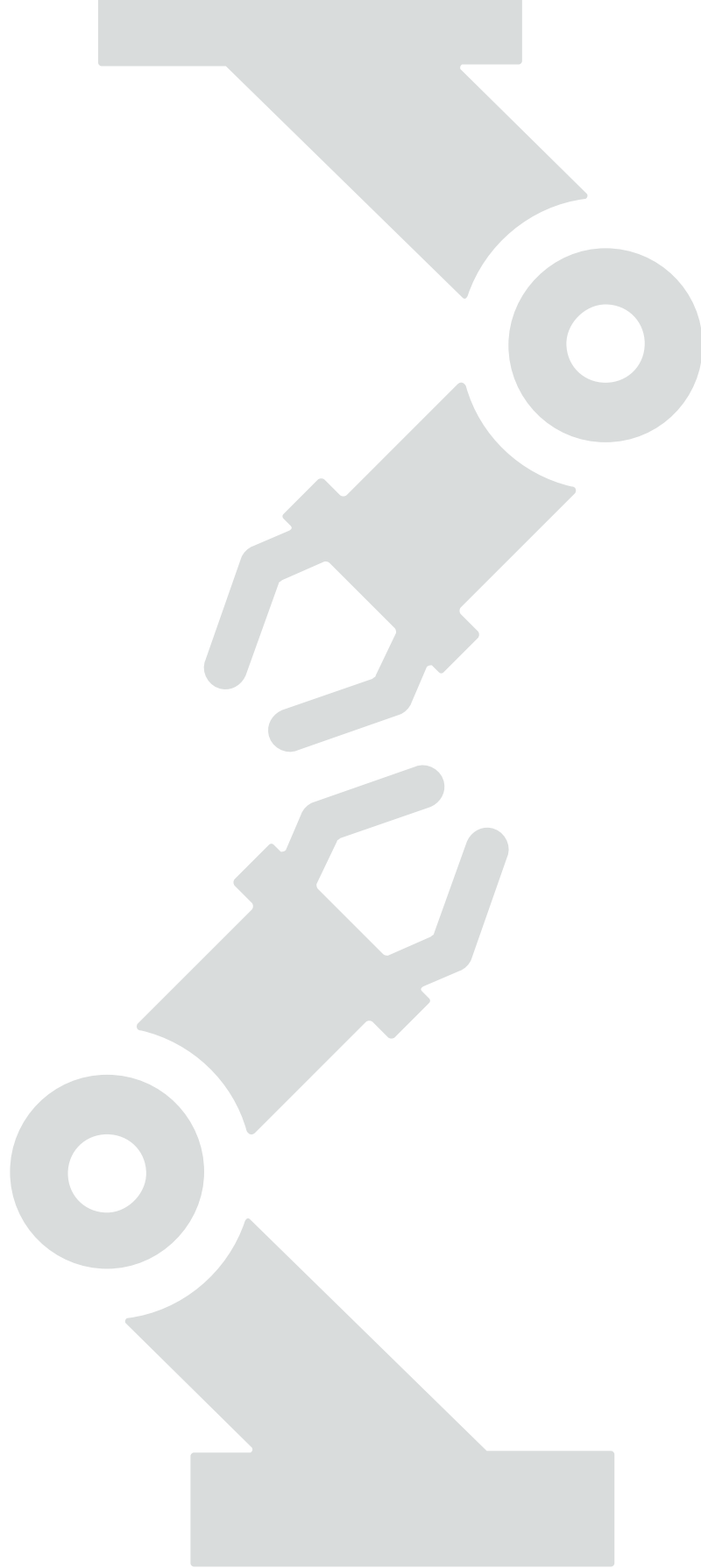


# IN DUS TRY 4.0



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**GERMAN INDUSTRY 4.0 INDEX 2017**

Staufen Digital Neonex GmbH and Staufen AG

STAUFEN.DIGITAL

NEONEX

**STAUFEN.**



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# Editorial



**WILHELM GOSCHY**

COO, STAUFEN.AG

Can you remember what you were doing on July 13, 2014? The chances are good that you were one of more than three billion soccer fans who were glued to their television, watching the German national team beat Brazil in the World Cup. Lahm, Schweinsteiger, Klose – it feels like it was ages ago. And the same thing is true of the first edition of the Germany Industry 4.0 Index. During the World Cup, the team was winning its way to the top, while in Köngen we were still fine-tuning the questionnaire for the study, which was supposed to go out to participants a few days after the final.

Three years have passed since then, and not only have there been changes among the team members, but the questionnaire for the Industry 4.0 Index is different too. Topics such as a batch size of one, predictive maintenance, industrial Internet platforms and agility are simply part of the conversation nowadays if you want to talk about how the German industry is doing in terms of its future sustainability.

At Staufen the lineup has shifted too. With Staufen.Digital Neon-ex, we now have our own subsidiary which consults and assists manufacturers in their digital transformation. The game plan includes not only pragmatic digital strategies: it also involves smart factories, data science and digitizing product portfolios and business models.

And how do things look at your company? Have you modified your strategy to manage these new challenges? Do you have good backup for the key positions on your team? Do you have a “digital team captain” yet -- a CDO?

The findings of the German Industry 4.0 Index 2017 indicate that many companies are still playing for time, despite all of the advances that have been made. And that’s a risky prospect: not every team will successfully get overtime like the German team did back on July 13, 2014.

# Experts talk about Industry 4.0

STAUFEN.DIGITAL  
**NEONEX**

## THE DIGITAL TOP LINE – BETTER SALES THANKS TO SMART PRODUCTS AND SERVICES



**DR. JOCHEN SCHLICK**

Senior Partner & co-Founder, STAUFEN.DIGITAL NEONEX GmbH

Most German manufacturers in the field of mechanical and plant engineering are already dealing with the topics of Industry 4.0 and digitization. Their main focus is on increasing efficiency in production processes.

Dr. Jochen Schlick, senior partner & co-founder of Staufen Digital Neonex, advises companies not to stop there: the real challenge, he says, is to leverage market opportunities and develop new value-chain potential by using new technologies.

There can be no doubt about the economic relevance and market-changing potential of digitization. And companies in the German mechanical and plant engineering sector have also jumped on the Industry 4.0 bandwagon. But it remains to be seen whether or not they are taking the right direction by focusing on increasing the efficiency of production processes. Instead, there is the mid-term risk of German manufacturers losing ground and merely being factories where all of the innovative strength is channeled into increasing efficiency and nothing else. And while this is happening, innovative product and business models will generate real profits elsewhere — at companies which concentrate first and foremost on the disruptive potential of digitization.

This frequently-cited disruptive potential of digitization is based on fundamental IT elements such as machine-readable identification of individual parts, integrating equipment into the Internet, and the option of making software cloud-based and thus accessible from anywhere. These measures create technical opportunities that let companies redesign their existing value chains with significantly lower transaction losses. Seen from a business perspective, this naturally means a brand-new redistribution of added-value potential as well.

The process described here is of vital importance for quite a number of German companies — in part due to the fact that a large part of proprietary company knowledge can be found in software. Not only does this include the software integrated into the products used in mechanical and plant engineering; it also includes companies' in-house software systems where corporate processes are visualized in input screens, individual workflows and configuration files.

There is a natural consequence to using the IT building blocks of digitization: the physical limits of the company will become more and more blurred over time. Especially in the field of software, the option of completely location-independent cloud-based access lets new providers offer standard solutions that are immediately available and do not require expensive IT installations. Furthermore, these sorts of standard solutions are often integrated beyond corporate and system boundaries as well. Additional machine functionalities or analytical and predictive algorithms can also be offered to an international customer base as additional features at any point in the product life cycle and at practically no transaction cost. Examples of smart (i.e. data-driven) services which build on these additional functions can be found in areas such as equipment and spare-part management or the field of use-based billing models and availability guarantees.

Digitization gives providers of smart services brand-new ways to generate additional sales across the entire life cycle of products which have already been sold. These sales can also be achieved with use-based business models in which the end user pays part of the targeted optimization to the smart-service provider. But the manufacturer of the original product is completely left out and, in some cases, gradually crowded away from the customer touchpoint.

The digital top line presents an opportunity that German companies have by and large failed to explore. The key aspect here is the use-based business model, where the real emphasis is on product users — in other words, not the company that buys the product via their purchasing department, but the customer's individual employees who have to work with the product every day.

This means that in addition to business with products such as machines and equipment, another line of business is developing: smart services that greatly expand the current service portfolio. The focus here is less on machines and equipment and their technical availability: instead, it is on the processes and activities of the people who make them efficient and dependable. In the case of a tool machine, for example, this would involve tasks such as set up, monitoring, preparing and maintaining tools and fine-tuning processing techniques.

A central aspect in performing these services is the issue of their scalability. And the key is to offer essential services via software. Taking this approach allows you to offer smart services to a large number of clients without having to increase your staff correspondingly. In a manufacturing company, for example, a piece of equipment can generate added value by installing software that clearly reduces set-up costs, by automating major aspects of tool management / maintenance, or by taking over spare-part management for the entire fleet of machines.

Smart services work with data as well as real-time information about the manufacturer's plant, and their transparency and analysis give the client a direct added value.

Smart software-based options are a paradigm shift for the kind of service that typically focuses on technical availability. New data-driven services work at a level far beyond that of the product itself. They operate on the customer's product-system level and thus involve their entire fleet of machines as well as organizational aspects of production. In the field of spare-part management, the scope of what smart services entails even exceeds the customer's added value system. Developing use-based business models that rely on smart services will necessitate a painful shift in culture, especially for those who manufacture successful products.

The products' self-defined system limits have to be overcome; the touchpoint has to be lifted to a new level; and selling smart services has to take place at the customer's level and correspond to their understanding of the process.

Making changes in corporate culture can be a long and involved process, and developing new competences is a very complex matter, which is why horizontal networking is an option here. Creating an ecosystem of specialist partners is a solid approach to quickly launching into the new business sector of smart services. In lieu of developing the necessary competences themselves, manufacturers open up their customer base to other businesses for a fee; these partners then offer smart services related to the manufacturer's machinery or equipment. A framework agreement ensures that the work between the manufacturer and the partner is regulated. And a software platform allows everyone involved to have access to the machine's data. At its roots, this model corresponds to an open internet platform for exchanging goods and services with a limited number of participants.

The kind of platform I'm describing, however, does not have to be open: it can be quickly and affordably created as a closed ecosystem with a defined number of partners.

For businesses in the mechanical and plant engineering sector, the digital top line is a pivotal option which lets manufacturers concentrate on the high-margin service life of their equipment and machines. In implementing new use-based business models, companies can draw upon the relationships to their clients and extensively leverage the software competence they often have already. Consequently, the digital top line is the main instrument when it comes to reinforcing the added value position of German companies and developing new added value potential by means of software.



# About the Study

## BACKGROUND AND FRAMEWORK OF THE STUDY

To compile the German Industry 4.0 Index 2017, the corporate consulting company Staufen surveyed a total of 394 companies in Germany.

The survey took place in July 2017. Over 70% of the companies surveyed came from the fields of mechanical and plant engineering, the electrical industry and the automotive sector.

As of this year at the very latest, there is no overlooking the fact that Industry 4.0 has made its way into the everyday business life of the German economy. The Industry 4.0 Index, which Staufen has been generating since 2014, has continually risen since it was first established, and in 2017 it achieved its highest level to date with a score of 41 points.

Only a very few manufacturing companies have not yet been involved in the digital transformation, and the overall number of such companies dropped by half since last year. At the same time, nearly 50% of the companies polled have already had hands-on experience with Industry 4.0. It's true that some representatives of the industry see the term as a kind of hype or another buzzword for increasing automation.

And that idea could certainly be debated, if for no other reason than the fact that the term Industry 4.0 does not yet have a clear and universal definition. That, however, is part of the nature of things. Driven by new and exponentially growing digital options, the shift towards a new industrial era entails a nearly unfathomable variety and scope of change processes. Even outspoken critics of the nomenclature can hardly deny the fact that an extensive paradigm shift is making its way through the industry.

This, however, is exactly where the risks of digital transformation lie. At the moment there are too many companies that are still stuck in a "yesteryear" mindset, even if they are already experiencing Industry 4.0 in their own factory halls. No matter whether we are talking about disruption or new digital sales platforms, though, by no means has everyone fully realized how quickly the tried and true may become outdated within only a few years. In many cases, people are still thinking in terms of their five- or ten-year plans, which is practically an eternity in the age of digital transformation.





16

2014

30

2015

35

2016

41

2017

“The digitization of Lean corporate processes increases competitive ability. Wherever it is possible, digitization opens the doors to changing business models.”

Dr.-Ing. Henning Bähren, CEO, punker GmbH

4

# The German Industry 4.0 Index

## 4.1

### Digitization has made its way into everyday business life

In year-on-year figures, the topic of Industry 4.0 has once again gained major ground in the German economy. Nearly every company surveyed has understood that there is no escaping the digital transformation. Only 8% are holding out against the trend, a number which is almost half what it was only a year ago. There are other figures which reflect that Industry 4.0 has established itself in everyday work life: in 2016, a third of the companies surveyed were still in the preparation phase. People were still observing market developments and analyzing data. In the meantime, that is the status quo for only a quarter, and the rest have progressed past that point. 14% are making specific plans or performing tests, and four in ten have already implemented smart-factory principles in individual projects. By contrast, the German industry is still struggling to apply Industry 4.0 concepts throughout every aspect of their company. Only 7% state that they have extensive smart-factory operations, which is still the exact number from the previous year.



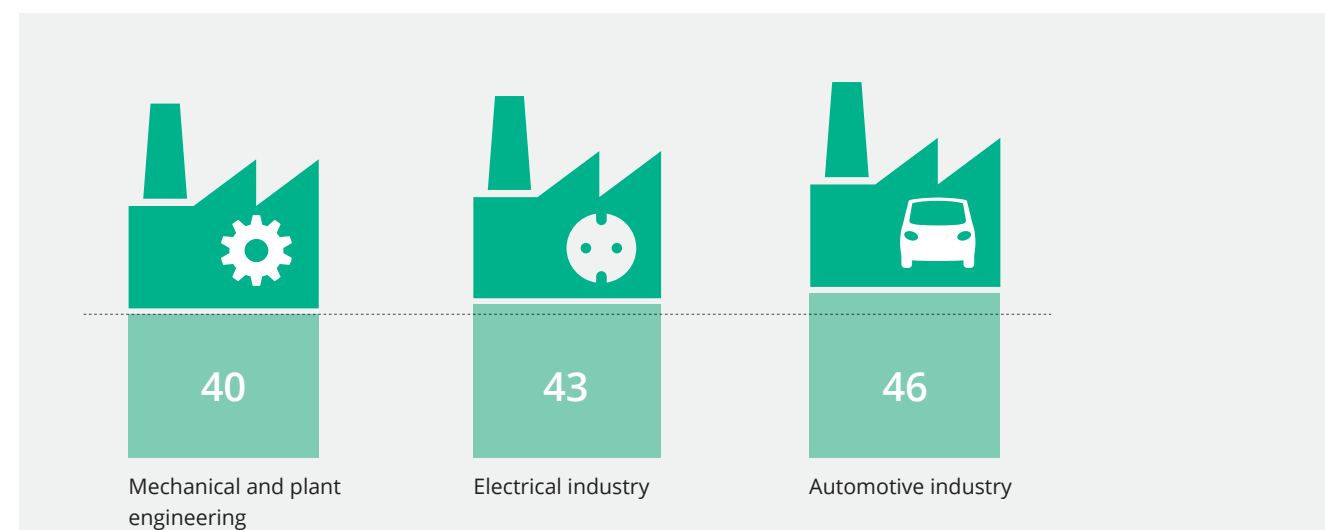
When we break down the numbers, the industries in question do not differ much: a certain harmonization has occurred since 2016. This is a sign that Industry 4.0 is penetrating the entire economy more and more, leading to an exchange of experiences and transfer of knowledge across industry lines. And this is no surprise, since many companies in Germany are closely linked to one another through their customer and supplier relations.

There are differences in maturity levels as far as implementing digital transformation goes, but they are rather insignificant in overall development. When it comes to putting Industry 4.0 into practice, the automotive industry is well ahead of the mechanical and plant engineering sector, for example, but most of the latter's progress is still in the planning and test phase and will soon be implemented. The slight discrepancy can be explained in part by the

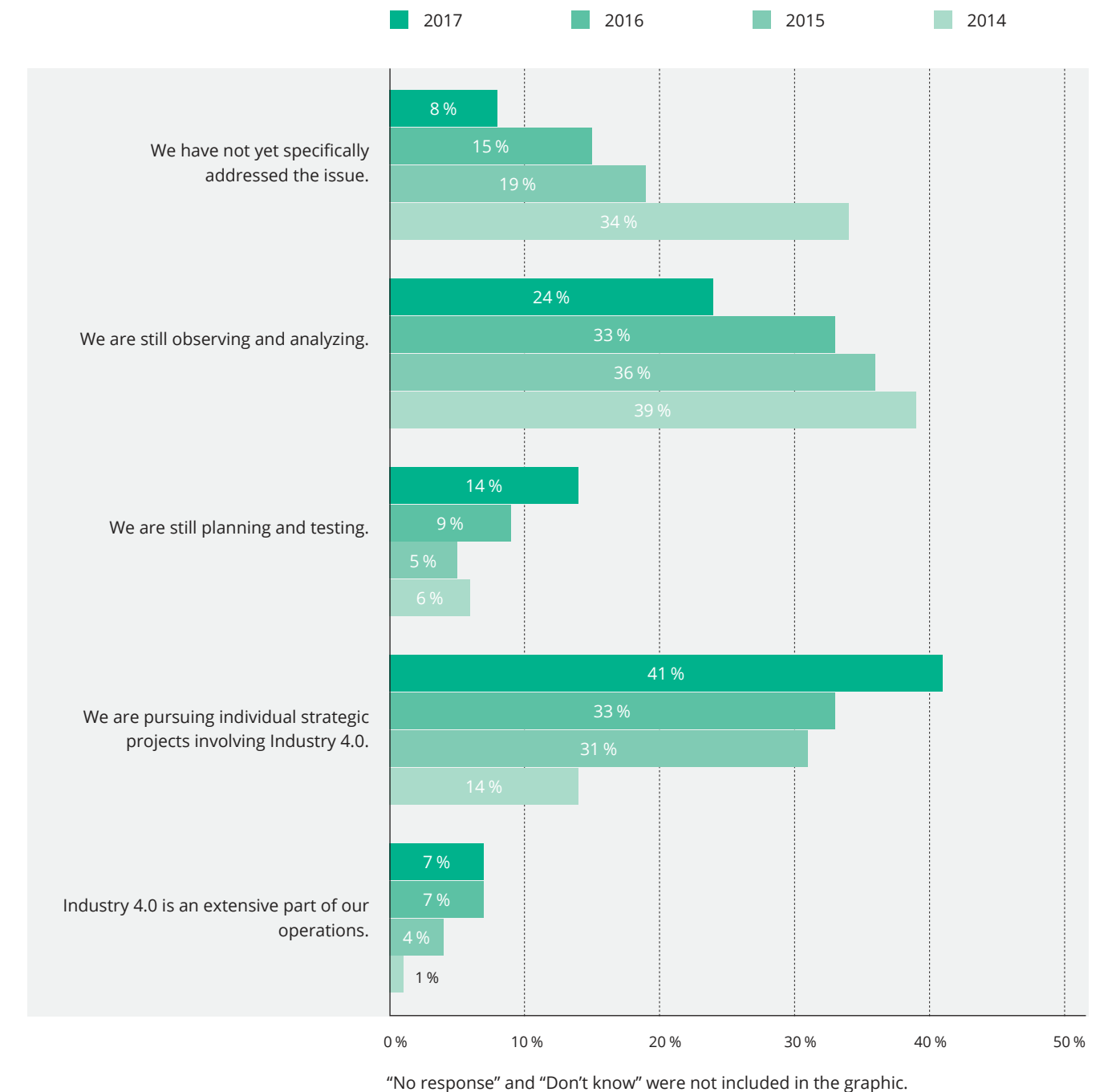
structure of the respective industries. Whereas the automotive industry is dominated by corporations with resources to match their size, the field of mechanical and plant engineering has many more mid-sized and smaller businesses.

Parallel to these figures, the Industry 4.0 Index that Staufe has been tracking since 2014 has risen clearly. This year, it came in at 41 points on a scale of 0 to 100 — 6 points higher than in 2016. Since data were first gathered, the figure has increased by a factor of 2.5, which refutes the occasional criticism that Industry 4.0 is nothing more than hype that will die down again at some point. A cross-industry comparison shows the automotive sector leading the pack at 46 points.

## Industry 4.0 / digitization is still the top issue. How far is your company along the path towards becoming a smart factory?



## Industry 4.0 / digitization is still the top issue. How far is your company along the path towards becoming a smart factory?

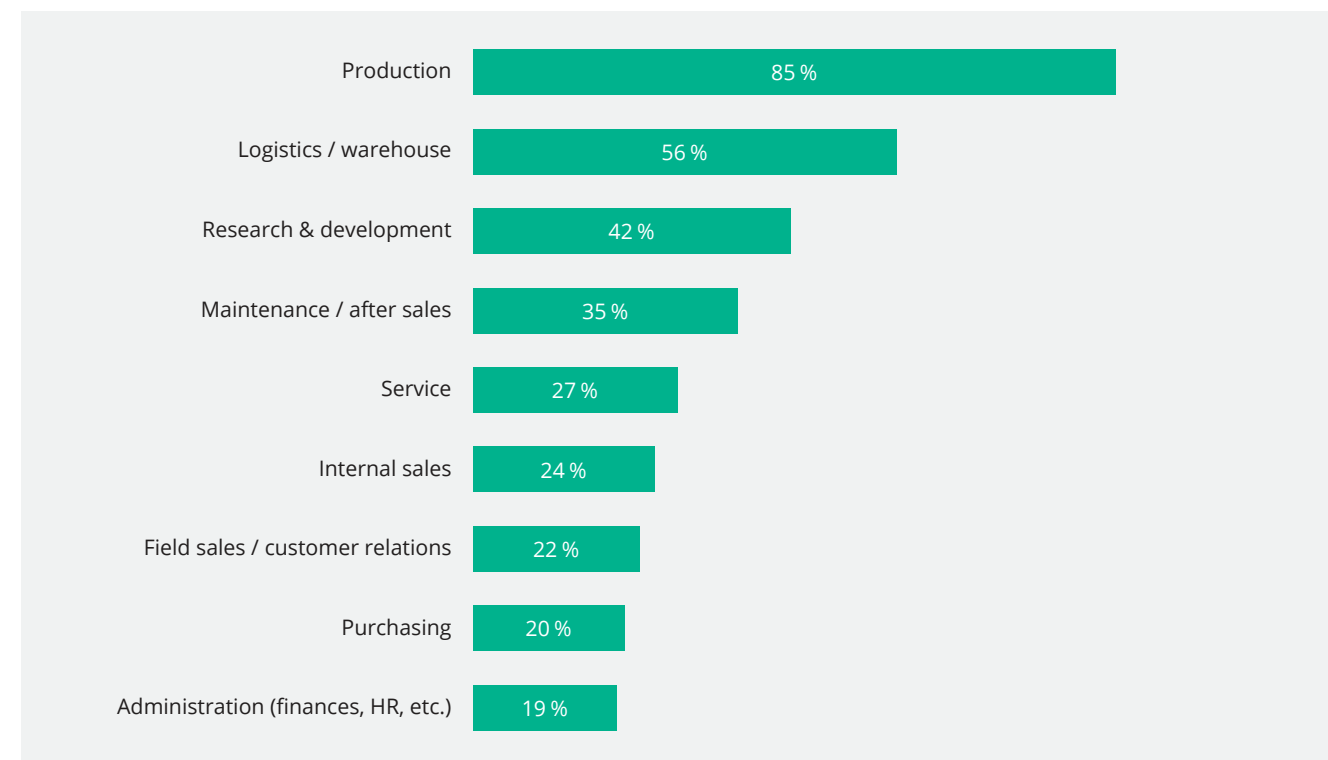


## 4.2

# User industries are driving mechanical engineering forward

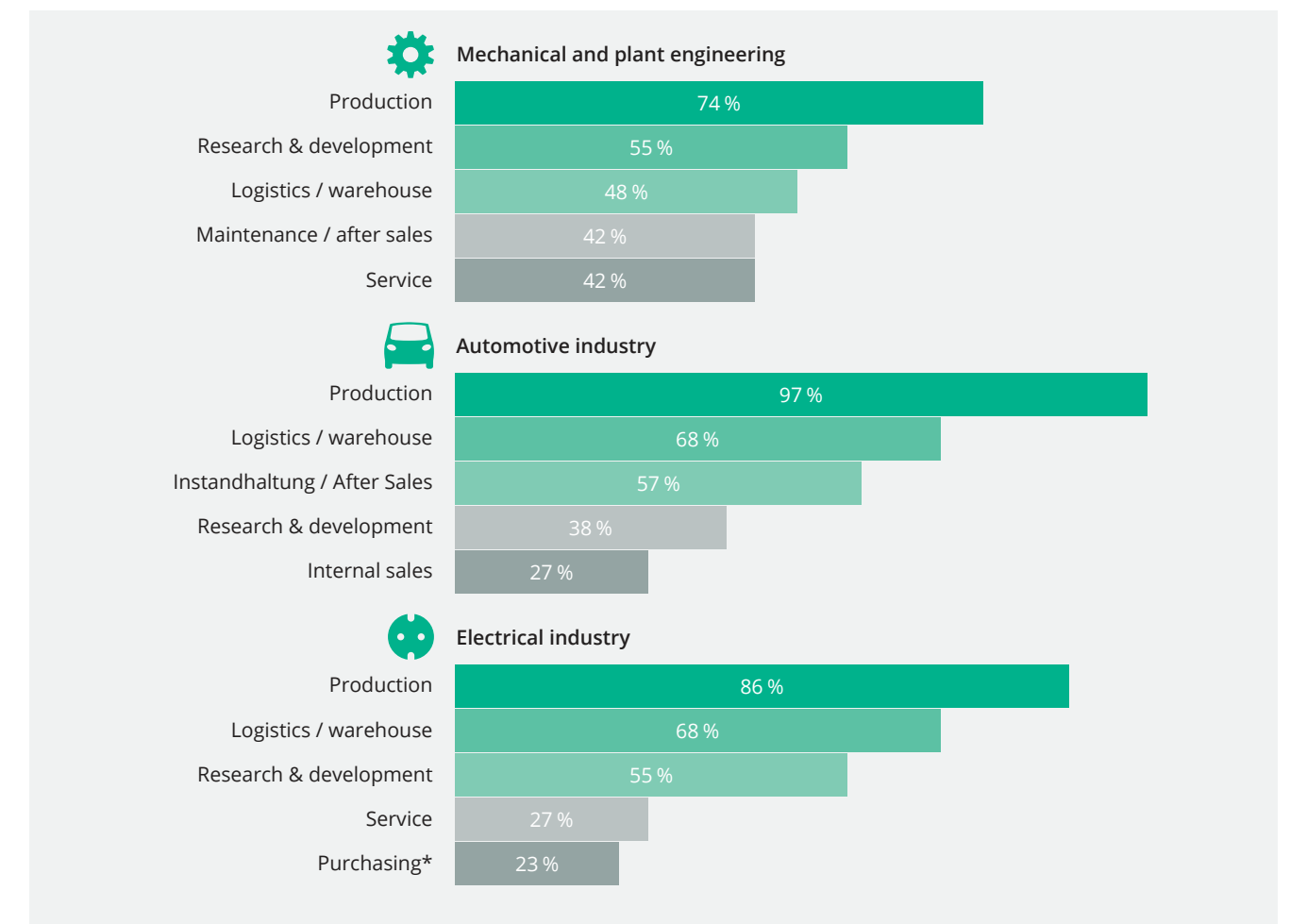
It comes as no surprise that once again in 2017, the clear focus of Industry 4.0 is on production. 85% of respondents which have already specifically dealt with Industry 4.0 have already implemented smart concepts or are soon to do so. The automotive industry is far ahead of the others here as well – 97%.

In which areas of your company have you already implemented Industry 4.0 / digitization or are planning to do so?



Only participants who have already had hands-on experience with Industry 4.0

Industry 4.0 / digitization is still the top issue. How far is your company along the path towards becoming a smart factory?



In terms of developments in logistics and warehousing, the overall picture was the same as in previous years. As a production-adjacent area, this category came in at second place in the ranking with a score of 56%. R&D work also stabilized at the comparatively high level of the previous year and is driven by Industry 4.0 in four in ten companies.

Mechanical and plant engineering deviates from this development, however, with R&D figures coming in at 55% and thus outpacing logistics. One plausible explanation is that this is the industry in which companies use smart equipment to pave the way for other industries to embrace digital transformation. This means that their business right now is heavily dependent on innovation: the demand for Industry 4.0 in user industries is driving the development process in mechanical engineering.

For the first time in the Industry 4.0 Index 2017, the field of maintenance and after sales was created as a category of its own, separate from service. Around a third of the companies indicated that Industry 4.0 played a part here, and all in all, it came in at fourth place. Under the circumstances, digital transformation is changing the nature of service at a remarkable speed. And even though maintenance was placed into a category of its own, the field showed the greatest amount of year-on-year growth. It has increased by 7 percentage points since 2016, meaning that companies are working in an Industry 4.0 environment even beyond predictive maintenance and similar service concepts. This may indicate that new business models are becoming more concrete.

\*Sales and maintenance / after sales ranked at equal frequency

## 4.3

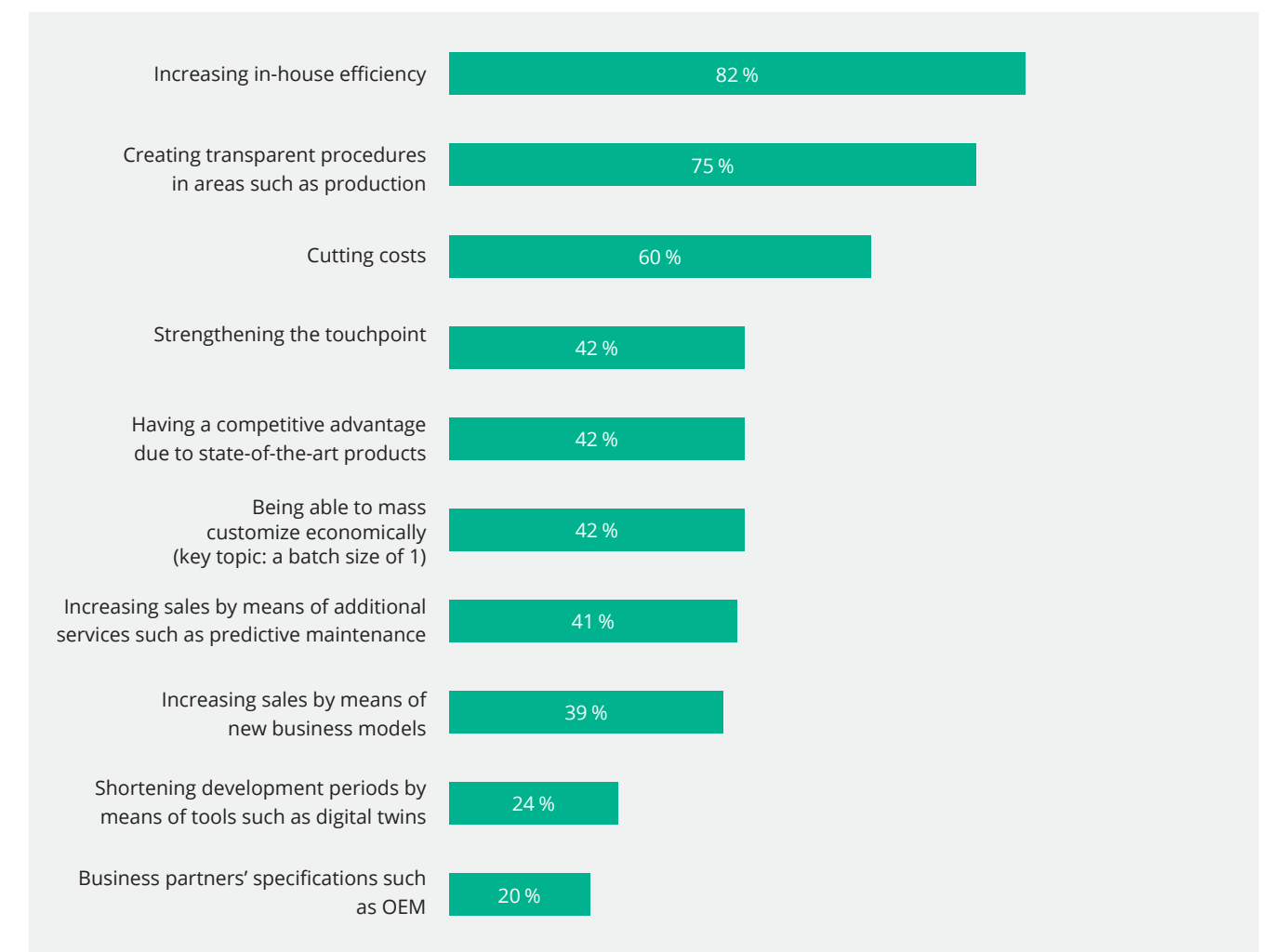
# Classic topics still motivate companies

Even though digital technology has led to so many advances, German companies are still citing the same classic arguments about what they expect: they want Industry 4.0 to increase in-house efficiency (82%), make processes transparent (75%), and cut costs (60%). Slowly but surely, the insight is gaining hold that a fourth industrial revolution is awaiting us, and it offers much larger opportunities. After the top three responses, the next slot in the ranking was divided equally among different items: the touchpoint; competitive advantages via innovation; and mass customization, the most extreme version of which is the batch size of 1. If nothing else, 42% consider these factors to be persuasive when it comes to moving digital transformation forward. A comparable number of respondents see the opportunities inherent in using Industry 4.0 to offer additional services. The promise of new business models also finally appears to be more attractive; there was a long period in which the German industry was accused of failing to recognize this potential dimension of Industry 4.0 in particular.

According to respondents, the lowest priorities on this list are shorter development periods and business partners' specifications. The latter came in at 20%, a surprisingly low figure when you consider the relatively high priority placed on the customer touchpoint. Many companies with this attitude could end up caught off guard. Currently, digital transformation is a process that is largely being implemented on an in-house basis alone. It is clear, however, that this transformation will not simply end at the edge of company property. For example, suppliers who are not adequately prepared for these developments may encounter considerable disadvantages in terms of customer loyalty.

## What motivates your company to pursue Industry 4.0 and steps towards digitization?

Only participants who have already had hands-on experience with Industry 4.0



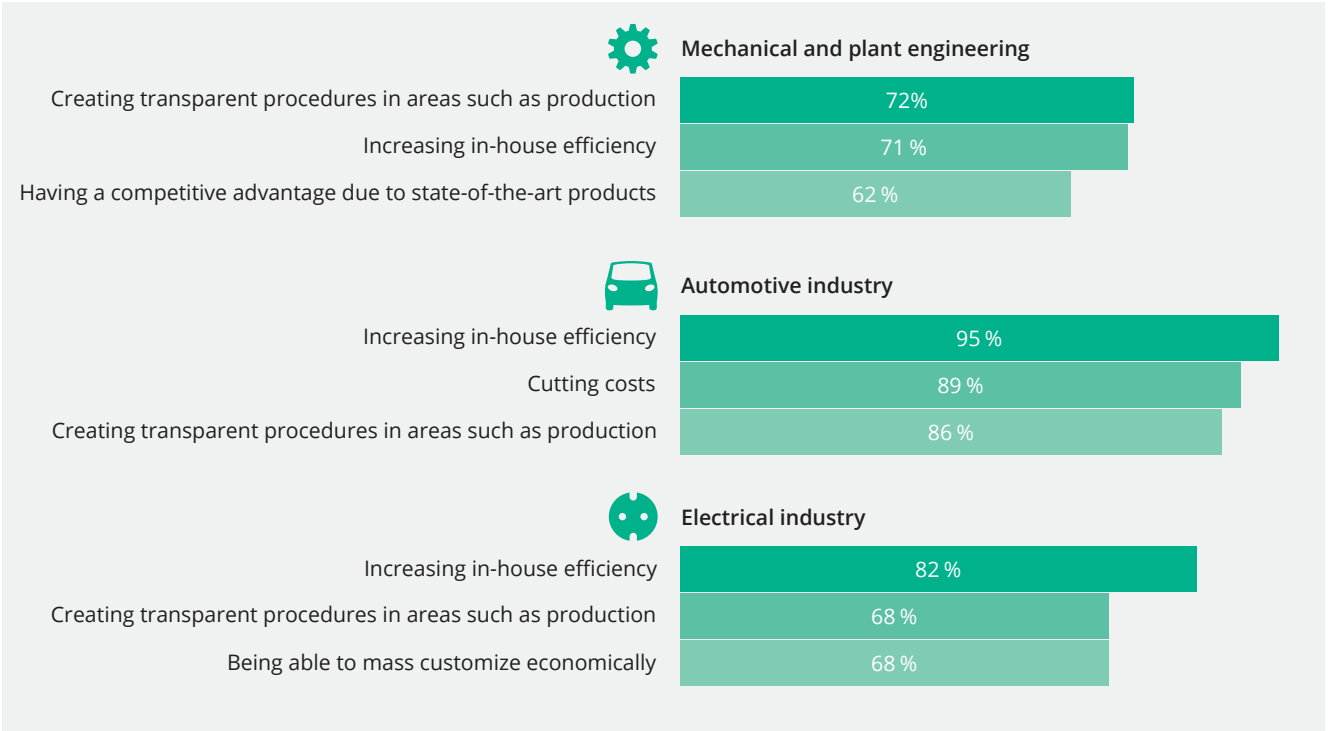


The individual industries surveyed showed a wide variety of motives for embracing Industry 4.0. All of them indicated that the classic economic factors were their main motivation. In the mechanical engineering sector, however, the third most important factor was having a competitive advantage due to state-of-the-art products. Here we are probably seeing the aforementioned situation where user industries are pressuring manufacturers to innovate: companies that cannot supply the equipment to

satisfy customers' Industry 4.0 needs will have a hard time on the market. By contrast, the third greatest priority in the electrical industry is economical mass customization. The customer and product structure may be an explanation here. Unlike mechanical engineering, the electrical industry has an extensive B2C business in which margins could increase significantly through customization.

What motivates your company to pursue Industry 4.0 and steps towards digitization?

Only participants who have already had hands-on experience with Industry 4.0



“From my perspective, Lean is still the leading concept, and Industry 4.0 will only reinforce existing Lean principles.”

Oliver Guehl, BMW AG

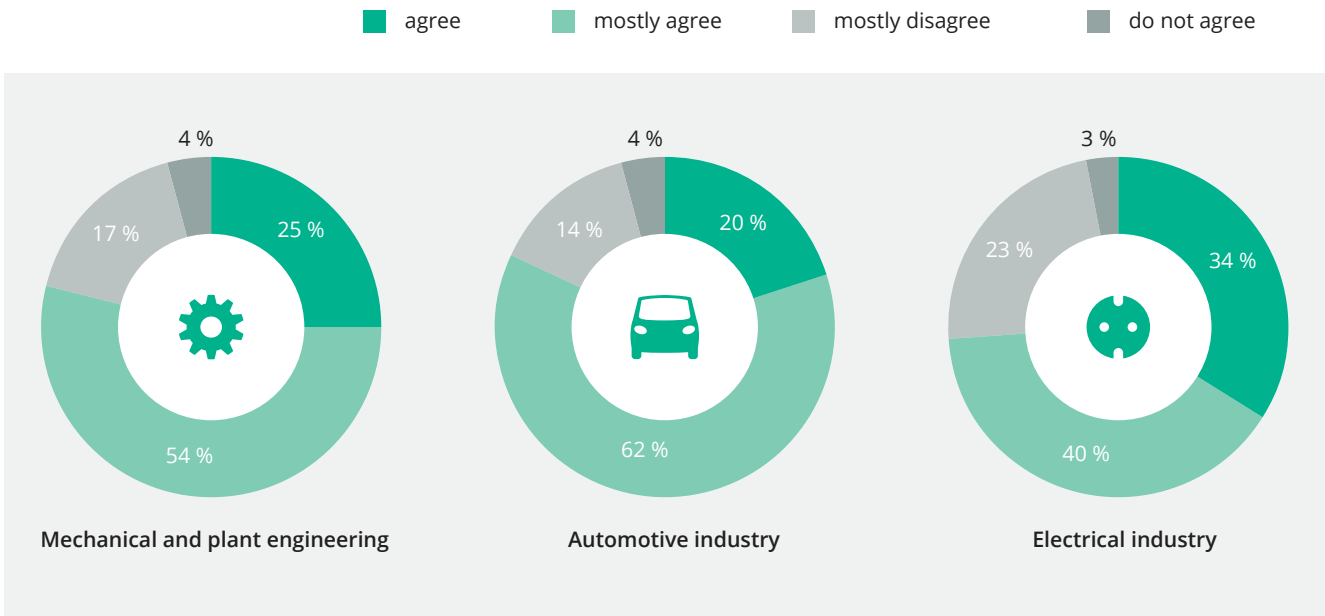


# 4.4

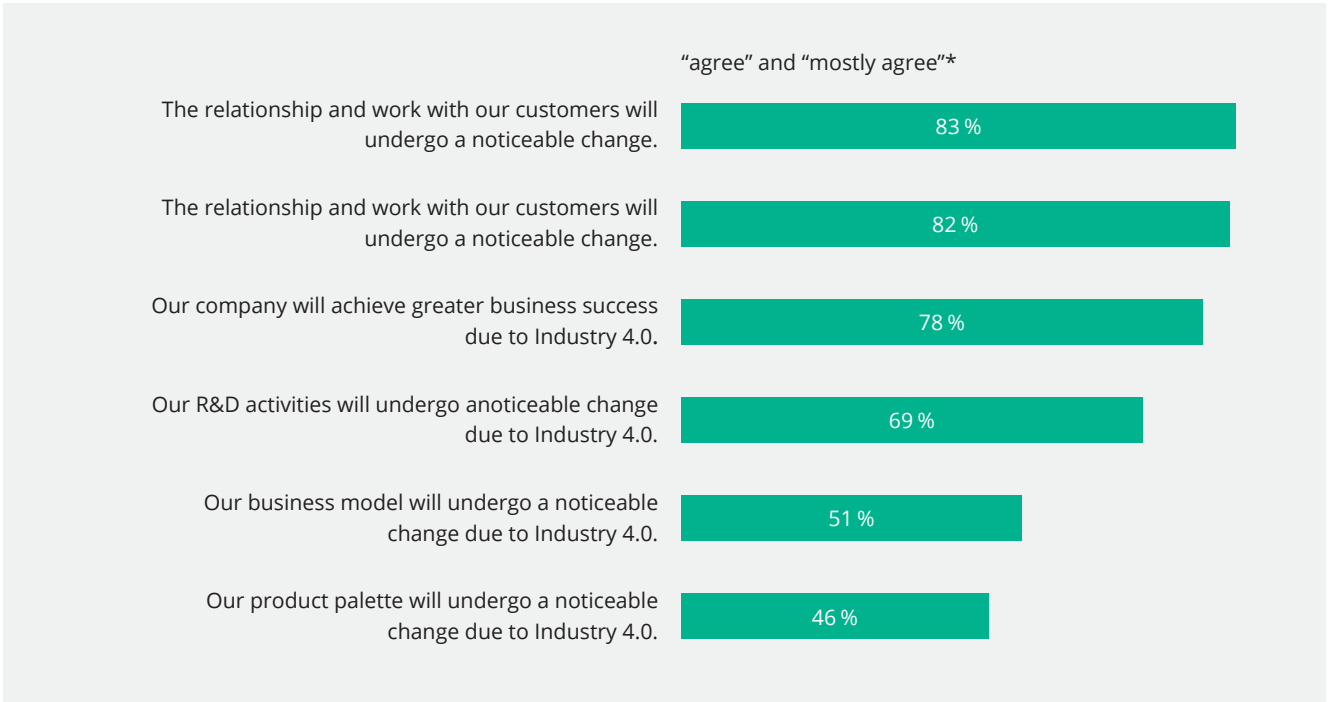
## Industry 4.0 remains the new hope for businesses

When discussing opportunities for economic success, people still express high expectations about Industry 4.0. At 78%, four percentage points higher than in 2016, respondents are convinced that they will increase their success in the upcoming five years through digital transformation. The automotive industry sees this in an especially positive light, although the mechanical engineering sector and the electrical industry also concurred at a rate of well over 70%.

What motivates your company to pursue Industry 4.0 and steps towards digitization?



What specifically will Industry 4.0 / digitization achieve in your company within the next five years?



\* responses on a 4-point scale ranging from “agree” to “do not agree”

When asked about concrete effects, the German manufacturing industry stated that it predicted noticeable changes, especially in their relationship with their customers. 83% assume that new developments will take place within the next five years. Nearly almost as many anticipate this in terms of supplier relations: there were five percentage points more than in the previous year.

On an in-house basis, the transformation is making itself known in areas such as R&D. Almost seven in ten companies expect to feel effects of digital transformation there; however, there is not yet a clear vision of the direction the development activities will

take. Nearly half of the companies forecast that their business model will change — an optimistic perspective in light of the five-year time frame under discussion and general cycles of industrial innovation that have been prevalent so far. Anticipation is especially high in the mechanical engineering sector at 63%. Companies anticipate somewhat less of an effect on their product palette, citing positive responses of a total 46%. The assumption here is probably that there will be evolutionary development that digitally optimize existing products and services, resulting in new business models.

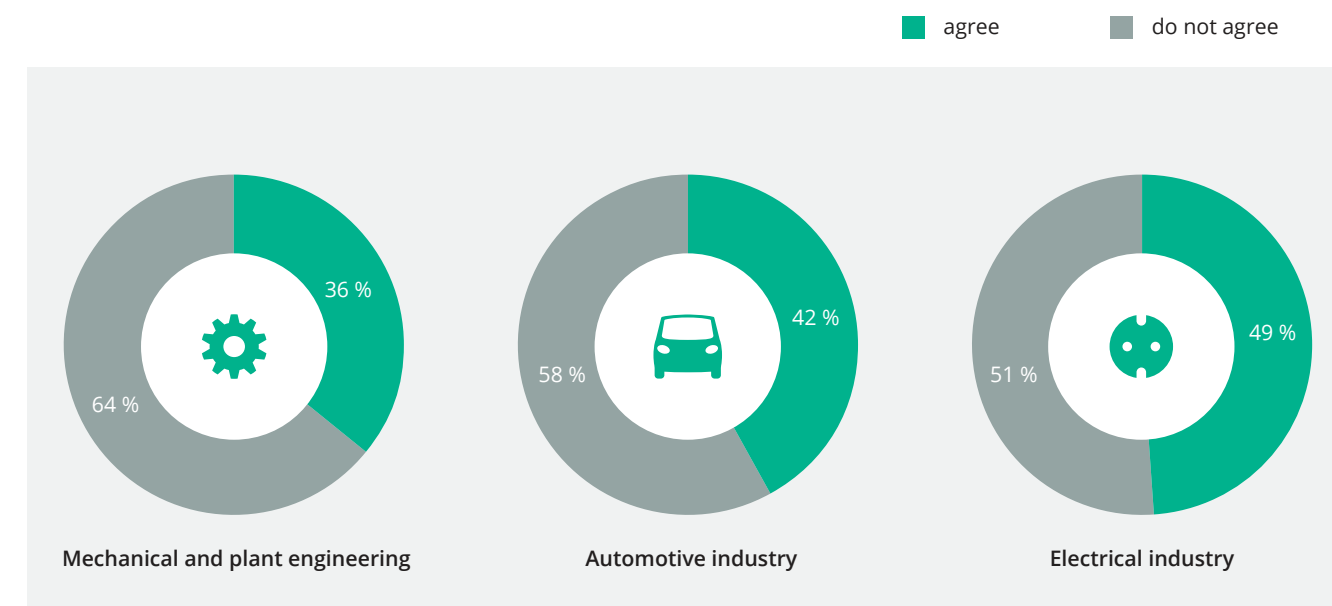


# 4.5 Overworked phrases

For many years now, Industry 4.0 has been the talk of the town in production technology, but nevertheless there is no avoiding the critiques of the concept. There are those who say it is nothing more than hype — simply another phase in the automation process. And it is worth mentioning that four in ten respondents share this opinion. This is an extremely high figure, considering the major opportunities which digital transformation is expected to facilitate.

It is safe to assume that a certain amount of fatigue has become linked to the concept. Far too often, the buzzword “Industry 4.0” — which is not clearly defined to begin with — is tossed around to describe any and every kind of digitally-driven product development. If the goal is to lower people's defenses when they hear the term, the objective has to be to discuss it with candor and a certain amount of realism despite the strong market interest. This defensiveness is especially widespread in the electrical industry, where nearly half of those surveyed see Industry 4.0 as simply the word of the day.

There are critics who have declared Industry 4.0 to be hype that is nothing more than an elaborate form of automation. To what extent do you agree with this statement?





## 4.6

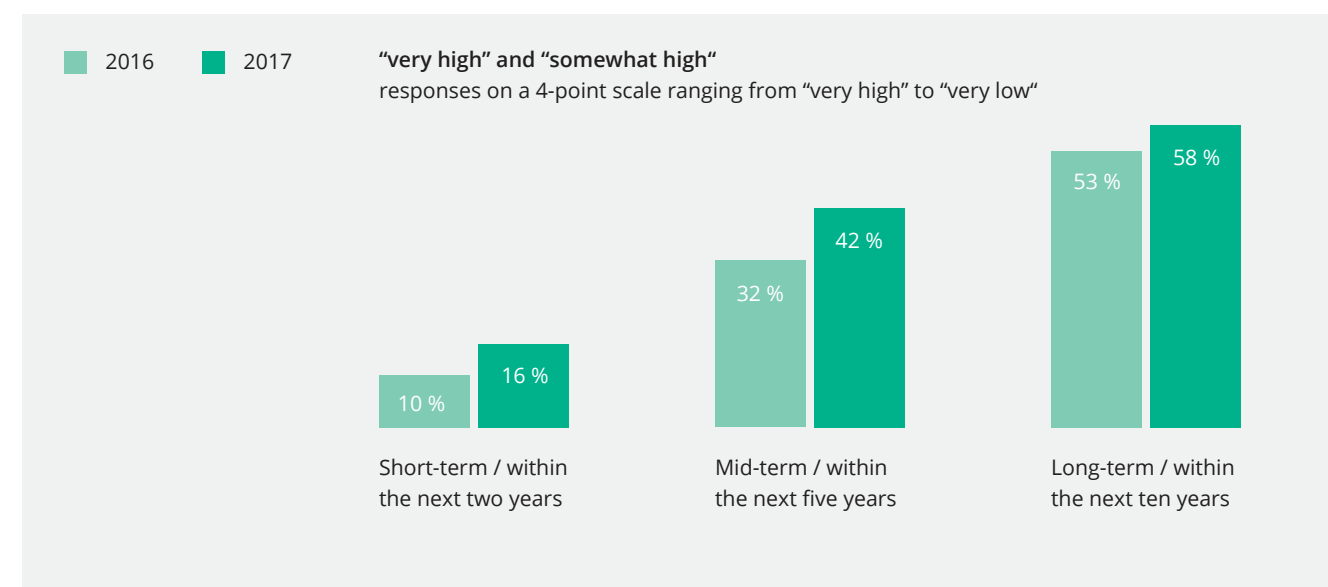
# New competitors are still being underestimated

German manufacturers are slowly coming to the insight that major technological upheaval not only means opportunities: it can also pose a threat to established businesses and business models. Last year, only one in ten could envision that their industry would be affected by disruptive competitors within the next two years, whereas the 2017 figure came in at 16%. 42% cite this risk over the mid-term period of the next five years — an increase of 10 percentage points versus 2016. And in the long term, even 58% say that disruption is likely.

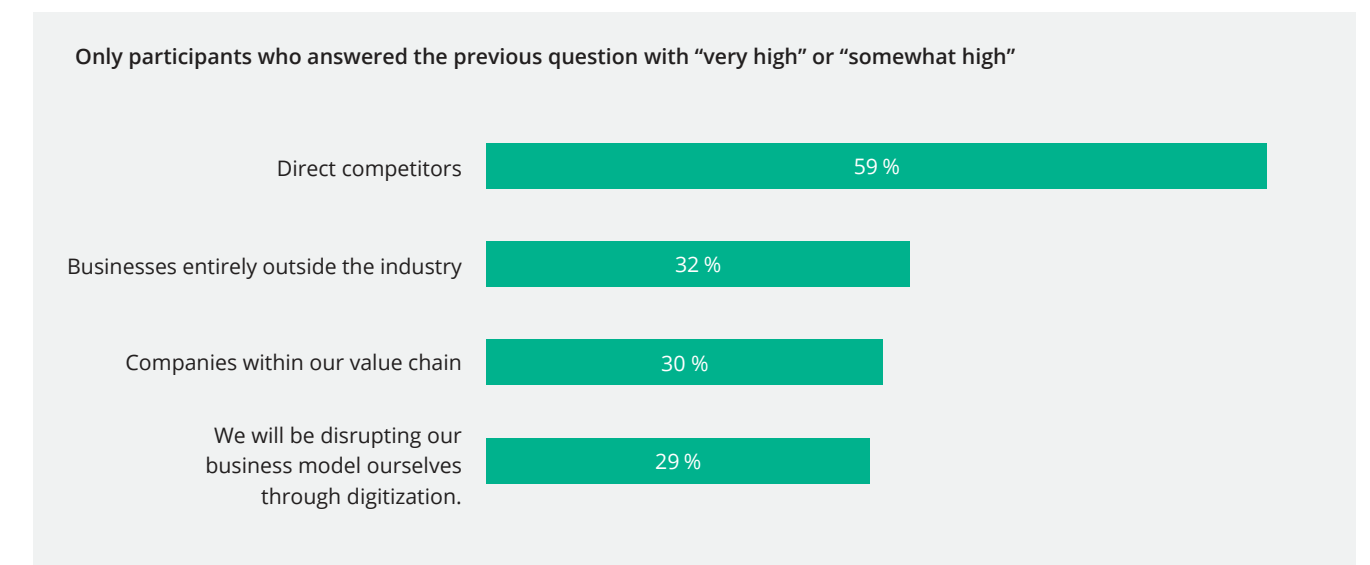
All of this means that the general awareness about the speed of digitally driven market changes has clearly grown, but it appears

not to have grown enough. Thinking in terms of five- or ten-year cycles does not adequately take into account the rate at which current technological paradigms can shift. The greatest risk awareness is present in mechanical and plant engineering, where 21% forecast this kind of disruption within the next two years — almost twice as many as in the automotive industry. This is astonishing when you consider that car manufacturers very recently learned how quickly disruptive business models can achieve market maturity; they got a taste of the phenomenon through the many new digital carpooling platforms and car-sharing models.

In your opinion, how high is the probability of new competitors disrupting your business via Industry 4.0 and/or digitization?



What do you think will disrupt your business model?



Respondents anticipate disruptive innovations primarily from within their own industry, as some 6 in 10 reported. 30% assume that disruptors will still mostly come from within their own value chain — for example, suppliers expanding their business model.

One third of the companies sees a threat from businesses completely outside their own industry. Here too, the automotive sector appears to be surprisingly unworried in light of their experience with the aforementioned all-digital competition: only 18% think that disruption will come from outside their industry.

It seems as if the notion of disruption is very narrowly defined in the automotive branch. But business models in which people no longer need to own their own cars ought to be seen as a much greater threat, especially given how society's values are shifting and how the trend towards a more urban lifestyle is going strong.

Nevertheless, an overall sense of optimism about the growing pressure to innovate was expressed by a total of 29% of companies. They are making plans to alter their own business model with disruptive forms of digitization rather than leave the field to old or new competitors.

# Digitally expanding product palettes

While many digitally oriented companies are currently still focusing on modifying their own production facilities, a considerable number of them are already pursuing further strategic goals. 56% are concentrating their efforts on digital product features such as unique digital IDs, connectivity modules or remote services. In doing so, the industry is gearing up for cloud-based connectivity, among other things. Purely digital products play a somewhat lesser role, although they were still mentioned by 47% of respondents who had experience with Industry 4.0. In other words, companies have been trending towards digitally expanding their existing portfolio, but they are also not disinclined towards new developments in the software field. Predictive analytics — a principle that can be understood as an interface between the physical and digital world — is a topic that is already relevant to 45% of the companies surveyed.

Smart data comes in at second place among the topics discussed. This comparatively high figure is certainly justified when considering that many aspects of Industry 4.0 involve smart data, and many optimizations and solutions are only possible because of it.

Three in ten companies intend to develop their own Internet platforms for different purposes such as sales channels for both digital services and physical products. By contrast, 20% rely upon existing products, at least when software services are involved. Strategic activity in the field of artificial intelligence or machine learning is quite high at 30%. Since corresponding applications have not yet been widely available to manufacturing companies

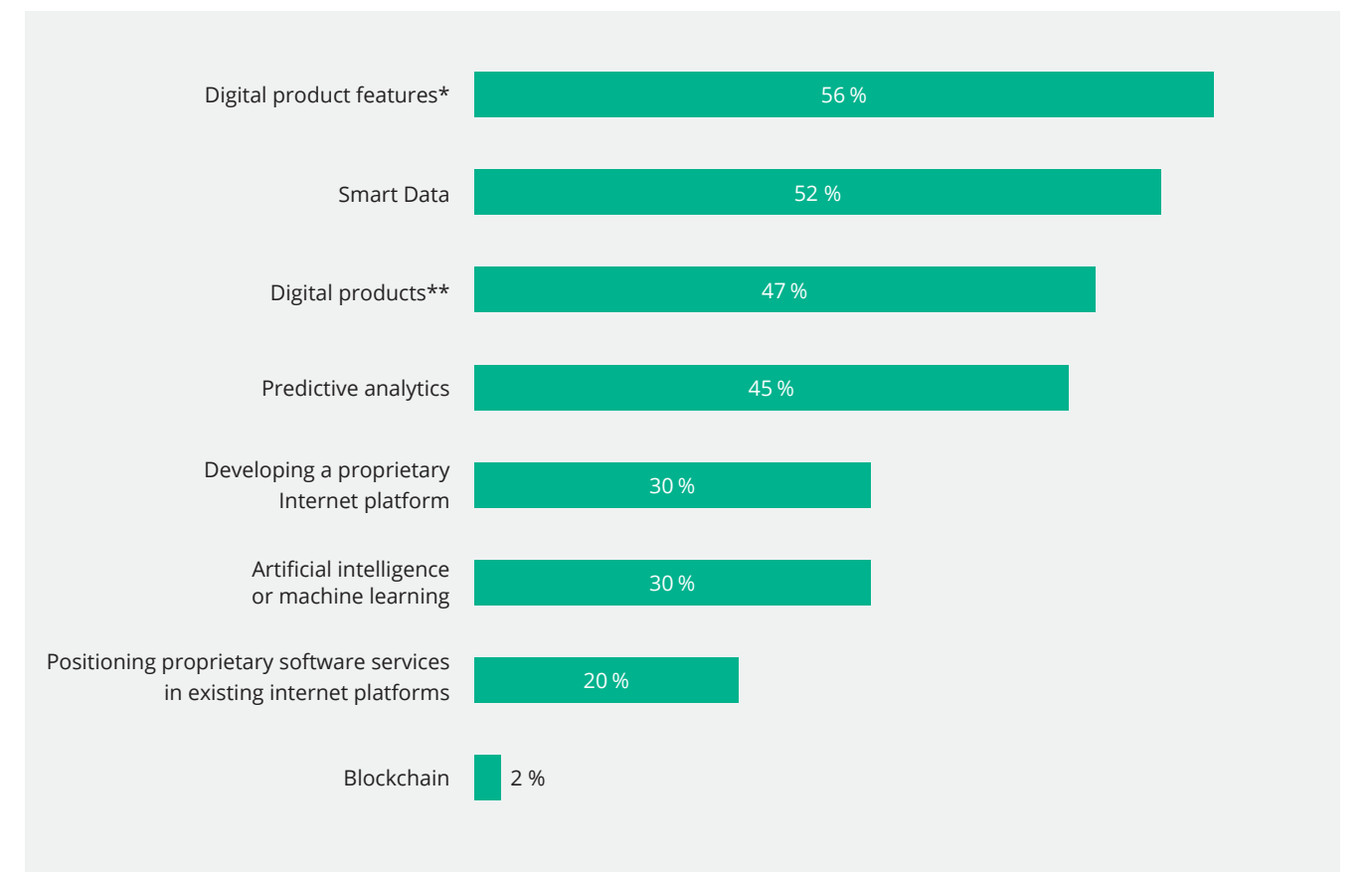
on a practical level, this issue is most relevant in pre-industrial R&D. However, this also shows that the German industry is taking the relevance of AI and machine learning very seriously and is taking appropriate action in anticipation.

The companies in the survey paid little attention to the blockchain: only 2% of them deal with this topic on a strategic level —

not surprising, considering that the implementation rate in industrial sales cannot in any way be compared to the predominantly digital business of fields such as the financial sector. But the role of the blockchain will become greater when more manufacturing industries turn their attention to straightforward software products and services.

## Topics beyond the realm of digitizing production which companies are already addressing strategically

Only participants who have already had hands-on experience with Industry 4.0



\*E.g. electronic rating plates, unique product IDs, connectivity modules, remote services, etc.

\*\*E.g. software services, software platforms, “as-a-service” products

# 4.8

## Underestimated

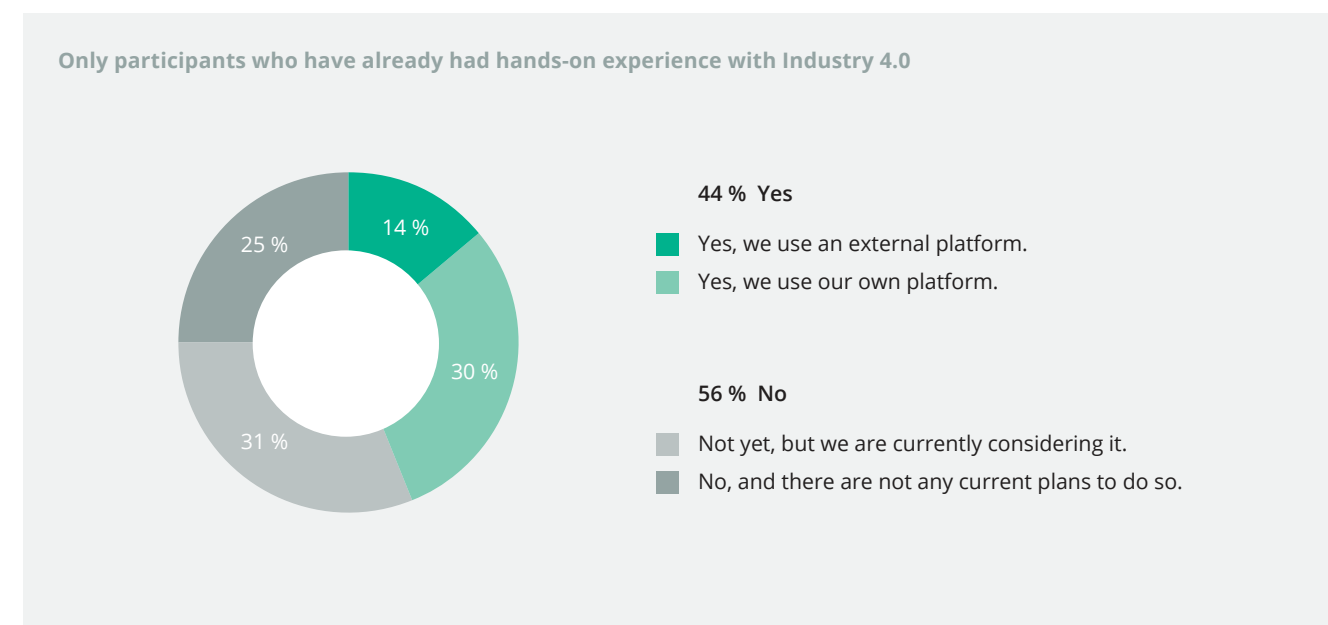
### Internet platforms

The changes which have already occurred in the relationships between companies and private individuals reflect the impact and power that Internet platforms can have when it comes to sales and customer loyalty. There is a great deal of evidence showing that the B2B sector will keep pursuing this development, including production technology and investment goods. That makes it all the more astonishing that a quarter of the companies with Industry 4.0 experience say they are not even open to discussing the use of Internet platforms. Nearly another third is at least talking

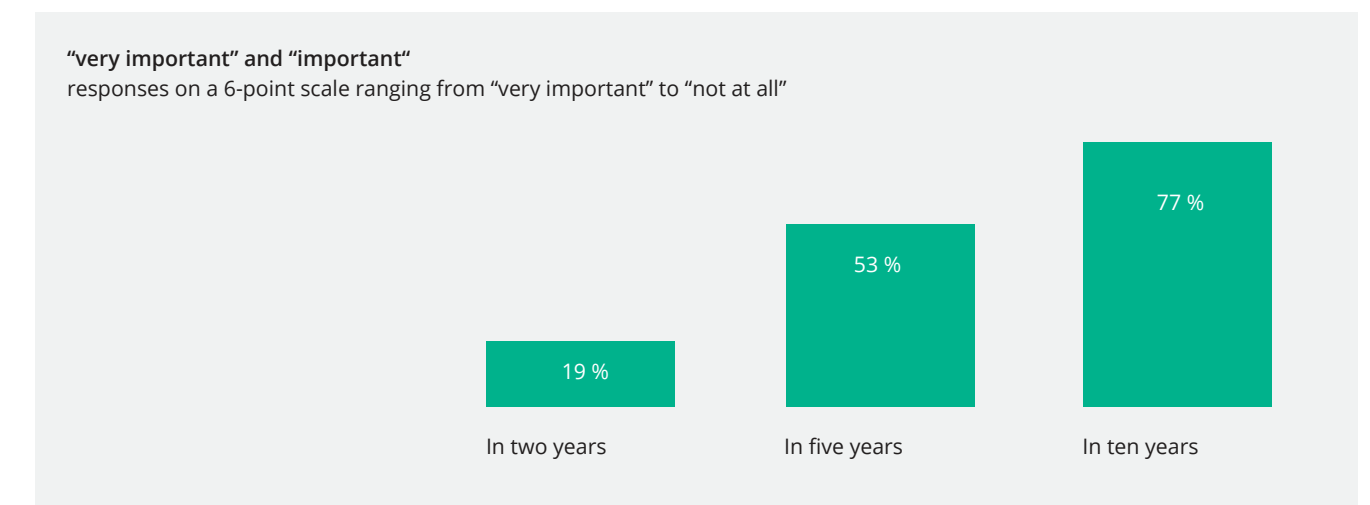
about the idea on a theoretical level. In other words, not even half of the industrial manufacturers which are supposed to be digitally oriented are working with industrial Internet platforms, either for sales or to support their value chain. The hope remains that these companies do not meet the fate of retailers — being mercilessly made redundant by the digital revolution of sales channels.

### Do you use industrial Internet platforms in the course of your 4.0 activities?

For example, to sell hardware, offer software-based services or provide digital support in the value chain



Going forward, how important will these industrial Internet platforms be in your field?



People’s views about the general relevance of Internet platforms correspond to the scenario described above. 44% of respondents say it is important or very important. 38% at least see the potential but do not see a need to improve.

All in all, perspectives are focused on the distant future. Only 19% anticipate that industrial Internet platforms will be of major importance within the next two years. Over half are convinced that this development will happen in the next five years. The vast majority (77%) expect it to be a major factor within the next decade. Here too we can see the extent to which the speed of digital transformation is being underestimated. With such exponential developments, it is nearly impossible to imagine a five-year time frame. The assessments made by the automotive industry are especially surprising: across all projected time frames, businesses in this sector attribute much less importance to the relevance of Internet platforms than other respondents on average.



# 4.9

## Predictive maintenance has yet to satisfy expectations

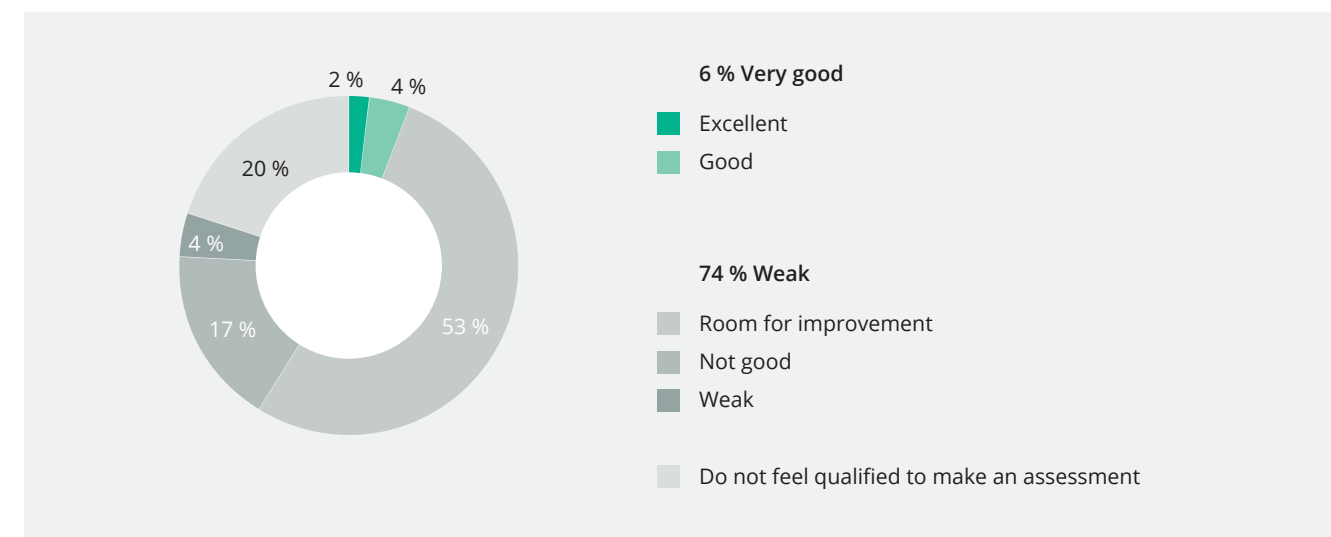
One of the most frequently cited specific uses of Industry 4.0 is predictive maintenance, which is based on observing process and mechanical data. Two-thirds of the companies in the study already apply this principle, either on an in-house basis or as a service they offer. We must mention, however, that the boundaries between classic condition monitoring and predictive maintenance are quite fluid. As a result, this high figure reveals very little about the degree of technical maturity in the systems being used.

The statement is also relative because of the performance standards of what is currently on the market: only 6% say

predictive maintenance solutions have excellent or very good performance.

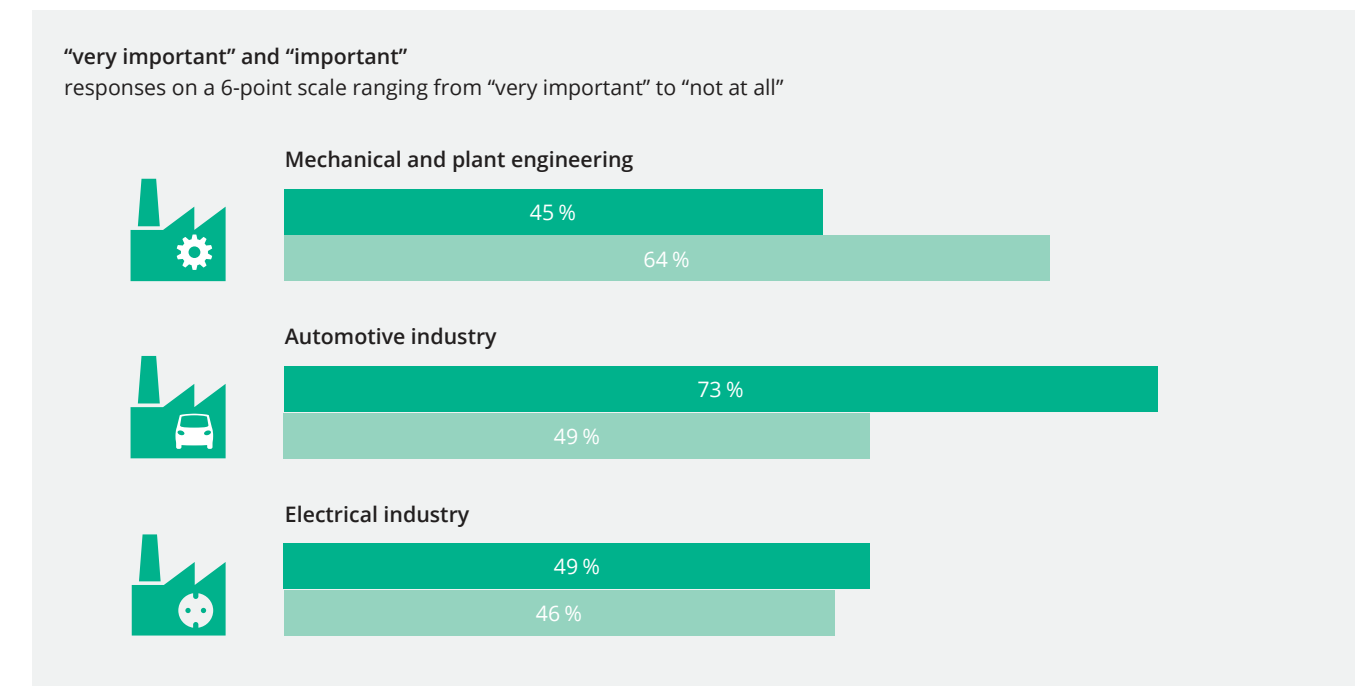
A majority of participants (74%) think that the options available here have room for improvement or are of little overall use. And a comparatively high number stated that they did not feel qualified to make an assessment. A fifth of those surveyed declined to respond, a figure which helps confirm the assumption that the entire principle of predictive maintenance is still not clearly understood.

How do you assess the overall performance of the predictive maintenance offers currently available on the market?



Which role will predictive maintenance play in your industry in 2 to 5 years?

■ In terms of manufacturing in your industry ■ In terms of products manufactured in your industry



However, the industry is putting a great deal of faith in a wait-and-see approach. According to 51% of those surveyed, it is thought that within two to five years, predictive maintenance will be important or even very important in production within their own industry. The same number of responses were given for products manufactured within their industry. But other industries reflect a more multi-faceted picture.

Whereas the automotive industry sees predictive maintenance having the greatest impact on its production, it is expected to have the largest effect on the product side of the equation in the mechanical and plant engineering sector – not surprising to mechanical engineers who have integrated the service into their equipment portfolio. The expectations in the electrical industry are fairly equal both in terms of the overall role of predictive maintenance and how it will influence the processing and product side.

## 4.10

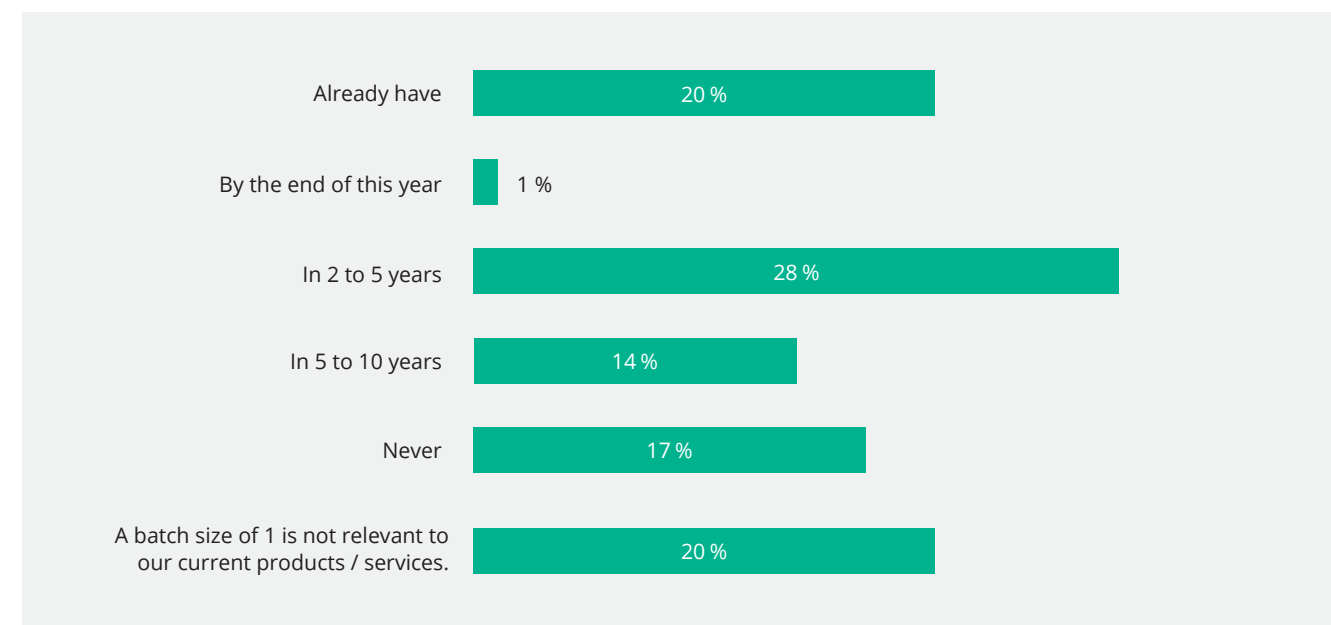
# A batch size of 1 is becoming more feasible

Industry 4.0 could mean that a long-standing dream of the manufacturing industry will come true: it will be able to mass-customize products at serial-production conditions. The most extreme form of this approach is the batch size of 1. It goes without saying that this goal does not apply to every product, a fact which is evident in the numbers: 20% of those surveyed stated that this issue was not relevant to them. But those whose products could be affected have painted a very optimistic picture. Accordingly, one-fifth have already successfully produced a batch size of 1 at serial-production prices. Something to be kept in mind is that there is a time-honored tradition of individually modifying equipment and machines, especially in the field of capital goods, and correspondingly, in this industry batch sizes are lower by comparison.

With an eye to the next two to five years, another 28% believe that they will achieve a cost-neutral batch size of 1, whereas another 14% state that they think it will happen within the next ten years. Only 17% currently express doubt that they will ever reach this goal. This may be too pessimistic overall, because Industry 4.0 will certainly expedite an economical form of mass customization to an extent we still cannot even imagine. At the same time, new processing techniques in the field of digitization are gaining ground, such as additive manufacturing. Initially, the main advantage was thought to be cost-effective options in special industrial solutions. But in the meantime it appears that there will be a much greater relevance overall.

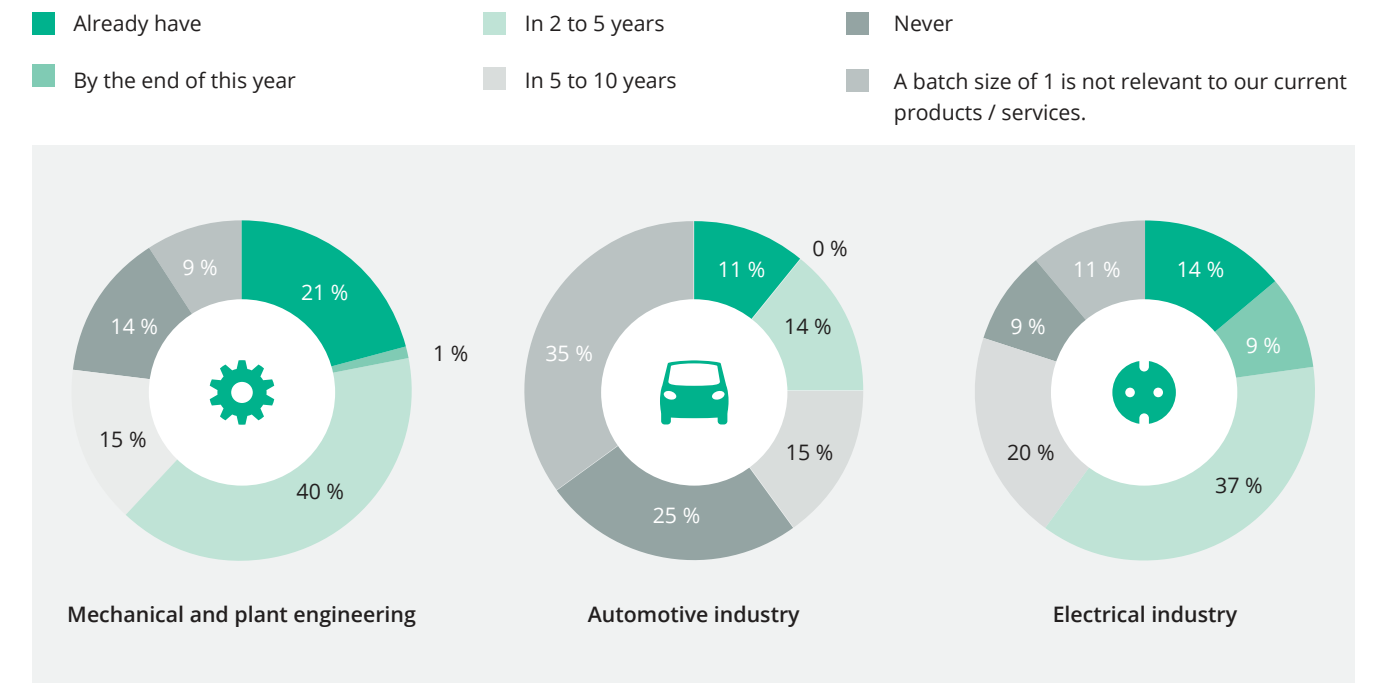
The first companies are now producing a batch size of 1 at the same price as serial manufacturing.

When will your company achieve this goal?



The first companies are now producing a batch size of 1 at the same price as serial manufacturing.

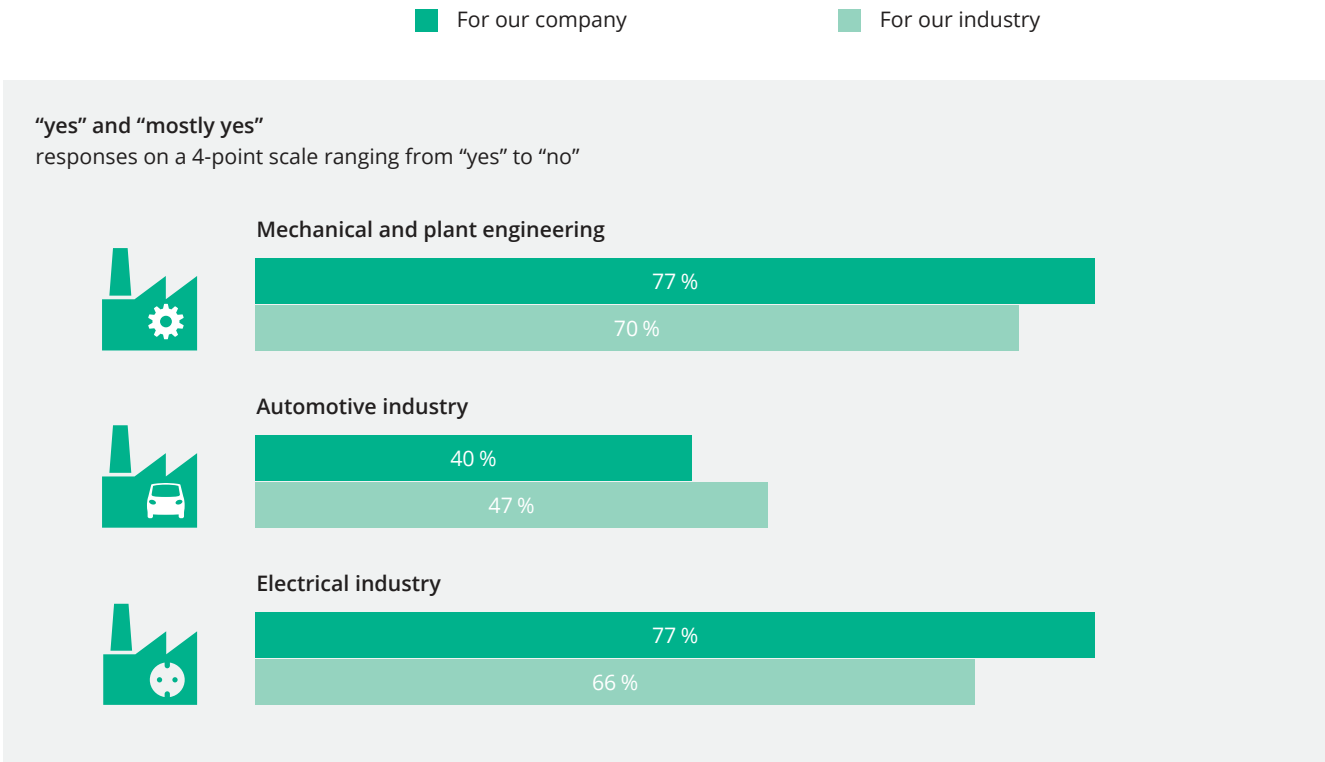
When will your company achieve this goal?



The topic of a batch size of 1 is met with great restraint in the automotive industry. Over a third of the companies state that it is irrelevant to their current products and services. A quarter of them assume that a batch size of 1 will never be feasible. Individual configuration of different car models is already something commonplace at this point, a fact which also has an effect on suppliers. This apparent skepticism may be due to their understanding of their industry, brands and products. Major modifications to car models are seen as a product group unto itself, and in selling cars, great emphasis is placed on the buyer identifying strongly with the brand and model.

As a result, it is certainly open to discussion whether the automotive industry in particular would benefit from a batch size of 1.

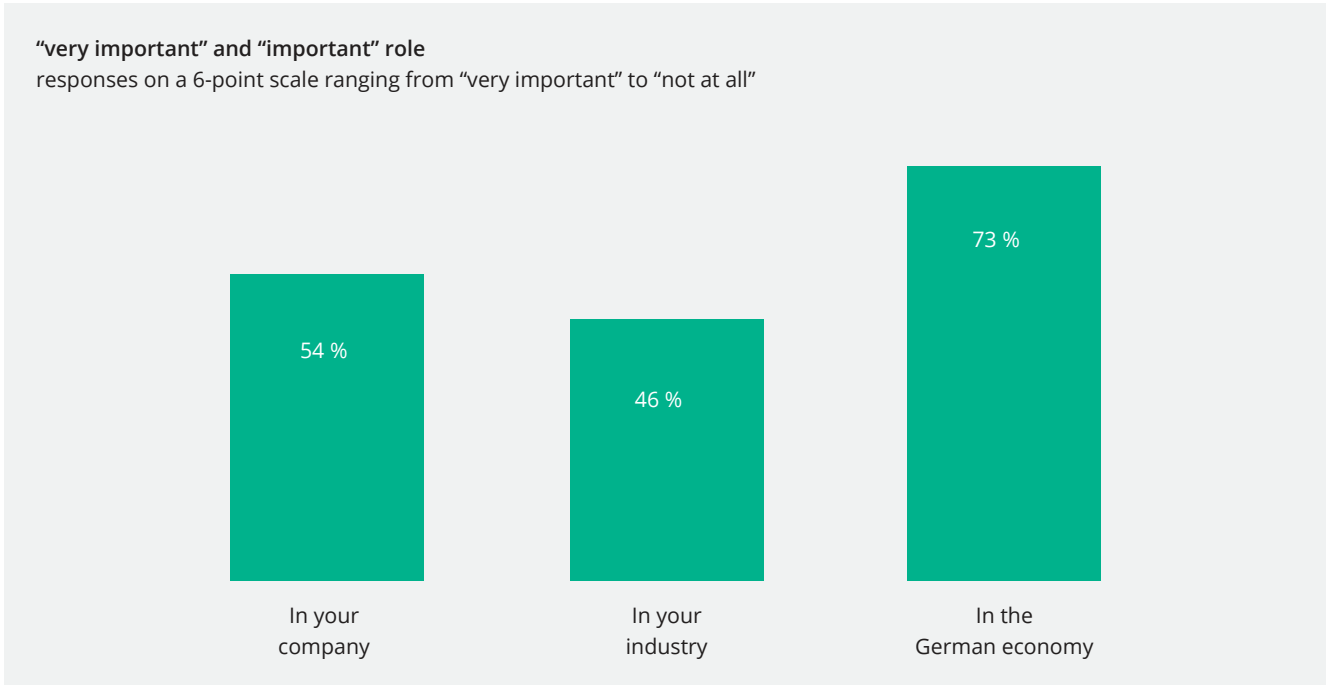
Is the topic of a batch size of 1 an important strategic issue for your company / your industry ?



In keeping with the developments that companies have achieved or aspire to, the majority see a batch size of 1 as a strategically important topic: 61% mentioned it as an issue within their own company and 59% within their industry. Mass customization is especially important in mechanical and plant engineering, a field where, as previously mentioned, the approach has a long history. A batch size of 1 has strategic relevance in-house in 77% of the businesses surveyed, and 70% say the same applies to their industry. Comparable figures were documented in the electrical industry.

Parallel to the automotive industry’s skepticism about the achievability of this goal, they also agreed with this question less than anyone else. Under half stated that the topic was important, no matter whether on an in-house basis or in the industry as a whole.

Digitization makes it possible to produce a batch size of 1 at market-ready prices. How important is this in the context of keeping high-wage countries like Germany attractive or even bringing manufacturing jobs back?



Whether or not cost-effective production of a batch size of 1 can bring jobs back to Germany and other high-wage countries remains to be seen: our study did not yield conclusive results here.

There is significant agreement as far as business in general is concerned: 73% of those surveyed see an opportunity for jobs to be brought back. When it comes to their own companies, people are much more pessimistic, but more than half of those surveyed believe this is possible (54%). This figure came in at 46% when the context was the companies’ own industry.

All in all, it is worth asking where jobs are supposed to be created if not at specific companies. The automotive industry in particular doubts that it will see a positive effect.



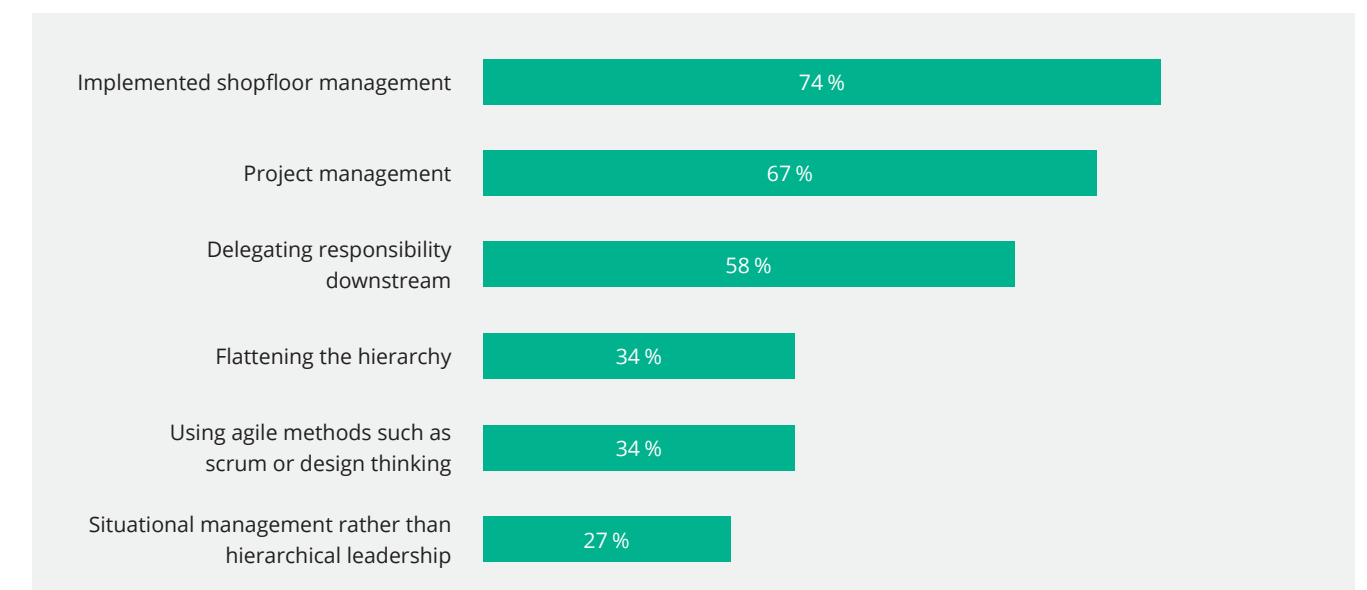
## Agile structures

have to be pursued  
more consistently

If you think of Industry 4.0 as a purely technical topic, you aren't seeing the big picture. Or, to put it bluntly, it's not enough to just buy yourself a few new machines. Instead, corporate culture and the way work is structured both have to be accompanied by an evolution.

This calls for mental flexibility and promoting innovation among employees to ensure that the company can hold its own against the competition amidst increasingly rapid cycles of innovation. To increase in-house agility, most companies take a classic Lean approach: they turn to shopfloor management, i.e. leadership that is practiced directly where the added value is created. This is a preferred strategy for 74%. Some two-thirds work with the principle of project organization.

Which structural changes / improvements has your company implemented or launched to increase agility?



In the industry, people struggle somewhat more with delegating responsibility downstream, but if nothing else, 58% do so to give employees an opportunity to work more independently. This, however, seems to happen more on a one-off basis and less on an organizational level: only one in three companies has actually flattened their in-house hierarchies, and a mere 27% have replaced hierarchical structures with situational management. A clear commitment to a new company culture is needed in these situations so that employees are integrated into the entire innovative process on the long run.

There is also need for improvement in terms of methodology: the key is to take individual cases where agility was implemented and then raise them to a more professional level. Agile methods such as scrum or design thinking are only in use at a mere third of these companies.

## 4.12

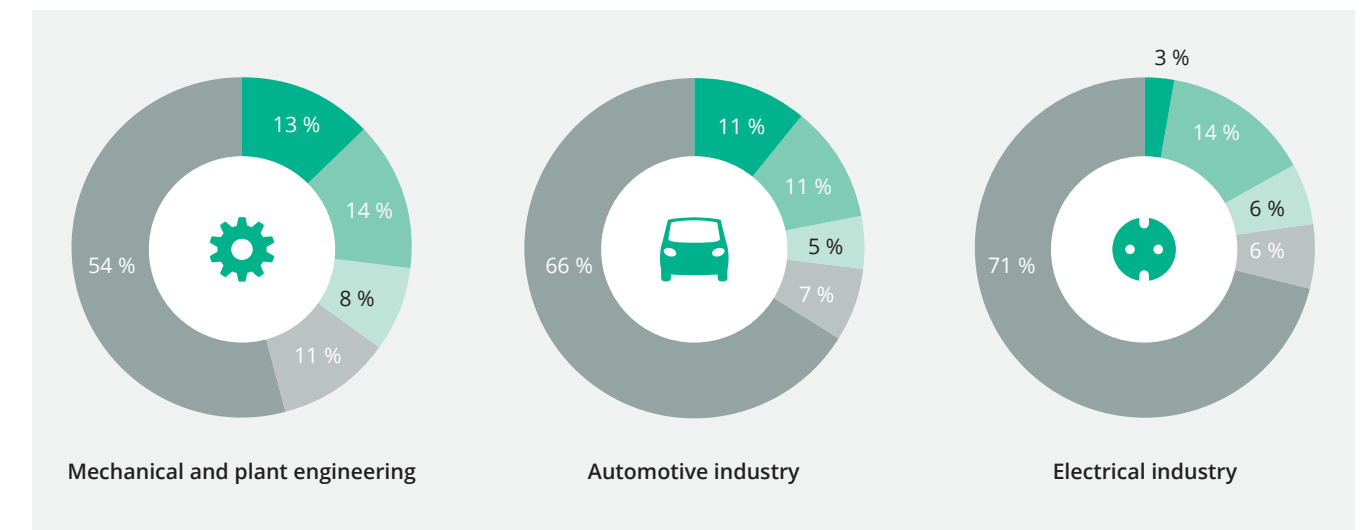
# CDO and CIO – Digital transformation at the C- level

It is not a contradiction in terms to both integrate employee potential while also moving digital innovation forward as a task for management. Changes to corporate culture are only sustainable if the management leads by example. One way to make digital transformation a management issue is to appoint a Chief Digital Officer (CDO) or Chief Innovation Officer (CIO) to the board.

So far, three in ten companies in Germany have taken this step: one in ten has a CDO, 13% have a CIO and 7% have both. In another 9%, one of these two positions will be created soon. On the other side, there are the 61% who have foregone having a CDO or CIO. In the electrical industry, this figure is as high as 71%.

Does your company have a Chief Digital Officer or Chief Innovation Officer?

- Yes, a Chief Digital Officer
- Yes, both a Chief Digital Officer and a Chief Innovation Officer
- No, but this position / these positions will be created or filled soon.
- Yes, a Chief Innovation Officer
- No



It goes without saying that such specific C-level functions are only some of the options in terms of embracing digital innovation.

However, it would be critical if the topic were not anchored in top management in some way. And correspondingly, the job has not been handled simply by creating an executive position in some form — that is, if the employees' innovative strengths also remain underdeveloped at all levels of the company.

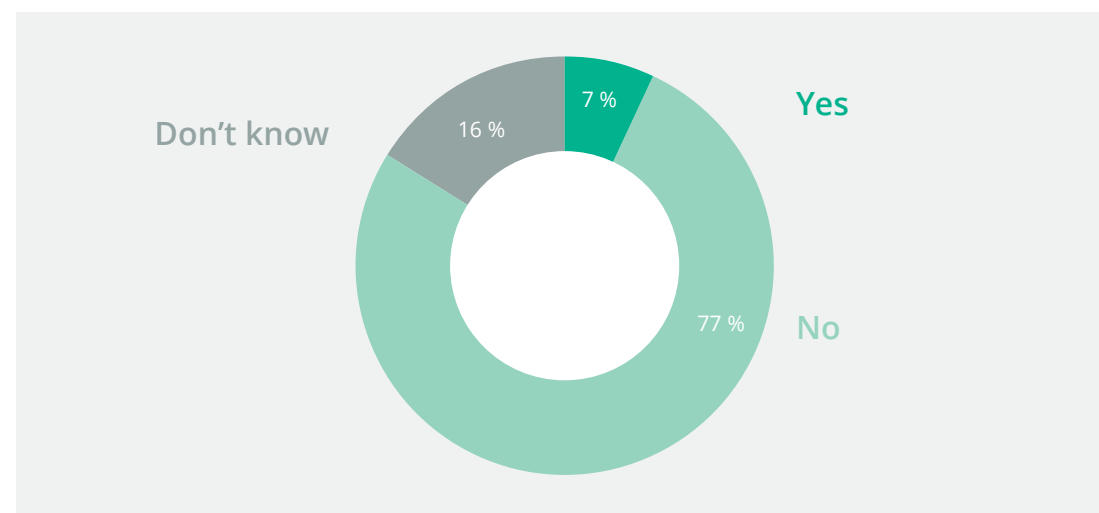
## 4.13

### No proper KPIs

Assessing business success requires having robust key process indicators. And here it is clear that digitization is still taking baby steps. Only 7% of the companies surveyed have KPIs that can corroborate their progress in the field of digital transformation. One reason for this is that KPIs cover an incredibly diverse range of issues; another is that is a comparatively new field of activity.

For decades, economic KPIs have served as the standard for evaluating business performance, but it has only been a few years since the digital transformation has been perceived as an wide-reaching paradigm shift in the work and business world. Presumably it will take quite some time to develop generally accepted and robust KPIs.

From your perspective, can currently applicable KPIs be used to quantify how much progress your company has made on the path to digital transformation?



“Digitization is an opportunity and motivation to solve existing problems with new tools. Lean thinking remains the cornerstone, and people who have not done their homework will probably spend far too much on digitization.”

Marcus Göhl, Siemens AG



# The bottom line

Industry 4.0 is not only going to continue as one of the prevailing megatrends for German companies: the digital future is also growing closer and closer.

Hands-on experience is growing both in breadth and depth, and along with them, there is more hope for the resulting economic success.

Even more than in previous years, our study shows that the real challenge in Industry 4.0 is not the technological aspects: on the contrary, companies are making major progress in that regard. Instead, there is an increasingly clear divide between new ways of thinking about technology and old mindsets. The speed of digital transformation is also being dramatically underestimated.

In Germany, there is a need to catch up, especially when it comes to organizational structures and corporate culture. It does not yet seem to be widely understood that an innovative and agile company needs the right structure to match. On an individual basis, some companies have realized the need for this shift, but in many areas they are miles away from implementing agile methods as the core of a new self-understanding.

Having the courage and willingness to rethink things on a fundamental level will ultimately determine whether a company can keep up with the speed of digital transformation in the long run.



## Who we are

Staufen is a Lean Management consultant and academy.

For over 20 years, we have been offering consulting and training to companies and employees. Around the world.

We believe that inside every company, there is an even better one waiting to grow. Our passion is discovering this company and working with you to establish a sustainable culture of change.

### Awards



## Facts. Figures. Data.

> 20

years' experience

€ 50

million in sales

300

projects a year

50

different  
Lean and Six Sigma  
trainings

> 500

BestPractice visits  
every year

260

employees

14

languages

> 3,000

seminar participants every year

13

offices  
in 10 countries

> 70

BestPractice  
partners

> 90

aktive trainers and  
coaching experts

ISO 9001  
ISO 29990  
AZAV

certified

## Studies.

All of Staufen's studies can also be found online at

<http://www.staufen.ag/en/company/media/studies-white-papers/>.



## Editorial staff

### EDITOR: STAUFEN.AG

Beratung.Akademie.Beteiligung

Blumenstraße 5, 73257 Köngen, Germany

### AUTHORS / CONTRIBUTORS

Wilhelm Goschy Thomas Rohrbach

### IMAGE CREDITS

iStockphoto / Staufen AG

### GRAPHIC DESIGN

[www.weberfink.de](http://www.weberfink.de)

## CONTACT



**Thomas Rohrbach**  
CEO  
STAUFE.N.DIGITAL NEONEX GmbH  
thomas.rohrbach@staufen-neonex.de  
☎ +49 711 933 55 84-0  
📠 +49 178 2902590

## MEDIA CONTACT



**Stephan Albrecht**  
Marketing Manager  
s.albrecht@staufen.ag  
☎ +49 7024 8056 149

## EDITOR

**STAUFE.N.AG**  
Beratung.Akademie.Beteiligung  
Blumenstraße 5, 73257 Köngen, Germany

☎ +49 7024 8056 0  
www.staufen.ag contact@staufen.ag

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