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The digital economy and structural change

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Industry 4.0 – digitalisation to mitigate demographic pressure

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With digitalisation becoming an ever more common feature along the value chain, the German industry looks set to enjoy higher potential growth in the coming years. While the actual economic effects are difficult to quantify, we believe that the favourable impact of digitalisation might lift manufacturing value creation by an additional 0.25 - 0.5 pp p.a. on average.

The additional gross value added in German manufacturing might total EUR 70–140 bn for the years between 2018 and 2025. This is roughly equivalent to 2–4% of Germany's GDP in 2017. However, as the effect of digitalisation is difficult to determine and measure, these figures should be taken with a considerable grain of salt. We are less optimistic about additional industrial value creation stemming from the digital transformation than other researchers.

As a rule, the industrial sector is in a better position than numerous (personal) services sectors to benefit from the favourable impact of digitalisation. After all, creating network connections between staff, machinery and components or intermediate products and automatising procedures is more important in the industry than in many services sectors. Industrial research and development, logistics, market research and sales planning and after-sales services (such as maintenance works) will become more efficient thanks to digital technologies and applications as well.

The Deutsche Bundesbank expects overall potential output to decline from currently 1.2% p.a. to roughly 0.8% p.a. between 2021 and 2025 as the pool of labour is likely to shrink and older employees may be less productive. In contrast, we believe that the German industry should be in a much better position than many services sectors to offset at least part of the unfavourable demographic effects by using digital technology. This is a key precondition for keeping the German industry competitive at the international level.

Traditional capital goods producers, such as the auto industry or mechanical and electrical engineering, are likely to see their gross value creation benefit more strongly from digitalisation than the metals or chemicals sector.

While industrial digitalisation is making progress, it is difficult to measure in statistical terms

The digitalisation of the industrial value chain is currently a key issue. However, any progress with the introduction of the "Industry 4.0" ("I4.0") is difficult to measure because of statistical definition problems. Things are looking different when it comes to qualitative assessments. There is a considerable number of studies concerning practical applications.

This study attempts to give an overview of the current situation and of recent trends in industrial digitalisation. Due to the lack of statistical figures on this issue, we rely mainly on studies by Bitkom, Germany's digital association, and surveys by industrial associations, in particular the Mechanical Engineering Industry Association (VDMA), which may be based on highly different methodologies, but nevertheless paint a largely consistent picture. Overall, the Bitkom overview of the industry suggests that industrial companies increasingly avail themselves of numerous digital opportunities[1]. However, studies by industrial associations show that the degree of digitalisation may differ between the individual sectors.

Industrial Internet of Things combines the advantages of two different concepts

This study will focus on the so-called Industrial Internet of Things ("IIoT"), i.e. the use of digitalisation in two areas which are particularly interesting for the industrial sector. The first of them is Industry 4.0 in the narrow sense of the term, i.e. the "industrial internet". The second is the "Internet of Things" ("IoT"). The two fields focus on different issues and result in different concepts.

Digital connections between people, machinery and products are moving into the foreground

— Industry 4.0 is about the digital interaction of machines, people and products. Its main goal is to improve production efficiency, starting with the efficient production of individual items (such as a unique specialist machine) and ending with a super-smart, fully connected production facility ("smart factory"). Ideally, fully connected machines should automatically communicate with each other and achieve significant efficiency gains, from the use of resources to shorter production times and better quality standards. Obviously, this goal has not been reached yet. With machine-to-machine ("M2M") communication fully operable, human activity will focus on planning and on dealing with any difficulties during the production or operation phase.

— The Internet of Things focuses on the final user or consumer. Its goal is to optimise utilisation. As digitalisation and communication make progress and individual products and devices become interconnected, new applications are developed. The goal is not only to improve vehicle utilisation, for example, including such ambitious efforts as electrical mobility or

[1] The Federal Ministry for Economic Affairs and Energy (BMWi) also believes that the digitalisation of German industrial companies has "improved significantly since 2016". See BMWi (2018). DIGITAL Economy Monitoring Report 2018. Compact. July. P. 6. According to the German Academic Association for Production Technology (Wissenschaftliche Gesellschaft für Produktionstechnik, WPG), digitalisation and Industry 4.0 are clearly becoming an everyday feature in German industry. See WGP (2018). Standpunkt Industriearbeitsplatz 2025. 27. August. P. 4. Peter Groche, Director of the Institute for Production Engineering and Forming Machines at TU Darmstadt and one of the authors of the WGP study, believes that, while fully automated and digitally connected production procedures will indeed be realised, this will not be the case before "around 2050". See Die Umsetzung von Industrie 4.0 fängt gerade erst an. Frankfurter Allgemeine Zeitung. 10 September 2018

Optimising utilisation via the Internet of Things

autonomous driving. Ultimately, a fully interconnected digital world will aim to check and improve not only mobility in all its facets, but also residential, household and communication devices and all aspects of everyday life. The IoT can only become a success if as many user data as possible are connected, aggregated, processed and analysed. Ideally, the devices will autonomously use the data pool to try and generate the optimal solution for consumers. Moreover, the data pool can be used as a basis to develop new, additional services for users or consumers. Data protection is obviously a highly relevant and sensitive issue in this context.

The Industrial Internet of Things will combine both concepts[2]. IIoT connectivity is based on the simultaneous utilisation of a range of devices and instruments, such as internet and cloud services, big data, automation and sensor technologies, smart logistics and production paths, intelligent machines and mature M2M communication. This will allow cyber-physical systems to respond to queries by human staff or users and pass the relevant information on to production robots.

IIoT combines two distinct fields

The IIoT will make a key contribution, as the Industrial Internet, with its focus on highly efficient production, will remain incomplete unless sales channels to the final client and the clients' preferences are not included. Thus, the IIoT's added value stems from the interaction between the two spheres.

Industry is opening up to digitalisation

Digitalisation of industrial production makes progress

In 2017, Bitkom[3] forecast that sales stemming from I4.0 solutions would total EUR 7.2 bn in 2018. This would be equivalent to an increase by more than one-fifth in year-on-year terms and by an impressive 77% in comparison to 2015. The digitalisation of industrial production is obviously making quick progress.

A representative survey conducted on behalf of Bitkom among industrial companies this year[4] supports the forecast. The German industry obviously continues to work on the digitalisation of as many procedures and production stages as possible.

In 2018, 24% of the machinery and equipment used by German industrial companies is "smart", i.e. connected to the internet. Back in 2016, the share was only 21%. 71% of the survey participants actively used I4.0 in 2018, up from 65% in 2016. Encouragingly, 49% of the companies use special I4.0 applications, i.e. more than double the percentage of their peers which plan to use I4.0 in the future (22%). Only 9% of the companies say that I4.0 is not and will not become a major issue for them. 18% can imagine using I4.0 in the future, but have not made any concrete plans so far. The percentages for these two categories were higher in 2016 (12% and 23%, respectively).

55% of all industrial companies have developed an overarching I4.0 strategy, and another 42% have developed a strategy for individual areas. The share of those which have only developed partial strategies is relatively high, probably due to robust industrial activity in the last few years, which typically hampers modernisation efforts and the introduction of innovative solutions rendered

[2] Improving the digital infrastructure is obviously a key precondition for the smooth working of the IIoT. Concerning the infrastructure issue see Heymann, Eric and Kevin Körner (2018). Digital infrastructure. Bottlenecks hamper Europe's progress. Deutsche Bank Research. EU Monitor. Frankfurt am Main.

[3] See Bitkom (2017). Umsatz mit Industrie 4.0 steigt bis 2018 auf 7 Milliarden Euro. 24 April.

[4] The survey was conducted among 553 industrial companies with at least 100 employees on behalf of Bitkom. For more details see Bitkom (2018a). Industrie 4.0: Jede vierte Maschine ist smart. 23 April. Bitkom (2018b). Industrie 4.0: Wo steht Deutschland? 23 April. Bitkom (2018c). IoT-Plattformen sind in acht von zehn Unternehmen Thema. 20 June. Bitkom (2018d). Industrie 4.0 verändert Geschäftsmodelle. 26 July.

possible by I4.0 because companies simply do not have the capacities to implement them.

Robust industrial activity in the past few years may slow down I4.0 activities

I4.0 strategies are usually developed by companies' own staff, together with medium-sized or large IT companies or jointly with external consultants. In many cases, staff cooperate with external experts to plan the strategy. Strikingly, the share of those companies which cooperate with medium-sized and large IT companies rose from 28% to 40% between 2016 and 2018. This probably reflects considerably higher trust in the IT companies' capabilities. Strategy developments in cooperation with research institutions, competitors or start-ups are less common.

Platform solutions support connectivity and interaction

IoT platforms an issue for four out of five industrial companies

Industrial companies which rely on I4.0 may find IoT platforms helpful to ensure connectivity and permanent interaction between machinery and corporate procedures. 16% of industrial companies already use self-programmed IoT platforms, and another 27% rely on platforms by external providers. This means that a total of 43% already use IoT platforms. Another 18% are planning to do so, and 19% are discussing potential options. IoT platforms are clearly an issue for four out of five industrial companies and the German industry has recognised just how relevant the topic is. Of course, there are major hurdles such as a lack of data protection, excessive costs or the lack of staff. Smaller companies in particular often mention these issues. In the longer run, however, the advantages of platforms should outweigh these disadvantages, as platforms are, as a rule, a suitable instrument to give companies a competitive advantage.

Three-quarters of I4.0 users adapt their business models. More than half of the industrial companies develop new or modify existing products and services under I4.0. Adjustments to the business models are necessary simply because smart products manufactured under I4.0 enable new data universes, which enable producers to offer clients additional "smart" services. Platform marketing has the additional advantage that clients can avail themselves of "pay per use" payment models, which enable them to book and pay for vehicle or machinery use as and when they need it. This makes them more flexible, as less capital is bound up in machinery and equipment. Platforms can therefore broaden the range of potential business models.

Companies still cautious about I4.0 decisions

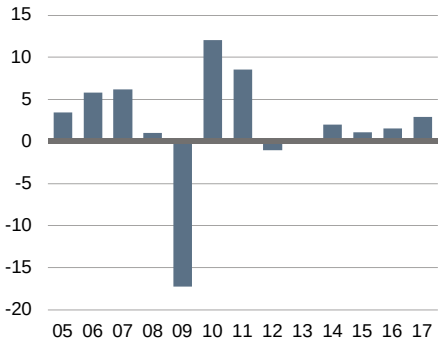
During the current year, investments in I4.0 solutions will amount to 5% of total sales on average. Significant data protection and security requirements and the lack of qualified staff hamper investment activity. At the same time, optimistic expectations about process optimisation, lower production costs, better capacity utilisation and shorter response times to customer requests are incentives to increase investment. Still, many companies are cautious, as it is unclear which solutions will establish themselves as standards. Premature investments might therefore result in considerable sunk costs.

22% of German industrial companies regard the country as a leader in the mega field of I4.0[5]. This is nearly the same percentage as that accorded to the US (26%) or Japan (25%). In contrast, only 11% see China and 8% South Korea in a leading position. More than four-fifths (83%) of the surveyed industrial companies believe that I4.0 is a key precondition for keeping the German

[5] In contrast, McKinsey thinks that Germany is lagging behind, as the country only utilises 10% of its digital potential, compared to 18% in the US and 17% in the UK. For details see McKinsey (2017). Driving German Competitiveness In The Digital Future. July. P. 11-17.

Moderate recent growth rates 1

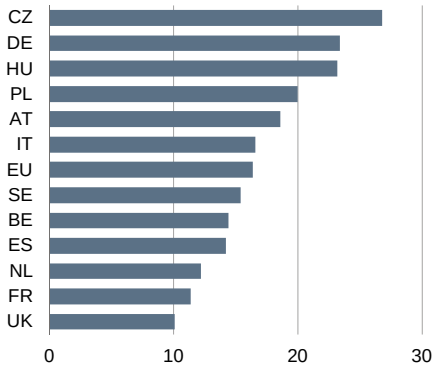
German manufacturing production in real terms, % yoy



Source: Federal Statistical Office

Industry has a large share in German GDP 2

Share of manufacturing in total gross value creation, 2017, %



Source: Eurostat

Industry invested 5% of total sales in I4.0 applications in 2017

industry competitive and thus securing jobs. In 2017, one out of five large companies lost I4.0 specialists, which is one reason why corporates attach considerable importance to training and recruitment.

Survey results should always be taken with a grain of salt, as they may be distorted for several reasons. They depend on the timing of the survey, the selection of survey participants, the general environment and, of course, the question which companies provide answers and which do not. In this case, different companies or even staff at one and the same company will probably define the meaning of "Industry 4.0" differently. In addition, survey participants will probably find it difficult to quantify all aspects of I4.0 in monetary terms (for example investments). Nevertheless, the surveys show that I4.0 is becoming an increasingly important topic for the German industry and that German companies can hold their own in international competition.

German industry in a good position for I4.0 changes, but the picture is different for the individual sectors

The German industry has proven resilient and robust in the last few decades in the face of huge challenges, such as the opening of the eastern European markets, the German unification, the integration of China into the industrial supply chain and the global financial crisis. Its ability to change and adapt is a huge advantage in the era of digitalisation. In addition, the individual industrial sectors can rely on a broad base and a close network, both between themselves and with sectors at earlier and later stages of the value chain. This is what comes of close cooperation, mutual inspiration and regular competition between market participants.

Germany's good standing in international mechanical engineering is very helpful in the era of digitalisation. As digital solutions such as automation and robotics[6] gain importance, other key industrial sectors benefit, for example electrical engineering, the auto industry, the chemical and pharmaceutical industry, consumer goods producers and construction.

Just like in 2018 (see above), the German industry invested roughly 5% of its total sales in I4.0 applications in 2017.[7] About two-fifths of this total were spent on staff, another two-fifths on software (systems and concepts). 10% went to digital production imaging, and 7% to mobile/smart production devices. Still, the average value – 5% of sales spent on I4.0 applications – hides a mixed picture. Consumer goods producers and electrical engineering made above-average investments (7% and 6.5%, respectively), whereas the figures for car producers (4.4%) and mechanical engineering (4.1%) were below the average. According to the survey, large (500 and more employees) companies invested a larger share of their sales in I4.0 applications than their medium-sized (100–499 employees) counterparts (5.7% vs 5%, respectively).

Digitalisation is an important driver of industrial investment activity in Germany. According to the Bitkom/EY survey, three out of four survey participants plan to step up their I4.0 investments in 2018 in comparison to 2017. Strikingly, 88% of mechanical engineering companies plan to invest more in I4.0. Thus, they have a lead over consumer goods producers (78%), electrical engineering (73%) and

[6] For a recent assessment see: Robotik und Automation: Rasches Wachstum setzt sich fort. In: Stahlmarkt. Issue 8, 2018. P. 20-22.

[7] For these and the following figures see Bitkom/Ernst & Young (2017). Industrie 4.0: Status Quo und Perspektiven. Ergebnisse einer repräsentativen Unternehmensbefragung in Deutschland und der Schweiz. 22 November. P. 30/31.

the auto industry (72%). Overall, all four major industrial segments are more willing to invest in I4.0 than in 2017 (average for that year: 66%). In 2017, only 68% of mechanical engineering companies, 74% of consumer goods producers, 64% of electrical engineering companies and 70% of carmakers planned to step up their I4.0 investments. From our vantage point, it is no surprise that mechanical and electrical engineering companies plan the biggest increases, both in absolute and relative terms. Rather, this is due to the particular role which the two sectors play in developing, providing, implementing and maintaining I4.0 solutions. This begins with smart machinery concepts and ends with software solutions.

Survey results should be taken with a grain of salt

Nevertheless, one should keep mind that survey results are not always reliable. To some extent, the differences between the individual sectors may be due to the fact that the sectors use different definitions of "I4.0". For example, one would have expected carmakers to make larger investments in I4.0 than consumer goods producers. A more detailed interpretation of the results is also rendered more difficult by the fact that the survey does not focus on the reasons for the different results.

Majority of mechanical engineering companies already focus on digitalisation

The more recent EY study from 2018 on the current situation in mechanical engineering and the outlook for the sector[8], which is based on a representative survey among 2,000 medium-sized companies in Germany (among them 250 mechanical engineering companies), yields similar results as the Bitkom/EY study of 2017 (see above). German mechanical engineering, which traditionally provides both domestic and foreign companies with machinery and equipment, is moving towards digitalisation.

A significantly larger number of medium-sized mechanical engineering companies than in 2017 regard digital technologies as a relatively important or important issue in 2018. The share of those companies for which digital technology plays a significant role amounted to 59% at the beginning of 2017, but rose to 65% in 2018. Strikingly, the number for medium-sized companies across all sectors was "only" 60% in 2018. In the industry, only electrical engineering registers a share above the average for medium-sized companies, at 62%. However, this figure is still below that for mechanical engineering. The figures for metal producing and processing companies and for food producers are in line with the average, whereas the figure for the auto industry is slightly and that for the chemical and pharmaceutical industries is a bit more significantly below the average, at 55% and 49%, respectively.

Majority of mechanical engineering companies regard digitalisation as an opportunity

— 78% of mechanical engineering companies regard digitalisation as an opportunity (completely or to some extent) and only 6% as a threat. This runs counter to what is often said by market observers and the media, namely that the German industry as a whole and German mechanical engineering is not adequately prepared for the digital era. 16% of the survey participants regard digitalisation neither as an opportunity nor as a threat. Carmakers are even more optimistic than mechanical engineering companies (84% regard digitalisation as an opportunity), whereas food producers are less optimistic, with only 61% seeing opportunities.

— 65% of mechanical engineering companies do not see any impediments to digitalisation investments (average for medium-sized companies: 60%). The remainder say mostly that there is a lack of qualified staff (18%), that

[8] See Ernst & Young (2018). Der Maschinenbau in Deutschland: Status Quo und Perspektiven. March.

Investment hurdles remain

financial means are limited (12%) and that there is a lack of know-how (8%). In fact, these three factors are what medium-sized companies in aggregate regard as main difficulties; the average percentages are even higher, at 20%, 13% and 15%, respectively. With qualified labour being very scarce in some regions, it is quite surprising that "only" one-fifth of the survey participants regard the lack of qualified staff as a major bottleneck.

Mechanical engineering uses digital technology to become more flexible

Even today, many mechanical engineering companies make intensive use of digital technology. Their preferences do not differ much from those of medium-sized companies in general. This is no surprise, as medium-sized companies are the backbone of German mechanical engineering.

Digital technologies are often used for customer relationship management

Medium-sized companies in general and mechanical engineering companies in particular mainly use digital technology for their customer relationship management and in the form of mobile devices. Automated production (i.e. I4.0) and digital technology-supported product development play a bigger role for mechanical engineering companies than for medium-sized companies in general. In contrast, online product marketing and online payment procedures are less widespread among mechanical engineering companies than on average. This is no surprise, as machinery and equipment are much more complex products than other industrial goods. The percentage of mechanical engineering companies which use digital technology for a closer integration of the supply chains or for manufacturing personalised products is roughly in line with the average.

Mechanical engineering companies are faced with numerous challenges as a consequence of digitalisation. The most important of them are expanding their staff's capabilities, cybersecurity, developing new sales channels and business areas and changes in the market environment (up to the emergence of new competitors) and corporate culture. Cooperation with start-ups that have particular expertise in the area of digitalisation or the divestment of sales or business areas play a smaller role.

22% of the mechanical engineering companies use digital networks to some extent in their production procedures, 3% even to a very large extent. Another 30% use digital technology to control their production processes. This means that more than half of all mechanical engineering companies already use digital steering and control in their production. And more than half of the remainder (27% out of 45%) plan to implement digital networks in production.

Automation and flexibilisation of production play major role

Mechanical engineering companies do not use all types of Industry 4.0 solutions to the same extent. Digital technologies are mostly used for the automation and flexibilisation of production (82% and 62%, respectively, of the survey participants). This offers clear and direct advantages, seeing that automation reduces production costs in the medium to longer term. And more flexible production procedures enable companies to include more highly specialised goods serial production and, ultimately, produce customer-specific machinery. Moreover, particularly innovative I4.0 solutions are already being used. 34% of the companies use 3D printing, if mainly for niche applications. Almost one-fifth of mechanical engineering companies use robot-driven process automation and artificial intelligence.

Mechanical engineering companies which already control at least part of their production by digital technology expect the share of machinery and equipment produced with the help of these technologies to rise from 27% of total sales in 2017 to 35% by 2020.

Mechanical engineering companies' investment behaviour also reflects the increasing importance of I4.0. Mechanical engineering companies already invest 3.9% of their total sales or one-eighth of their total investment (12.5%) in digital technologies. Both figures are higher than for other industrial sectors such as carmakers or electrical engineering.[9]

German industry can increase potential growth by digitalisation

Industrial gross value creation to rise by an additional 0.25 - 0.5% p.a.

With digitalisation becoming an ever more common feature along the value chain, we believe that the German industry looks set to enjoy higher potential growth in the coming years. While the economic effects of digitalisation are difficult to quantify, as we have explained above, we believe that the favourable impact of digitalisation might lift manufacturing gross value creation by an additional 0.25–0.5 pp p.a. on average.

The additional gross value added in German manufacturing might total EUR 70–140 bn for the years between 2018 and 2025. This "I4.0 effect" is roughly equivalent to between about 2 and just above 4% of Germany's GDP in 2017. However, as the effect of digitalisation is difficult to determine and measure, these figures should be taken with a considerable grain of salt.

Other research is probably too optimistic

We are less optimistic about additional industrial value creation stemming from the digital transformation than other researchers. For example, a study by Roland Berger commissioned by the Federation of German Industries (BDI) in 2015 found that additional gross value creation might sum up to EUR 425 bn (accumulated figure) by 2025 in an upside scenario.[10] In order to achieve this absolute gain, digitalisation would have to lift industrial value creation by more than 1 pp each year. This does not seem realistic to us.[11]

Preconditions for the use of digitalisation are better in the industrial sector

As a rule, the industrial sector is in a better position than numerous (personal) services sectors to benefit from the favourable impact of digitalisation. After all, creating network connections between staff, machinery and components or intermediate products and automatising procedures is more important in the industry than in many services sectors. Industrial research and development, logistics, market research and sales planning and after-sales services (such as maintenance works) will become more efficient thanks to digital technologies and applications as well.

Digitalisation to counteract shrinking of the pool of labour

The Bundesbank expects overall potential growth to decline from currently c. 1.2% p.a. to about 0.8% p.a. between 2021 and 2025, as the pool of labour shrinks and older employees may be less productive. In contrast, we believe that the German industry should be in a much better position than many services sectors to offset at least part of the unfavourable demographic effects by using digital technology. This is a key precondition for keeping the German industry competitive at the international level.

[9] The fundamental caveats about survey results apply to these figures, too.
[10] See BDI (2015). The digital transformation of industry. A European study commissioned by the Federation of German Industries (BDI) and conducted by Roland Berger Strategy Consultants. Berlin, Munich.
[11] However, the study does not explain which basis it uses for the calculation of gross value creation. This limits comparability.

Digitalisation stimulus not evenly spread across sectors

All industrial sectors can benefit from digitalisation

In principle, all industrial sectors can benefit from digitalisation. We believe, however, that mechanical and electrical engineering and the auto industry should benefit most, as these sectors are forerunners in the digitalisation of production processes and products.

— Information and communication technology, which still enjoys significant growth momentum, prepares the way for digitalisation. More and more innovative and (self-)learning software solutions will make machinery, electrical appliances and vehicles more flexible. Since the new industrial age will be based on an even more intensive exchange between mechanical engineering, electrical engineering and IT, this is where the biggest growth potentials in the industrial sector lie. Virtually all mechanical engineering sectors should benefit, from robotics and automation to agricultural machinery[12].

— Electrical engineering is the leading sector of digitalisation. Its digital solution capabilities support not only manufacturing, but also help in the digital transformation of highly different sectors such as energy, healthcare, mobility and buildings.[13]

— The German auto industry will use I4.0 applications in order to efficiently deal with the fundamental changes in the sector.[14] Lower carbon emissions limits, the mega issue of electrical mobility and smart driving and integrated mobility systems will require the use of digital technology along the whole value chain. Car companies are innovative when it comes to future mobility solutions and integrate different digital trends, i.e. new software solutions, development networks, production alliances and international value chains.

Materials-oriented sectors likely to benefit less

However, some industrial sectors will benefit less from digitalisation, not least because their products are relatively "simple" and their production processes run continuously. This applies to more materials-oriented sectors such as the chemical and the metals industries.

— The chemical industry is working on "Chemistry 4.0"[15] and on a restructuring of its product portfolio in order to take into account business and retail customers' growing concerns about sustainability. Chemistry 4.0 basically aims to optimise value chains by using digital networks. Digital progress and the intensive use of big data should have a favourable impact on innovation and production procedures. The permanent exchange of information will support research progress and the continued improvement of production procedures, product portfolios, value chains and business models. Nevertheless, digitalisation will play a smaller role than in the capital goods sectors mentioned above.

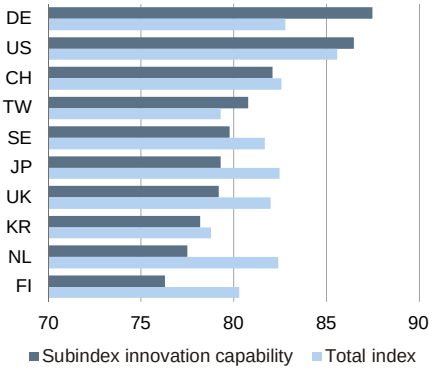
— The metals industry, too, will benefit less from digitalisation than mechanical or electrical engineering. However, Industry 4.0 and the new 3D printing technology will make metals processing more flexible and permit the

[12] For the German programme on digital or smart farming see BMEL (2017). Digitale Landwirtschaft. P. 10-33.
[13] For an overview of the contribution of electrical engineering to digitalisation in the key markets of Industry 4.0, energy, healthcare, mobility and buildings see ZVEI/Fraunhofer ISI (2016). The Electrical and Electronic Industry as the Leading Sector of Digitisation. November.
[14] For more information on digital cars see Heymann, Eric (2017). The digital car. Deutsche Bank Research. Germany Monitor. Frankfurt am Main.
[15] For an overview see VCI (2017). Chemistry 4.0. Growth through innovation in a transforming world. September.

establishment of new market segments, mainly in niches for now. This will allow individual, client-specific products in metals processing, too.

Germany a leader in terms of innovativeness 3

Global Competitiveness Index 2018, scores



Source: WEF

Much remains to be done, despite good WEF competitive rating

In its recent Global Competitiveness Report 2018, the World Economic Forum (WEF) explicitly mentions the importance of Industry 4.0 for the global competitiveness of individual countries[16]. The new Global Competitiveness Index 4.0 includes additional factors which permit us to draw conclusions about the status of industrial digitalisation in the surveyed countries.

We believe that the WEF is quite right in thinking that, in the age of the fourth industrial revolution, the global competitiveness of a country no longer depends only on traditional factors such as the tax system, worker qualifications, infrastructure or economic policy. For this reason, it took into account additional criteria which have an effect on competitiveness in the digital age. These include a creative and open environment which provides room for new ideas, permits the establishment of innovative companies and does not hamper disruptive innovation. According to the WEF, Germany is currently the most innovation-friendly country out of 140 peers. The WEF emphasises that it takes much less time to develop, implement and market an innovative idea in Germany than in other countries (even the US and Switzerland).

The final ranking is based on an aggregation of the twelve factors used to measure competitiveness. In 2018, Germany ranks third, after the US and Singapore, but ahead of Switzerland. In 2017, Switzerland was at the top and Germany "only" on rank 5. The rise in the ranking is due to the increased importance attached to I4.0 criteria. In addition, Germany benefits from particular macroeconomic stability, good qualification and infrastructure in an international comparison.[17]

German industry not fully digitalised yet

However, despite the good WEF ranking much remains to be done until the German industry is fully digitalised. Germany achieves 82.8 points on a scale from 0 to 100, lagging behind the US (85.6) and Singapore (83.5). While Germany is clearly above the median at 60, much remains to be done to achieve the full 100 points.

Our research on German industrial sectors has shown that almost all sectors will need to make additional investments in digitalisation in order to become really fit for Industry 4.0. Investments should take place soon and made steadily in order to maintain competitiveness in the coming years. Since other countries, which have done less in the field of I4.0 so far, will probably step up their efforts in the coming years, adopting a wait-and-see stance would be a major risk.

Risk of economic and social split and polarisation

The WEF regards a potential economic and social split and polarisation, both within and between countries, as a new challenge stemming from I4.0. In fact, these risks should be taken seriously. If the German industry and economy made more extensive use of the new opportunities of digitalisation than so far, all stakeholders should ultimately benefit.

[16] For Details see WEF (2018). The Global Competitiveness Report 2018. Geneva. P. 1-47.
[17] For Germany's WEF assessment see in particular WEF (2018). P. 239-241.

Conclusion: I4.0 offers considerably more advantages than disadvantages for the German industry

Openness for technology an important precondition for digital stimulus to value creation

Several market observers have been quite critical of the German industry's path into the digital age so far. They claimed that German companies were still too focused on the "old economy" and thus did not take well to using new digital technologies and holding their own in international competition. However, the German industry is increasingly making use of digital innovation. At the international level, Germany benefits from its broad range of industries and its openness for innovation. It is just this openness which should make it easier for companies to avail themselves of the numerous new opportunities of the Industry 4.0. We expect digitalisation to become a major stimulus for mechanical and electrical engineering output and production in the auto industry. The traditional chemical industry and even the metals industry should benefit from I4.0, too. And last but not least, digitalisation promises to lift Germany's potential growth rate. This is obviously another encouraging factor. However, it is unlikely that all companies will successfully exploit the opportunities of digitalisation, which means that some will be squeezed out of the market in the coming years. This selection process should ultimately improve the competitiveness of the German industry. The economy as a whole should benefit particularly from the fact that digital technologies will help to mitigate the burden of the demographic development in the coming years (shrinking pool of labour). In this regard, the industrial sector is in a much better position than many personal services sectors.

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