companies with advanced levels of digital maturity should accumulate experience with specific applications that appear promising from their individual perspective, but should do so in test mode before thinking about a large-scale roll-out.

All in all, there are plenty of good starting points from which to develop a platform economy in the mechanical and plant engineering sector. Even so, small and medium-sized enterprises too need to be convinced of the possibilities and integrated in suitable ecosystems. Only then will it be possible to sustainably implement horizontal applications, but also some vertical applications. If this succeeds, Germany's mechanical and plant engineering industry with its fragmented structure of many small specialists and hidden champions could gain a crucial advantage in the face of dynamic international competition, especially from the US and China.

GLOSSARY

B2B | Business to business – Business relationships between companies

B2C | Business to consumer – Business relationships with end customers

EDI | Electronic data interchange between companies

ERP | Enterprise resource planning – The planning and management of capital, human resources, operating resources, materials and IT systems in line with the object of the company

HaaS | Hardware as a service – The customer pays for the service, not the hardware

HVAC | Heating, ventilation and air-conditioning

IaaS | Infrastructure as a service – Customers or users rent space in a virtual data center (cloud) instead of buying their own expensive data center infrastructure

IoT | Internet of Things – Connected devices and machinery

IIoT | Industrial Internet of Things in the manufacturing and industrial environment

LORA or SigFox | Long-range wide area network for IoT applications

LPWAN | Low-power wide area network

NB-IoT | Narrowband IoT – Wireless technology with low energy consumption but strong building penetration and range for IoT applications

OEE | Overall equipment effectiveness

SaaS | Software as a service – Software and IT infrastructure are not purchased, but operated by an external IT service provider and used as a service

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About VDMA

The VDMA represents more than 3,200 companies in the medium-sized mechanical and plant engineering sector. With 1.35 million employees in Germany and a turnover of 224 billion euros (2017), the sector is the largest industrial employer and one of Germany's leading industrial sectors overall.

HANNOVER MESSE – Get new technology first!

HANNOVER MESSE is the world's leading trade fair for industrial technology. With its core focus on "Integrated Industry" and "Integrated Energy", it is the No. 1 global platform for Industry 4.0. The show will next be held from 23 to 27 April 2018 in Hannover, Germany, and will provide a comprehensive overview of the latest visions and technologies for the digitalization of production and energy systems. The upcoming HANNOVER MESSE will feature five parallel shows: IAMD (Integrated Automation, Motion & Drives), Digital Factory, Energy, Industrial Supply and Research & Technology. It will also be co-staged with CeMAT, the world's leading trade fair for intralogistics and supply chain management. Mexico will star as the Partner Country of HANNOVER MESSE 2018.

About Roland Berger

Roland Berger, founded in 1967, is the only leading global consultancy of German heritage and European origin. With 2,400 employees working from 34 countries, we have successful operations in all major international markets. Our 50 offices are located in the key global business hubs. The consultancy is an independent partnership owned exclusively by 220 Partners.

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