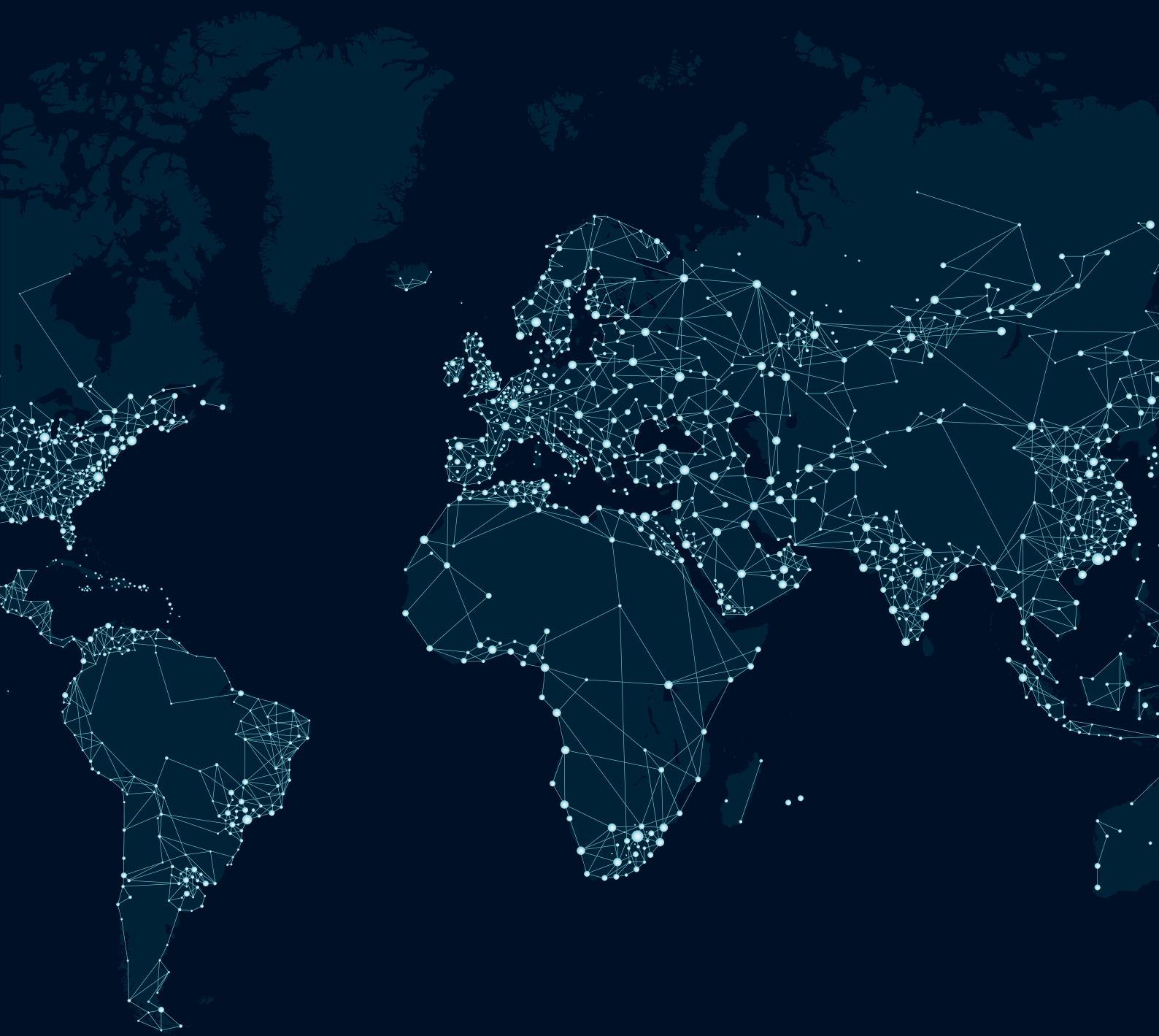
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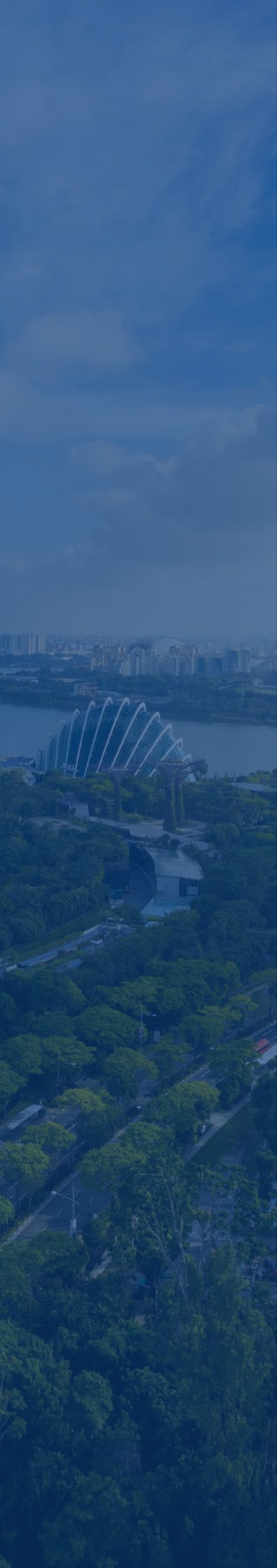


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B2B Research & Strategies

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Create and understand markets: market research for your business

Since 2008, DTO in Düsseldorf has been a reliable partner for gathering market data and supporting strategic decisions. Its rigorous methods and analyses across countries and sectors have built broad expertise in industrial market research.

The customer needs are the central driver. Each company is individual and needs tailored advice. In more than 400 projects, the questions were very diverse: from after sales analyses, to B2B market analyses, strategic optimization projects, to the establishment of a market research department, our company was always required to advise our core clientele of SMEs in the best possible and proactive way.

Many projects have been initiated and successfully completed in our core sectors: industry, medical technology, logistics, cleaning and machinery.

This dossier shows what makes DTO distinctive and what you can expect from market analysis tailored by our interdisciplinary teams. Case studies explain our approach and the results achieved.

In addition to the client projects of our customers, we have always looked at current market developments within the defined core industries. In our technical articles, we have dealt with new questions that describe the change of the future, such as: B.: IT processes in medical technology, sustainability, hydrogen as a future industry, green logistics or hygiene concepts in pandemic times. With a trained view, to recognize new developments and to build up necessary knowledge, we focus you optimally on the future. Let's go this way together.

From the DTO team: enjoy reading!

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Market analysis & market research explained



Typical issues in B2B and industrial market research: Examples of projects and issues in the B2B and industrial sectors (2017)

Example case 1: Worldwide market analysis and strategy optimization for a construction machine manufacturer

Requirements A manufacturer of road construction machines is considering producing a special machine itself in the future instead of having it manufactured externally under its own brand as before. The worldwide survey of sales figures aims to determine the market potential and to find information for an appropriate international strategy.

DTO approach and approach In a joint workshop with the customer, the project design was developed and a discussion guide was developed for the expert interviews. Around 300 interviews with competitors, dealers, associations and other market experts were conducted worldwide. In addition to disclosure of global sales figures, insights into the functioning and specifications of the individual markets were generated.

Results The road construction machine manufacturer received an evaluation tailored to its needs, which was used as a basis for a strategic orientation. In addition, recommendations for action could be derived from the results in order to facilitate the "Make or Buy" decision. By understanding business models, market specifics, trends and machine properties, the company achieved an enormous competitive advantage.

Example case 2: European market analysis for a manufacturer of medical devices

Requirements A manufacturer of medical devices and medical devices wants to expand its business activities. So far, the company's products are only sold in Germany, Austria and Switzerland. It is now necessary to identify the most attractive target markets in Europe for the company and to identify the potential market in a total of 16 countries. At the same time, in addition to pure market analysis, possible market entry strategies are to be worked out and evaluated. As a basis, an overview of the individual European countries is desired, which classifys them in terms of their attractiveness for entry into the market. In addition to the pure data search, the company also wants a recommendation for action regarding a market entry for the respective country. In addition, potential attractive market partners will be identified in the course of secondary research.

DTO approach and procedure After the commissioning of DTO, the project objectives and the research design were worked out together with the customer during a workshop. Project manager on the customer side was the in-house marketing. At the beginning of the data collection phase, a secondary search was carried out to identify the data available on the market for the respective countries and to prepare the primary survey.

prepare. The following primary survey was about obtaining further data and high-quality information that could not be generated through secondary research. As a means, DTO chose an expert survey in the form of telephone interviews. In order to reach the appropriate interlocutors, associations, potential trading partners, potential customers, competitors and other experts were contacted and interviewed. After conducting the interviews, DTO evaluated the data from the secondary and primary surveys.

Results The data obtained from the survey provided the customer with an important basis for further company orientation. DTO provided the company with an in-depth overview of the 16 potential target markets as well as a recommendation for action regarding market entry and market entry strategy. In addition to financial and competition issues, intercultural and logistical aspects played a central role.

Example case 3: B2B market analysis and market entry strategy for a coupling manufacturer

Specifications A manufacturer of couplings wants to get to know its market and its competitors better internationally. It will then decide which markets will be eligible for entry into the market. As the company's resources are limited, priority should be given to markets in Europe and the Middle East. The primary information required for this is sales figures, market volumes, market prices, competitors and market structures.

DTO approach and approach In a first step, the project structure was developed in cooperation with the customer. In addition, the countries that should be included in the investigation were selected. Before the interviews started, an extensive secondary analysis was carried out. This was followed by expert discussions with competitors, customers, associations etc. in a total of 15 countries.

Results The project results were processed for the client in a PowerPoint presentation and presented in a workshop for management and export management. Together, a concrete strategy and an implementation plan were developed. The customer received a concrete action and timetable for the implementation of the internationalization strategy.

Example case 4: After-sales and service surveys for a construction and machine manufacturer

Requirements A globally active construction and machine manufacturer plans to benchmark its own service and delivery quality with that of the competition. For this purpose, own customers as well as customers of the competition with regard to various service parameters and machine equipment features are to be surveyed. The country focus is in the following case on the DACH and Benelux regions.

DTO approach and approach In a workshop, the company's information needs were identified and structural integration into the company was developed. In this case, a staff unit has been set up to work on other divisions of the company and also

various reports continuously made available. The processes and interfaces were defined together with the area managers and a communication structure was established. In a second step, employee training (3 days) took place with the relevant company divisions. Here the most common methods and structures in B2B market research were explained and deepened with concrete exercises.

Results The company is now able to cover a large part of the necessary information needs through its own resources. Employees are also familiar with the most common and important market research methods. However, you also know exactly when it is necessary to use professional external assistance. The systematic use of market, competition and customer information is now integrated into the company's processes and gives the company an enormous competitive advantage.

Example case 5: Establishment of a B2B market research department and employee training

Requirements Not every company wants to achieve market data acquisition and strategy-finding exclusively with external support. In the concrete case, a customer wanted to set up a department for market research and competitive intelligence himself and only give projects to the outside world. Since the company's knowledge was limited for the establishment of such a department, DTO, as an external body, should be involved in structurally building the department and the employees should be targeted at future client projects such as: Competition analyses, market analyses, etc.



Our foreign branch in Tallinn, Estonia

DTO approach and approach In a workshop, the company's information needs were identified and structural integration into the company was developed. In this case, a staff unit was set up to work on other divisions of the company and to provide various reports continuously. The processes and interfaces were defined together with the area managers and a communication structure was established. In a second step, employee training (3 days) took place with the relevant company divisions. Here the most common methods and structures in B2B market research were explained and deepened with concrete exercises.

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Sell targeted and use market research to identify and exploit potential! (2017)

Advantage through market understanding Strategic decision-making to establish itself in markets in the long term or to enter new markets is usually used to consult various sources of information. Strategic market research offers interesting templates for such entrepreneurial decision-making processes from many points of view. Especially in order to focus on the market and target group-oriented. However, it is not always seen as a necessity to generate information of this kind from the market, since the business model currently still guarantees secure sales. But since entrepreneurial goals and their achievement are mostly influenced by future market factors, continuous monitoring of the market is essential. Also in the long term to adapt to the different - even changing - needs.

Different markets show their own laws and have their own rules of conduct. But who ultimately decides whether a product is bought or rejected? Who decides which company will be preferred in a densely crowded competitive market? An answer that sounds so simple and yet is full of complexity. It is all of us who come into contact with the most diverse products on a daily basis and thus, without being aware of it, can contribute to market development.

Individuality creates identity This insight shows that markets are shaped by individual buyer behaviour.

To make a product tangible and, above all, distinctive, it should clearly position itself and differentiate itself from competition. This differentiation makes for an individual brand or brand. Product appearance created. Brands are also what they promise in our eyes, that is, they provide us with the expected benefits, and there is an adapted market orientation. But why is it important to recognize complex market structures and target group needs and to describe them in a comprehensible way?

Consumer goods markets and capital goods markets show different conditions. This postulates a holistic view of the different stakeholders, the legal framework and the emotional as well as rational factors. An analysis of the currently prevailing characteristics of the market shows, for example, which emotions a product awakens, what benefits it provides and how it is perceived. In different countries or regions, this even requires different marketing strategies or product variants, depending on prevailing market conditions.

The future is written in the present The often discussed concerns that the results of trend and market research cannot be transferred to practice show that the recipe for the "miracle product" simply does not exist. But this is not the intention of market and trend research. There's a lot going on.



more to identify needs and understand market mechanisms in order to obtain an image of the current situation. Developments arise in the present and continue to develop in the future. So there are often a few adjusting screws to be operated, which do not necessarily assume that a product innovation is the measure of all things. In this way, product differentiation and product diversification can be conceived from market gained insights, which enable a targeted strategic approach in individual markets. However, needs can also be identified, which can be taken into account later in a suitable target group approach, as part of a communication strategy.

At the beginning of each route planning there is a goal In order not to fall into an entrepreneurial sling course, however, at the beginning of each strategy planning, previously defined enterprise or business plan. Marketing

to set a corresponding target. In order to achieve these objectives, strategic instruments will be identified in the next step, as part of this strategy. In order to be able to make an adequate selection of these instruments, it is necessary to establish market transparency beforehand. This is also necessary in order to ensure that the planning of these relevant instruments is directly related to the company and/or the company. There are marketing objectives and the prevailing market requirements.

For example, in order to plan a marketing strategy and the marketing mix to be used, market research offers helpful insights. Market information can be obtained through various methods of market analysis. It is essential, however, that the implementation of the different investigation concepts should always be related to the target requirements of the company or companies. Marketing goals fit, because only in this way can market research be used strategically and profitably.

Targeting market data usage for strategy and marketing in SMEs! (2017)

In the course of a constantly advancing globalization, a whole series of new market and sales potentials are also opening up for medium-sized companies. These are often very successful in their product and service segments and have excellent positions in the world market. But these companies often struggle with corporate structures that have not grown to the same extent and have been professionalized as the core business has grown. In addition to internal processes and structures, this usually also affects the company's strategy and the company's orientation towards existing and potential target markets. Not infrequently, the potential of internationalisation is also misunderstood or the know-how to open up new markets is limited or not at all available within the company.

But the targeted use of market knowledge and information as well as their targeted use for marketing and strategy can also begin within a very manageable framework. Due to their size, many SMEs do not see the need to deal systematically with their customers, their competitors or their markets. In doing so, the integration of market-relevant information into the process of corporate or marketing strategy finding is quite easy to implement, provided that these processes have once been defined firmly and the employees have been trained in the handling of market information. For example, be enormously important for a company, actions or strategies of betting

In this context, it is important to be able to identify competition at an early stage and to react accordingly. If the relevant information is available here and is made available to the user group in the company, these can be used both by the corporate management to optimise the strategic orientation, as well as by the field service for acquisition preparation or the operational level for the implementation of measures. However, the responsible parties must ensure that a good balance is created between information transparency and data protection. Not all information should be made available to all user groups. Especially in the case of positions in the company, which are subject to increased fluctuation, too high information transparency can lead to the emigration of know-how. If information is selectively published, performance losses at certain levels are the result. Also, only as much market information should be collected as is really needed for strategic and operational planning. Many employees, even in medium-sized companies, suffer from an overload of information. This is because information is not collected or processed as required. Here, the overview can quickly be lost and the assessment of relevance is not always easy.

In addition to the competitive and market-relevant information, employees and customers already have many solutions for existing problems or future developments. A company may:

make use of this potential easily. Either a regular survey of customers can be carried out by for example, to collect satisfaction or existing application problems or customers can be asked about possible product developments or application trends. In addition to a regular customer satisfaction analysis, a continuous survey of the own employees is also offered. For example, external assistance will provide the basis for many surveys to be carried out within the company. In addition to the purely survey methodology, evaluation and implementation in the strategy processes are also important. Straight

Employees in the marketing departments often have very sound marketing knowledge, but do not know how results of market research can be used correctly for strategy development. This interface problem can also be equalized by targeted training and process definitions.

Market research can be used in a wide variety of ways. Whether a rough market overview is needed to make basic decisions, or whether complex market entry strategies are planned, the risk of failure can be greatly minimized by a strategic market data acquisition. Market research does not have to be expensive or resource-intensive.



Our overseas office in Singapore is located at the German Centre for Industry and Trade.

Advantages through the combination of market research and strategy consulting in the B2B sector! (2015)

Many companies are faced with the question of whether and how they can or should open up a new market. This may include: This may include a new market segment, a new region or a new country. In the context of these considerations, a number of questions often arise, which are usually not addressed through internal information (for example, sales agents) or available secondary materials (studies, association information, press articles, etc.) can be answered in whole or in part. However, in order to be able to make an informed decision regarding entry into the market, a valid data base is required as far as possible.

But data and facts alone are usually not enough without a strategy and evaluation of the strategic options for action. Questions that could arise in this context:

Is entry to the market worthwhile with your own products and services? Usually there is a simple cost/benefit consideration. However, before it can be properly assessed, it must be known whether there is potential for specific products and services in the market under consideration. For example, legal provisions or regulations could make import much more difficult. The volume of the market can also be so low that entry into the market is not expected. Another problem could be the experience of potential customers with the product or performance. Many market segments, which are well developed in this country, are in countries such as Germany.

Asia or South America still far back. Many markets in the industrial context need to be developed accordingly until market entry is worthwhile. This can be associated with a high cost and resource burden.

What is the market and sales potential? Market and sales potentials are often a kind of black box for companies. Even if the overall market is known, it is often difficult to estimate how market shares are distributed among the different market participants. Sources in the company (e.g. However, it is often only very subjective market impressions that can be gained. However, whether or not a market is attractive can usually only be determined by an accurate knowledge of the sales potential for one's own products and the suitability of the distribution possibilities.

Which competitors are on the ground and what strategies do they pursue? In order to find the right strategy and to be able to assert itself in the global and national competitive environment, it is important to be able to accurately classify one's own performance in the competitive context. This presupposes that competitors and their strategies for market processing are known. In many markets, competition is made up of global companies and national suppliers. Market access by distribution partners or their own distribution network is a significant factor here.

What are the market structures and sales channels? If a company has gained clear insights into the competition and its strategies, this usually also makes the market structures clear. Competitors, which can only be found on the market via direct export, or is the market handled by branches in the countries? In the B2B sector, it is often the case that companies that have a direct presence on the ground have certain advantages over companies that work exclusively via export. However, whether it is worth a branch (e.g. The creation of a sales office or a production site in other countries or regions depends on many factors. Market developments, market volumes, number of customers, know-how, resource availability and competitive intensity are just some of the key factors that should be considered here.

Who are the potential customers on site and who currently supplies them? Even a market of sufficient volume can be relatively unattractive if there are already competitors with a very large market power. For example, long-term supply contracts with potential customers can become impossible to enter the market on an ad-hoc basis. Long-term contracts are often the basis for cooperation, particularly in the field of automotive suppliers, mechanical engineers or construction companies. The state as a potential customer can also be difficult to serve for foreign companies in some regions of the world. Calls and Tenders are handled very differently. In addition to cultural aspects, a company should gain clarity about this before any foreign activities.

How are the market shares distributed and how do they develop? It is also important to know which competitor is working on the market with what strategy and intensity. Even if there is an alleged mismatch on the market, acquisition efforts or strategic developments in other companies' portfolio may indicate that market shares will change in the future. The customer estimates and the innovative power can be used here. These are important indicators, for example. If there is a valid knowledge of market shares and if the individual market participants can be accurately assessed, there are a number of strategic options for action.



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What is the right strategy to enter the market? The available resources, the know-how, the market framework conditions and the future foreseeable corporate and market development are the decisive factors in whether and how a market should be processed. For example, a direct export, a licensing, the establishment of its own sales sites, a joint venture or its own production sites. As previously described, the decision should take into account both internal and external perspectives.

What intercultural issues or barriers could arise? Cultural differences in serving a market are often underestimated, particularly by German SMEs. Business practices cannot be assumed to work as they do in Germany. This affects everything from customer acquisition to warranty obligations. Interpreting and reviewing contracts calls for professional support. Before entering a new international market, a company should study the prevailing business culture closely.

Are there potential market partners that facilitate access and minimise risk? If the company does not have enough of its own resources or lacks appropriate market access, market processing is possible with the help of a local partner. In any case, screening, albeit rough, should be done via potential market partners. This often results in previously unconsidered synergies or strategic options for action. The risk of entering the market can also be minimized by the expertise of a potential market partner. This includes both legal, cultural and business factors. When working with a market partner, the intensity of the cooperation can range from a simple distribution partnership to a joint venture on an equal footing.

Do the internal structures of your own company fit in with the possible market entry strategy? The company's internal perspective, which has already been described, should be taken into account in the development of

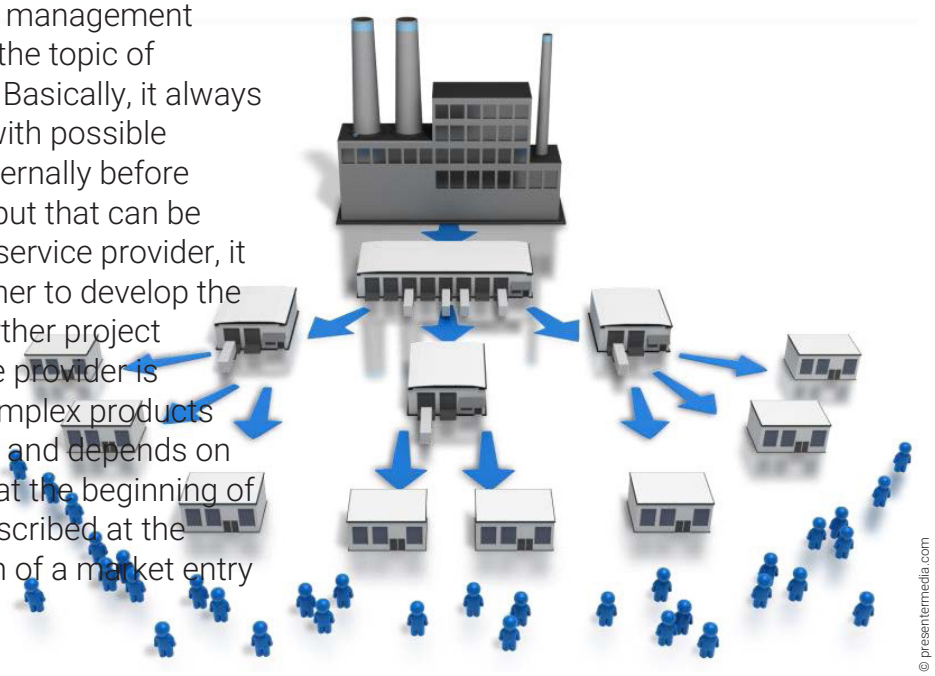
a market entry strategy must be taken into account. It should be seen whether the current corporate structure needs to be changed or supplemented by areas, so that new markets can also be served organizationally. If necessary, external know-how must also be re-established in the company. It is also necessary to check whether the sales departments for example, an export business can take over or whether a separate export department has to be created.

What are their own strengths and weaknesses and how do they influence the market entry strategy? Known from the classic SWOT analysis, careful consideration of one's own strengths and weaknesses is indispensable so that a strategy can be adapted exactly to this. For example, the available financial capital, compared to competition, is rather low, so that capital-intensive market entry cannot be realised through costly trade fairs and other marketing actions. In this case, a low-budget strategy would rather be offered, e.g. This can be achieved through partners or very targeted actions. The skills of their own employees should also be put to the test in the course of this analysis. The lack of skills can be gained through new recruitment or further training. But the strengths should also be taken into account. If there are employees in the company who have contacts in certain markets or have the cultural background, this can greatly facilitate market entry. Last but not least, language barriers can be greatly minimized here.

In principle, a company should first consider these and other questions a

Find the answer in order to be able to process a new market as targeted as possible. While large enterprises often already have experience from past projects or can consult internal sources, many medium-sized enterprises do not have this opportunity. This is the case in the case of the IHK, for example, or a public business promotion company, in order to obtain basic information on the subject of internationalisation. More detailed information on markets, market structures and e.g. Competitive activities, however, are rarely obtained here. A good way to get the right information in this context is provided by an external service provider, e.g. B. a B2B market research firm or a management consultancy dealing with the topic of opening up new markets. Basically, it always helps to deal intensively with possible questions or problems internally before taking this step. By the input that can be passed on to an external service provider, it will be much easier together to develop the right foundations for a further project approach. Often, a service provider is confronted with highly complex products especially in the B2B area and depends on the customer's expertise at the beginning of the project. As already described at the beginning, the preparation of a market entry is just

In the B2B area, there is always a link between different disciplines. On the one hand, valid data must be collected and on the other hand, these should also be incorporated into the strategy with the relevant conclusions. It should be noted that the data-receiver (B2B market researcher) acquires a lot of knowledge about the market and its development during the conduct of interviews. For a data user (B2B strategy consultant or in-house department) it may be difficult to make a decision only on the basis of the data. A lot of ideas.


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and much knowledge, cannot be transferred completely (numbers or information in text form). This is one of the main reasons why in the B2B area market research and strategy creation should not be separated and DTO has strategically occupied these two disciplines by in-house experts. Thus, it is possible for DTO to generate a decisive competitive advantage for our customers.

Systematic knowledge of customers, products and markets as the basis for a successful sales strategy: Use market research as a strategic competitive advantage! (2017)

Many companies believe that they know their customers and markets exactly. Is external help e.g. In the form of coaches or consultants, these usually work methodically on the basis of available information, supplemented by discussions with people from the company-related environment. These are usually executives, sales staff, dealers or customers. This group of people is also often one of the most common sources of information for companies in the development of their own product and sales strategy.

However, it is often not considered that this leads to a limited view of the market or the market. Competition situation and thus ultimately lead to an incomplete basis for strategy-finding. In SMEs in particular, many companies have not yet recognized the potential for their own orientation and strategy in the systematic use of market and competition information. However, the market data collection should not be understood as a one-off action. Instead, an independent survey of existing customers and potential customers can be carried out in certain regularities, for example, make the success of strategy and implemented measures visible. A regular analysis of the competition and its products also helps to react in time to its actions and to integrate new product trends into its own portfolio at an early stage.

Part of the market data collection should be carried out by own employees in product management, marketing or market research. This may include: secondary analyses, which includes the sighting of studies, articles and competition websites. It is essential that our own employees learn to recognise external and internal information in its relevance and to include it in the decision-making processes. It is also important to ensure that the relevant information is also made available to employees who need it in their daily work, especially in companies of a certain size. A knowledge database on the intranet, with the possibility of granting access rights, or a responsible employee for the topic of knowledge management, could be suitable possibilities here. If a company decides to resort to professional external assistance in strategy and sales, it is appropriate to collect and provide in advance the relevant information that a coach or coach needs. This can also be done on external support e.g. A market research institute may, for example, use this know-how if it is not available in its own company.

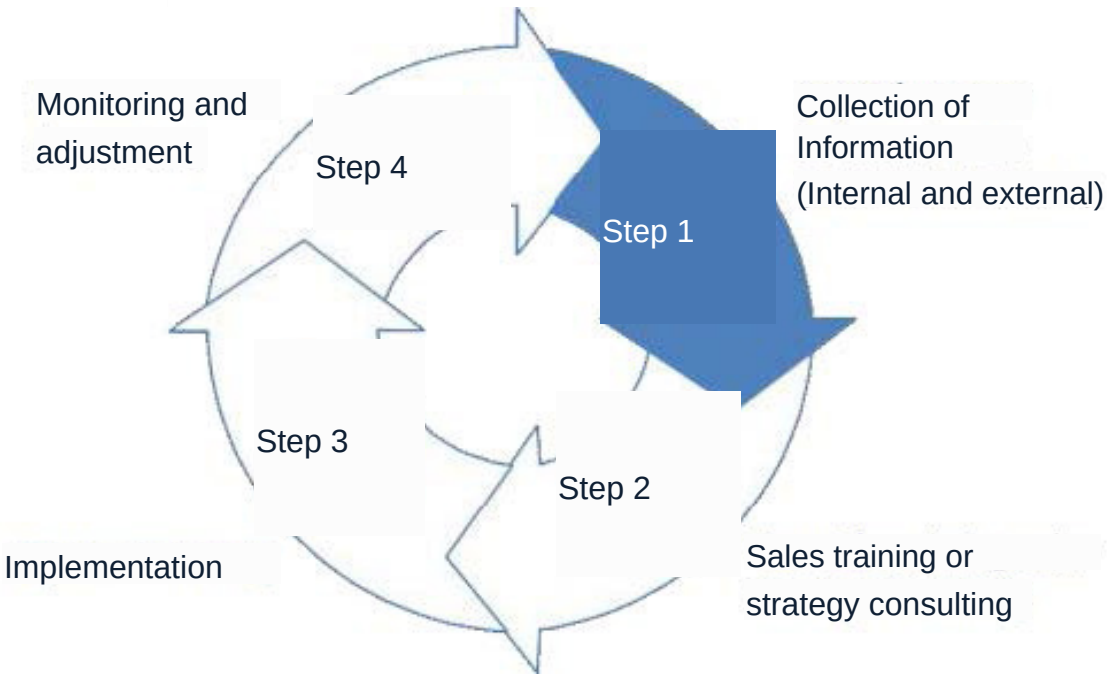
Usually sales trainers and coaches do a very good job methodically, but by combining the knowledge from the market and their own skills prepared for them could be even more targeted in

Training and training to address the problems of their customers. This applies both to the knowledge of market structures, distribution channels or USP of the competition (external perspective) as well as to internal experience knowledge, which has been professionally prepared (internal perspective). The company's positioning on the market can also be derived from this knowledge.

Questions in this context could be: • -How is the company perceived by the customers? • --Where is it possible? Image problems or discrepancies between perception by customers and the company's self-image? • What are the arguments that are most important to customers for the products? • • What distribution and communication channels are essential and how can they be adapted? • Who is the actual target group? • What are the key arguments to position yourself against the competition? • Etc. It can also be useful to prepare a sales or strategy workshop.

to organise an upstream workshop with the sales trainer/coach and to respond here once again specifically to the results of the market survey.

From the described a process can be derived for the optimal procedure in an optimization of the sales. This process involves four recurring steps. This is important in order to be able to respond adequately to the dynamics of the market. However, the time intervals are strongly determined by industry and product life cycle. In special industrial sectors, for example, in special machinery construction, the cycles are much longer than in IT, for example. In the latter area, the often low half-lifes of the products create consultation/training needs at much shorter intervals. However, the basic structure of the process should always be the same. Based on the preparation of current market and company information, a targeted sales training can take place. Mostly the consultant or coach is also entrusted with the implementation support. In the last step, the controlling and, if necessary, an adjustment of the strategy take place. The control



ling can take place both internally and externally. Internally, with the help of certain key figures such as sales development or number of complaints, it can be determined whether the desired development is created by the sales training/consultation. Externally, for example, a continuous customer survey is carried out (e.g. This is the case with the aid of a market research company. As a rule, the strategy adjustment is based on:

Adviser/Coach back in support. Finally, it can be said that the optimisation of distribution, whether strategic or operational, should always involve a combination of knowledge/information and methodology. Even if the former is unfortunately still too often neglected especially in personal direct sales.

Market research in the B2B sector

Since 2008



1.215

Realised projects



122

Satisfied customers



35

Dedicated staff



32.350

Expert interviews conducted

"We provide our customers with clearly structured and immediately ready-to-use data, so that Action steps based on the results can be implemented immediately.

Market analyses in international B2B projects: challenges in planning, implementation and controlling (2017)

Foreign business as an opportunity for sustainable business growth Many companies in the national market find that growth is not easily possible without a look at new markets abroad. The prospects that open up markets in the nearer countries or overseas often seem to be promising. But before you dare to jump into the cold water and build up a corresponding foreign business, you should deal exactly with the selected target markets and prepare the market entry well. This paper is dedicated to the specificities of market analyses in the B2B sector and is intended to show companies what pitfalls they should pay attention to before entering foreign markets.

B2B and B2C – the differences in the strategic approach to the development of new markets For the establishment and expansion of international activities, it is advisable for a company to know well the market and competitive structures. But this often raises questions and brings with it some challenges. What is the actual situation on the ground? What are the sales structures for the specific product in the market? What's the demand? Often the markets are intransparent and there are no data or statistics that represent the information needed. In addition to the closedness of competition and the unclear market structures, a strong intercultural component is added.

While it is important in the B2C area to interview the end user in the countries (best through native speakers with the corresponding cultural background) personally, by phone or online, there are in many cases only a few market experts in the B2B area who have international experience and can make an assessment of the market. It is not always necessary to carry out costly personal interviews in the countries on the ground. As a rule, in the special B2B areas in particular, the willingness of these experts to exchange views with specially trained interviewers in English is high. This makes it possible to manage the market preparation and evaluation centrally from a single source in a cost-effective and valid manner for different countries. However, with regard to language barriers, there are also countries where the experience of past projects has shown that it is essential to involve native speakers with appropriate cultural knowledge. This is particularly true of France, Japan, as well as large parts of Asia and countries in South America.

For the preparation and execution of market analyses in the B2B area, some points should be considered: 1. Technical talks with these market experts (e.g.

Dealers, competitors, associations etc.) are usually sufficient to generate valid information about market structures, market volumes, price, customer requirements and product usage. This is particularly the case in sectors such as: Construction machinery, machinery, mechanical engineering, mining, chemistry, energy, supplier industry and logistics.

2. If one wants to carry out market analyses at this level, a very good preparation of the interviewers, which is in advance best guaranteed by product trainings by the manufacturer and intensive product searches, is essential. Experts are willing to provide assistance and provide information only when they feel they are having discussions at eye level.

3. A further special feature of B2B interviews, compared to the B2C projects, is the type of remuneration for the interlocutors. Most experts see the incentive for an even longer technical discussion in the outpouring of information and not in monetary remuneration. Therefore, e. g. This is the case in the case of the study, where the project is completed and extracts from the study are made available at the beginning of the interview.

4. The evaluation of the results is also different. Although the statistical analysis of a large number of interviews is essentially spared, this makes the statements of each interview all the more fundamental. In contrast to the B2C sector, the specialised B2B market research projects do not have to work with certain representative case numbers, but rather by combining information, such as:

As in a puzzle game, to construct an overall picture of the market.

Only very few B2B market research companies master this way of working and it pays off to work with specialists in this field. Many companies believe that there are no external specialists in their industry who know the market as well and in detail as they do. The objection is important and justified and also applies at the beginning of a market research project. But an objective and well-trained interviewer quickly achieves a well-founded knowledge advantage through the dialogue with several experts. A benchmark of different opinions and views around the market gives him an objective view, which in a company for various reasons such as: If there is no longer any operational blindness, it may not be present. Another major advantage is that the interview partners usually meet neutral experts with a higher willingness to provide information than potential competitors in the market.

Once the B2B market analysis has been completed, the results can provide a solid foundation for further action. The evaluation provides answers to how and which markets should be handled by which resource use. The exact analysis of potential markets for entry into the market, or markets where business activities are already underway, makes it possible to optimise the use of resources in terms of personnel and financial resources. Risks can also be minimized to fail when entering the market through wrong strategies or decisions.

Consideration of internal and external perspectives in planning and implementation If you want to build a market analysis in the B2B area, it is advisable to always consider the external and internal perspectives. The external approach has already been explained in the upper section. In the following, the internal perspective is discussed. In the ideal case, a survey of your own employees (e.g. Salesman) to bring their experience and expertise into the project. This usually also increases the internal commitment to the new project. Especially when opening up new markets, employees should not feel that they have been ignored, but should be involved in the expansion process as far as possible. In the second step, questions are developed which are essential for the preparation of a market analysis. In practice, it has been shown that this type of projects is accompanied by the management board, the marketing department or the product management, especially in the middle class. When decision-makers meet at a table, support from a moderator can often help to shape a goal-oriented discussion.

Process of identifying and selecting the right service provider Companies often want to work with external partners in the field of market research. When choosing the service providers, the above-mentioned persons face the challenge of identifying the appropriate partner, contacting them and choosing the right one among the offers. It may be difficult for the contracting authority to find a suitable solution for the almost inconceivable number of market research firms and institutes.

That decision ultimately determines whether the project succeeds or fails. Companies selecting a service provider for industrial research should consider specialists in B2B market research. They understand the processes and requirements and can select suitable methods even in complex markets. Reliable findings require specialist expertise; inexpensive generalist researchers or outsourced student theses may not deliver it. As with medical diagnosis, companies should rely on specialists when assessing markets and developing strategy.

It is important to note, especially with B2B projects in special industries, that in addition to the pure methodological competence, the ability and experience of the interviewers is essential. These are less likely to be found in institutes that deal with B2B and B2C topics across sectors. In some sectors and areas there are B2B market research institutes that bring exactly this experience and expertise. The result of their work can be used in good conscience to plan and implement action plans and strategic plans.

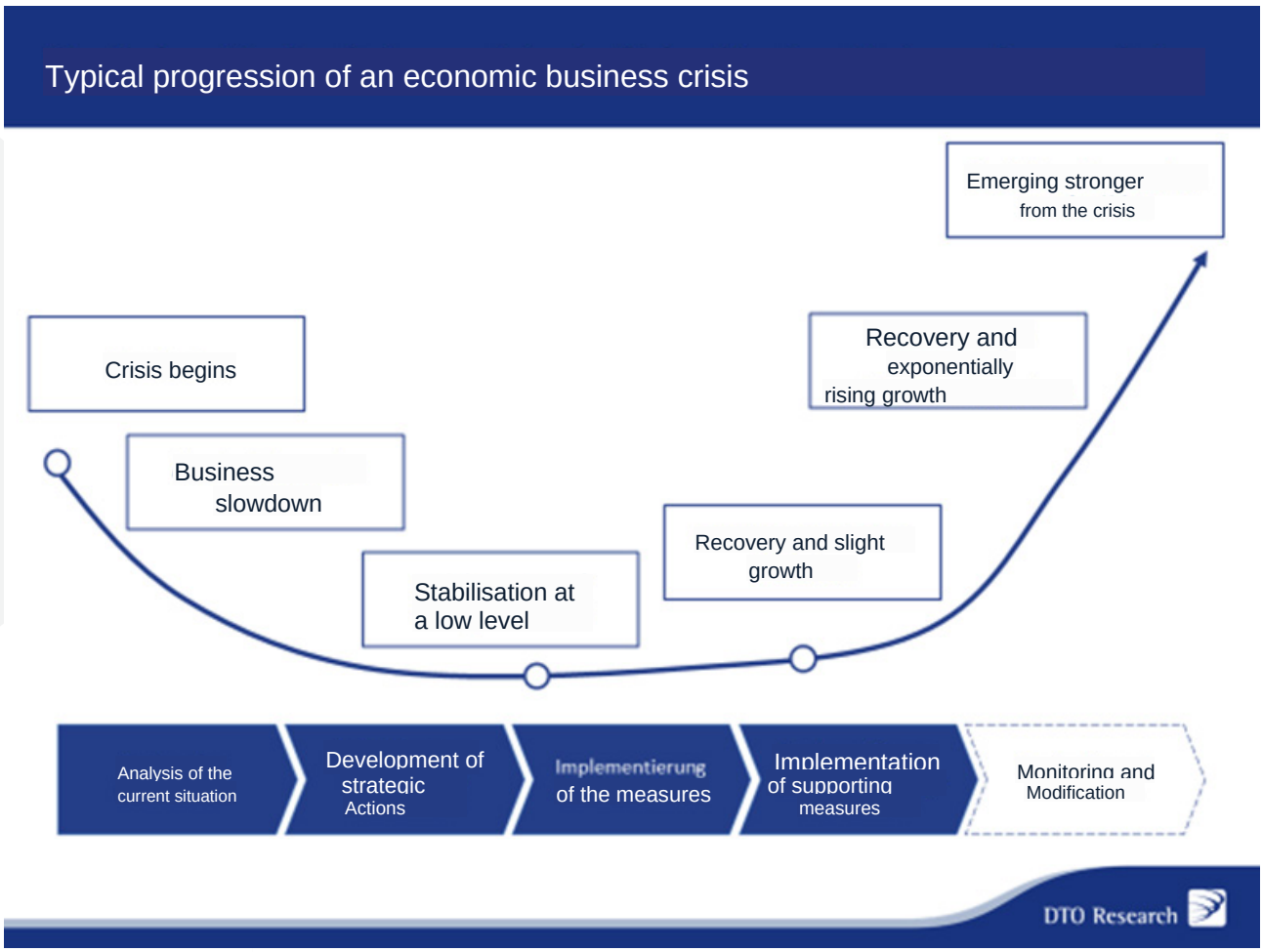
React correctly in corporate crises: take appropriate measures to stabilise and plan for recovery (2020)

The impact of the COVID-19 crisis on the economy is becoming increasingly visible. Inquiries are decreasing, supply chains are no longer functioning and uncertainty in companies is increasing. That is why it is only understandable that politicians react with an unlimited credit commitment in order to stabilise the economy. It remains to be seen whether companies have learned from the 2008 economic crisis and whether early warning systems and measures to mitigate the impact of the crisis work.

If one looks at the typical course of corporate crises, one should not forget in the current situation, in addition to implementing measures to stabilize the business, to plan adequately for the upswing. In the current situation, we are experiencing a weakening of business in many companies and industries. The primary objective now is to analyse the IST situation in companies and their market segments and to take measures that will lead to stabilisation. For companies, it can be used for example: For example, it is important to know how customers plan in the near future, or how much competition is affected by the crisis, and what measures are planned. Crises also often offer the opportunity to question one's own company orientation and strategy in a way that is difficult in the sometimes stressful, regular day-to-day business.

On the basis of the analysis, tactical and strategic measures can be developed which, on the one hand, ensure and support post-crisis growth and, on the other hand, also have early warning functions to prevent future crises. It is important that further support measures are defined after the implementation phase in order to support growth sustainably and that systematic action controlling is established. Only in this way can it be ensured that the measures also have their desired effect.

Conclusion Economic crises are usually associated with severe cuts for companies. However, they also offer opportunities if the planning of measures for the recovery is carried out in good time and the own strategy is put to the test. Especially when day-to-day business weakens, there are spaces to question things and often the willingness of employees to make necessary changes is greater than in times of upswing. Competition is also affected by the crisis in various ways, which can lead to significant post-crisis competitive advantages, provided that the right measures are identified and implemented in good time. If you look at the developments in China or Korea, the COVID-19 crisis will also be over in the foreseeable future.



Further interested in crisis management; and
What measures do you take for your business?
may, do not hesitate to contact us at www.dto-research.de
to contact. We will gladly arrange with you a
Online meeting and discuss options, you and
To provide adequate support to your company.

Medical Markets



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Innovation processes in medical technology: How 3D printing changes an entire industry! (2021)

In the production of components and prototypes, industrial companies increasingly rely on development processes with 3D printing technology. This is accompanied by digitalization in medical technology. Although the overall development often only concerns smaller components and the way out of the niche can be seen in the medium-long term, the dynamics are increasing. What is the current state of play in the field of medical technology? DTO's clearing up.

Finding your way around the market of 3D printing is not so easy, since there are now a lot of application methods and, in addition, many synonyms that describe these processes: The super-concept for 3D printing processes is commonly referred to as additive manufacturing. And here we go. Several sub-concepts and procedures can already be subsumed under this term.

The best known methods briefly explained: • Fused Deposition Modeling (FDM) • Stereolithography (SLA) • Selective laser sintering (SLS) /Selective laser melting (SLM) • Digital light processing technology (DLP)

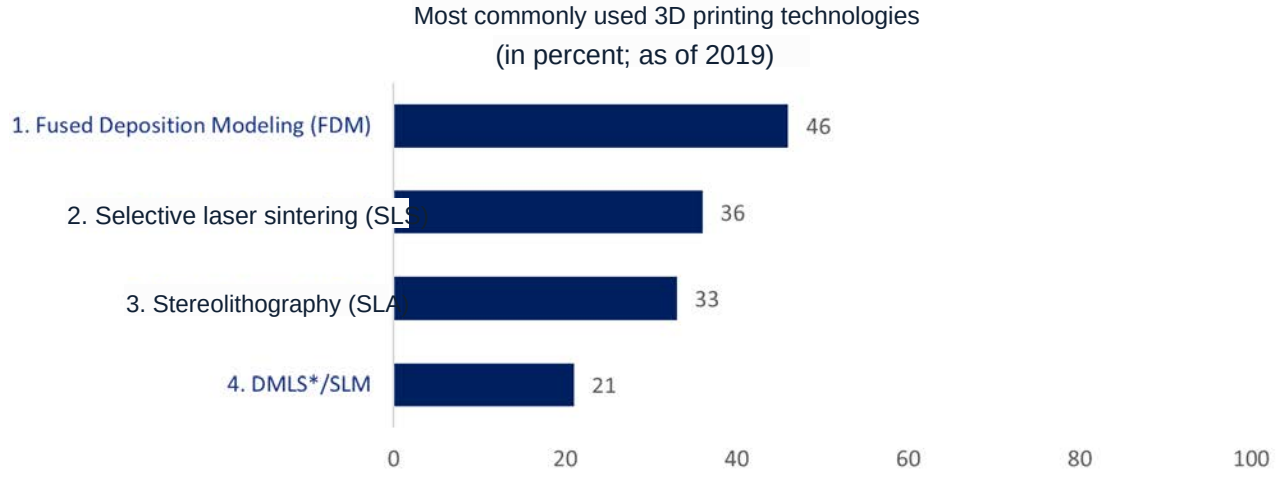
Fused Deposition Modeling (FDM) Fused Deposition Modeling (FDM) heats a plastic thread (filament) and puts it into position through a nozzle. The melting temperatures are about 200 to 300 degrees Celsius. Some materials require a heated pressure chamber or a heated pressure plate.

Stereolithography (SLA) This method is the oldest in the field of 3D printing. The beginnings go to the year 1983. In the process, a photopolymer in the liquid state, such as epoxy or acrylic resin, is selectively cured with a UV laser layer by layer. This method can be assigned to the so-called rapid prototyping (fast model construction) and is an attack for the production of individual components based on design data.

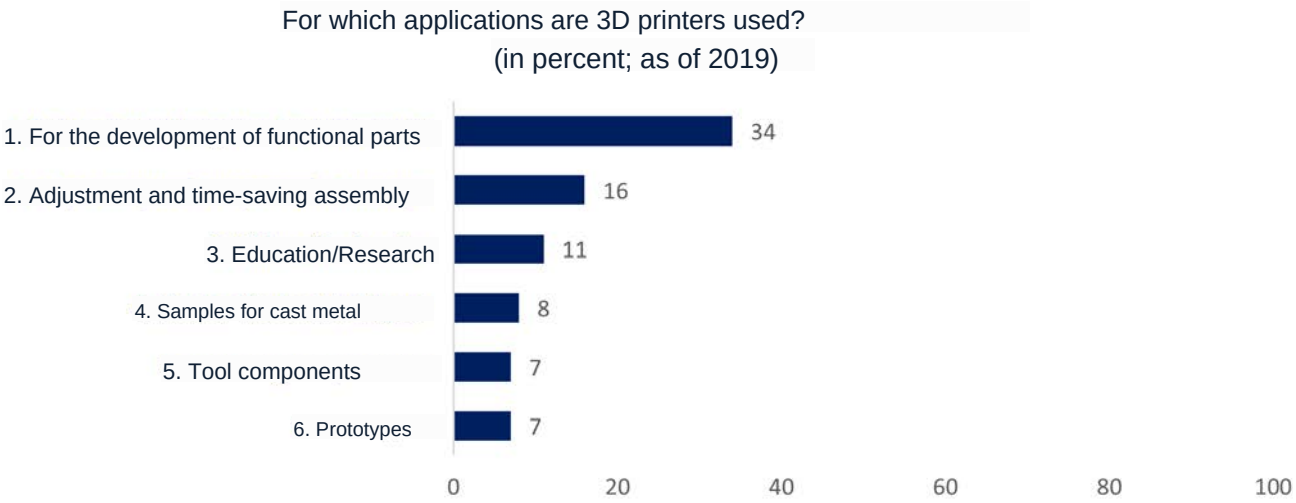
Selective laser sintering (SLS)/ Selective laser sintering (SLM) Selective laser sintering is used for rapid prototyping similar to the SLA method. During sintering, fine-grained, ceramic or metallic material is heated until shortly before the melting point of the material. Often selective laser melting is used in one breath - but this is not to be used synonymously. Unlike sintering, metal components can be manufactured here. The components experience a density of around 100 percent and thus have mechanical properties.

Digital Light Processing Technology (DLP) Digital Light Processing Technology (DLP) is an additive manufacturing method in which polymer resins are hardened with the help of a projector. This process is very similar to sintering, so the workpieces are either immersed or pulled out in the tub bath. The top layer of the object is exposed via a projector - so this is made to harden.

Studies show that a few core technologies have developed.



In addition to many processes that exist within additive manufacturing, the uses are also very diverse. (* Direct metal laser sintering)



There is a clear trend in uses. It is primarily about developing additive functional parts that are intended to complement components. Often the components are still very small, but especially in sectors where smaller components are needed, such as: For example, within medical technology, it can be very useful to produce additively. The trends in the field of medical technology are characterized by innovation.

Gautam Gupta, Vice President Global of 3D-Systems, summarizes it as follows: "At the global level, manufacturing is currently undergoing a transformation in which companies integrate the possibilities of additive manufacturing into their workflows. This is the case in the United Kingdom, the Netherlands and the United Kingdom, which are based on traditional methods of production. The medical technology industry is no exception and we see that these highly specialized manufacturers are now beginning to exploit the advantages of 3D printing in the design of implants and instruments.

3D printing in medical technology Medical technology was one of the first industries to discover the topic of 3D printing. An important keyword here is the topic of personalized medicine. By means of additive manufacturing processes, manufacturers can respond very individually to the patient's wishes. The processes are already so advanced that in addition to the improved

Technology has also created price advantages. All of these are the main drivers of increased investment in this segment.

3D printing in the field of medical technology has proven its practical suitability, especially in three key areas: • Prostheses production • Orthoses production • Manufacture of surgical instruments

In dentures, some applications have already found their way into practice: internal and external prostheses such as artificial hip joints, bites, hearing aids, arm and leg prostheses can be designed highly individually with 3D printing. The advantage: the patient receives perfect replacement products for his damaged body parts. Ultimately, the parts from the 3D pressure allow a higher level of quality of life. A millimeter-precise adaptation of products is now possible, ultimately standardized prostheses are always a compromise.

Software development as a key factor As the implementation of 3D printing models always takes place on the basis of design data, software development in medical technology is essential. Large 3D printing manufacturers such as EOS therefore always provide suitable software to meet the solution provider's requirements. In fact, the focus is always on operational discharge.

Powerful advantages of this type of digitalization in medical technology are: • user-friendliness: easy to handle through clarity. • integrability: integration into production environments and IT infrastructures.



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Software solutions are particularly important in surgery, and 3D printing already offers major benefits. Implants, including those used in maxillofacial surgery, have made the work of treating physicians considerably easier.

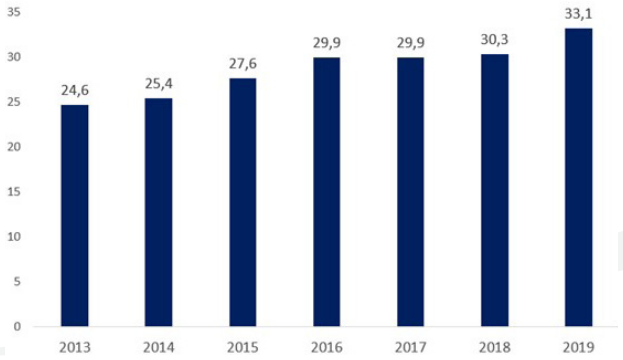
Organs from the printer? In fact, organs can already be reproduced on the basis of models. Here, too, a job relief is created for the medical specialist. The exact reproduction allows a very accurate understanding of the nature of an organ. Market experts suspect that in the medium term, implementable organs could be produced from the printer. It would be necessary to use the printer to produce a collagen model of the organ and then plant it with stem cells. It is certainly still a long way to go until approval, however, with sophisticated technology, organ donations would be completely superfluous. The driver "Innovation Medizintechnik" has not yet reached the end.

Medical technology and the importance of innovative IT processes: Where is the growth industry developing? (2020)

The central driver within the medical industry is technical progress. This has an impact on a wide range of areas. We explain in our article which current developments on the topic of medical technology also exist in combination with IT topics.

Technological progress leads to an evolution within an industry that has always been encouraged to change. Overall, the medical technology industry is an industry in growth. This has been demonstrated by the development of recent years. In 2019, sales amounted to around 33 billion. EUR in the MedTech area.

Worldwide sales of the German medical technology industry in 2013·2019, EUR billions



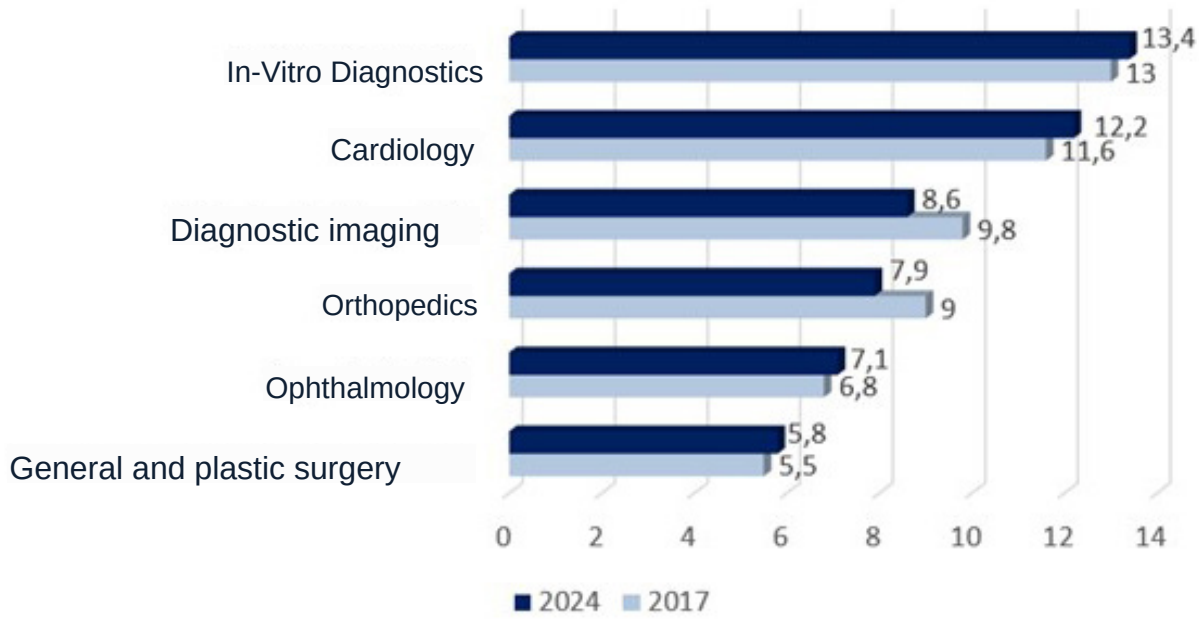
Source: Spectaris (2019); DTO presentation

The industry is characterised by medium-sized businesses both in Germany and internationally. In Germany, the central medical cluster is located in Baden-Württemberg. In recent years, medical technology companies in Baden-Württemberg, together with clinics and other medical providers, have established a good network of suppliers and customers. With more than 600 companies, the South West of Germany one of Europe's leading locations in the field of medical technology. International large companies such as Aesculap AG and Karl Storz GmbH & Co. KG are active in the industry as well as many small and medium-sized enterprises.

The strongest sales drivers in the field of medical technology are in-vitro diagnostics, cardiology and imaging diagnostics. There is a certain saturation of the market in these areas. Today, the innovation segments in the field of medical technology are elsewhere: Read on which innovative processes and applications these are.

Technological trends in the medical industry Digitalisation certainly has the greatest influence on medical advances. In one of our last articles, we already devoted ourselves to this topic on the basis of a concrete case study. Let us now look at further trends from a bird's eye view. Microsystem technology, nanotechnology and optical technologies are used to minimize products. The state of the art today is that we can talk about implantable microsystems that work actively or passively, sensoryly, telemetrically or with nerve coupling. The type of surgery will also change fundamentally. These will be carried out even more frequently in the future with minimally invasive surgery: image-guided, catheter-based or endoscopic.

Market shares of the six largest segments of the global medical technology industry in 2017 and forecast for 2024 (%)



Molecularization is also established – represented by biotechnology, cell and tissue technology. Medical technology will become more important especially for regenerative medicine, especially when research in cell and tissue technology is applied. The next major step in the healthcare revolution, as in many other areas, will be artificial intelligence (AI). The AI includes intelligent data analysis and data usage via algorithms, which are constantly learning and becoming better. As a supporting supplement tool, systems that allow for a more accurate hit probability in diagnostics are suitable to minimize the error potential at peak load on the doctor's side.

Problem areas of operational implementation There is still a lot to be done until the apparent change in operational practice is experienced. In addition to prestige projects, such as those implemented at the University Hospital Hamburg, there are:

More than half of hospitals currently do not have their own digital strategy, and implementation is often still lacking.

The reasons why the compass is often missing in terms of digitalization are manifold: • Interoperability of IT. • A process style, due to insoluble barriers to IT conversion, represents a security risk, which means that this important issue is not addressed. • In other places, the problem is structurally deeper: if the structure in the core processes of a hospital is missing, no IT or digital strategy can be implemented on this insufficient foundation.

Another important issue is data protection. If processes are opened up to a higher level of digitalization, there is a risk of cyberattacks and security vulnerabilities in general. In this context, it is important to note that the

The law on secure digital communications and healthcare applications entered into force at the end of 2015. This eHealth law is intended to contribute to making better use of the undeniably great opportunities offered by digitalization in the German healthcare sector in the future. The law promotes, among other things, telemedical treatment options and the electronic medication plan. The law is to be implemented by 2021. But what can treatment facilities do for themselves?

Implementation of IT processes The implementation of a holistic digital strategy is not always directly possible, therefore it is necessary to select selectively those processes that are standardizable. Rather softer factors, without changing the entire process chain of the hospital, are, for example, the automatic check-in of a patient with the help of the electronic health card, patient tracking through the hospital or the automatic transmission of test results to mobile devices. Furthermore, it is of benefit if hospital operators orient themselves to already existing reference projects, i.e. first get technical input before the implementation takes place. While commercial factors such as investment funds needed and running costs can be easily quantified, it should be considered in particular at which sensitive points a digital strategy can start. Typical questions on which digitalization can affect can be: How is it possible to optimise patient stay (without qualitative restrictions for the patient)? Which co-ordinative processes can be optimized? Another important point is efficiency measurement: Was the pilot project successful? Are the changed processes qualitatively measurable?

Understanding and Creating Medical Markets

Individual market analyses for:

- Manufacturers & dealers of medical technology
- Manufacturers & distributors of medical consumables
- Manufacturers & distributors of OTC products
- Medical services

Sustainability as an opportunity: What prospects exist within the medical technology industry? (2020)

A wide range of products are produced in the medical technology industry, most of which are sustainable. There is also currently no defined set of rules for the sustainable production of medical devices. Examples from the textile industry show that things can be different. Nevertheless, there are initial perspectives within the medical technology industry, which include optimized manufacturing processes and the recycling of materials and products. According to international studies, the medical industry is responsible for 4.4 percent of the world's pollutant emissions. An ecologically compatible footprint looks different. But how can an industry that does not seem to be sustainable at the moment be more sustainable?

No rules It is the case that medical companies have recognized the need to be more sustainable. But when can a medical device be described as sustainable? If it was produced with green energy? It can be especially long in use? Made of recycled components? The definition is difficult. Currently there is a central problem in this matter: a separate seal "Sustainable medical technology", which defines prerequisites, does not exist yet.

Awareness of sustainability, especially in the textile industry In other sectors, much more is happening. The textile industry is at the forefront of this: sustainability is defined above all by three key aspects: credibility, environmental sustainability, environmental sustainability, environmental sustainability and environmental sustainability.

Environmental and social compatibility also matter. Siegelklarheit.de provides an overview of certifications such as OekoTex. Some caution is still warranted: no label currently covers the end-of-life stage, so product recycling is not assured. To address this, some companies work with textile firms to process or reuse textiles for longer, putting sustainability into practice.

Reducing resource consumption Developing a uniform sustainability concept is particularly difficult because each product group has to be evaluated independently. Especially in medical technology, the term "medical engineering" applies to a large number of product groups. In addition to pipettes and disposable gloves for the laboratory as well as for CT devices and displays.

This is the one thing, the other is: how are concepts currently being implemented towards sustainability? Some manufacturers, such as the laboratory outfitter Starlab, are trying to save resources. "Green Officers are used to ensure that sustainability is at the forefront of the agenda. Starlab, for example, produces pipettes. They are made of plastic and are only used a few times before they are sorted out. But how can sustainable processes arise not only through reuse, but also through changed manufacturing processes? The company in question is entitled to:

In the case of the injection moulding process, the use of polypropylene (thermoplastic plastic soot) in the production process is reduced by making the pipette tip thinner. The quality is not restricted, but the consumption of thermoplastic plastic has been significantly reduced.

Perspective: Hospital of the Future Currently, we are also discussing how hospitals can become more energy efficient. An average German hospital generates between 500,000 – 700,000 euros of energy costs per year.

• Model calculations and studies show that optimising all energy-using processes in the hospital allows savings of 40 percent, in individual cases up to 50 percent (VDE, BUND).

• In addition to all German hospitals, this results in a saving potential of 450 to 600 million euros - with a simultaneous avoidance of 6 million tonnes of CO2.

Dose reduction and speed increase in diagnosis lead on the one hand to increased patient comfort, on the other hand, both contribute to sustainability in medical operations. The iterative (stepwise) dose reduction in computer tomography with its lower use of contrast agents results in lower radiation exposure of the patient. At the same time, the process requires a lower tube current and thus increases the eco-efficiency and CO2 emission values of the technology through lower power consumption.

Further perspectives result from technological progress and an overall increased efficiency: faster signal transmission with MRI and CT through more powerful computers and better image data processing at a high reconstruction speed. Thus, the increase in speed can contribute to a faster diagnosis, while at the same time the intervention times are reduced. Shorter examination times thus increase patient comfort and increase the productivity of medical processes – overall a guarantee for a more comprehensive sustainability model.

The solution for an increased form of sustainability lies in the changes in the overall process and is influenced by different adjustment screws: further use, technical progress, less material use and changed manufacturing processes. Despite more visible successes, it is still a long and long way off.

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IT & Telecommunications Markets

For technology service providers, IT service providers, telecommunications, software and consulting companies

Industry Markets



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The energy transition: Is the planned expansion sufficient to supply industry? (2020)

While in this country the expansion of renewable energies has stalled due to long discussions about distance regulation in the wind power sector, the global share of alternative energies is steadily increasing.

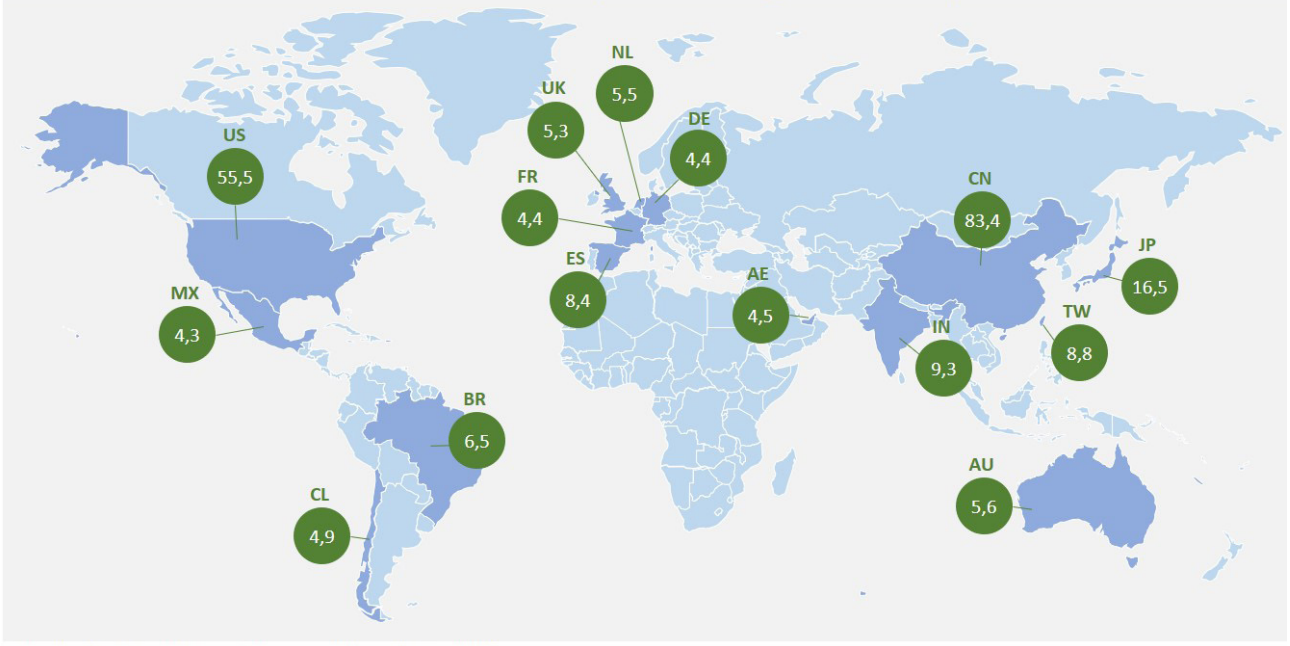
Status Quo With 194 gigawatts, more renewable energy production plants were built in 2019 than ever before. Photovoltaic power accounted for the largest share of this, which accounted for the lion's share of all alternative energies with 118 gigawatts.

Climate targets and innovation pressures stimulate the expansion of renewable energies. In addition, the cost of producing renewable energy has fallen significantly over the past ten years. The biggest price drop has occurred in photovoltaic systems. The average cost is around 83 percent

In the case of offshore wind energy, the price reduction of the plants still amounted to 51 percent, and in the case of onshore wind energy, the decrease amounted to 49 percent. It has also been noted that more than half of the world's renewable energy investments have taken place in emerging and developing countries.

The crux of climate policy With a share of around a quarter, the industrial sector contributes to global CO2 emissions. More and more projects to reduce this burden are now falling under the policy and industry action plan. With the expansion of renewable energies, the production of green hydrogen as an energy source also gains an increasingly important role. This can serve as a storage medium for the electricity obtained and also for various applications,

Countries with the highest renewable-energy investment in 2019 (USD billions)



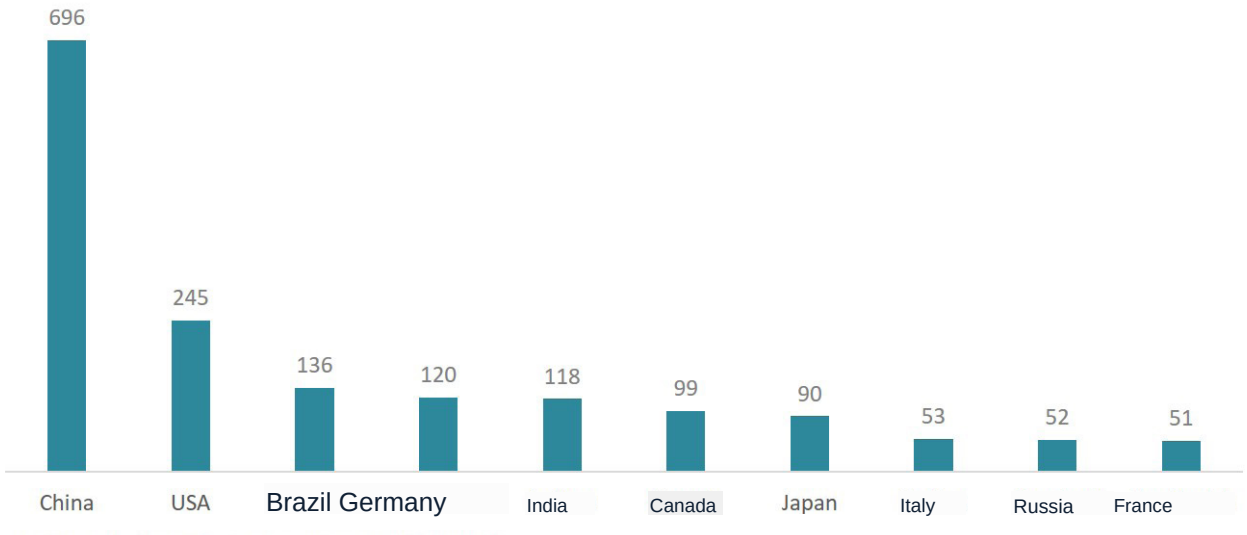
Source: Frankfurt School of Finance & Management; DTO (2020)

as for blast furnaces, for example. The demand for such "green solutions" is quite increasing. Many companies strive to introduce these new technologies in order to set new standards in innovation and climate protection. However, with all the positive appearances, the impression arises that the political decisions that should actually be confirmed in the long term are often made in a situation rather than in a goal-oriented manner.

For example, the Renewable Energy Act (EEG), recently presented by the German Federal Government, is to be named as an example. The aim of the "EEG-Novelle 2021" is to create the legal conditions for the entire electricity produced to be climate-neutral by 2050 at the latest. By 2030, this target is already to be met by 65 percent. Critics complain that the EEG wrongly does not consider that electricity consumption will be higher in 2030 than in 2020 and that the planned expansion of renewable energies cannot therefore fully compensate for future higher demand. Not to mention that a higher proportion of climate-friendly electricity is obtained can. The new regulation also provides that if the stock exchange electricity price is negative at a certain interval, there will be no support for electricity production from future EEG plants. Revenues from electricity produced thus become uncertain and poorly predictable, which could ultimately be reflected in plant prices.

There is still a need for improvement on the part of policymakers. Be it either in an explanation of why such restrictions exist or to create rules that allow for better predictability for plant operators. For example, the President of the European Commission, Leyen, shows that new, tougher and not easy to understand requirements cannot necessarily be understood. Just recently presented, the EU's new planned target is to reduce industry's emissions by 55 percent by 2030, rather than by 40 percent as previously communicated (1990 reference emissions). This goal came as a surprise and presents the companies with great challenges. The companies already affected by the COVID-19 crisis are thus exposed to large amounts of investment, which lead to a strong additional burden.

Installed electricity generation capacity based on renewable energy (Gigawatt, 2018)



Quelle: IRENA Renewable Capacity Statistics 2019; Darstellung DTO (2020)

Country	Investment (USD bn)	Change 2018/2019
China	83,4	-8%
USA	55,5	+28%
Japan	16,5	-10%
India	9,3	-14%
Taiwan	8,8	+390%
Spain	8,4	+25%
Brazil	6,5	+74%
Australia	5,6	-40%
Netherlands	5,5	+25%
United Kingdom	5,3	-40%

Source: Frankfurt School of Finance & Management; DTO (2020)

What's next? Worldwide, 87 governments have committed to install a further 826 gigawatts of renewable energy by 2030. The related investment capital comes to a value of around one trillion US dollars. However, considering the last ten years, 1,213 gigawatts of US$2.7 trillion have been created worldwide. It follows that, despite falling plant costs, there will be a significantly lower expansion over the next ten years than in the same period of time.

The COVID-19 crisis has also helped slow down decisions, which in many places is likely to slow down the expansion from 2020. However, the expansion is not only important in order to achieve the defined climate to achieve objectives, but also offers an opportunity to align the economy in a forward-looking and sustainable manner. Faster expansion is even essential for the stricter requirements regarding emissions. The currently severely reduced investment costs must be the reason to push forward the further expansion of renewable energy projects as part of stimulus packages. It is now also important to create incentives and not to surprise companies (just now) with stricter requirements so that, despite difficult times, planning can be ensured. It is therefore clear that the planned investments in renewable energy projects and green hydrogen are far from sufficient to meet the required demand, let alone to ensure competitive energy prices.

Market research in B2B markets: Or the exciting question of what a rotary encoder has to do with mechanical movement! (2020)

Industrial market researchers have to face new challenges in the production of customer-specific market analyses in relatively intransparent B2B markets. An individual project design must be designed before each project. The approach is similar to a puzzle game in which many small segments, in the form of knowledge blocks, first have to be generated and then assembled in order to ultimately create a realistic image. For this purpose, existing information is specifically supplemented with new information. This procedure is to be understood as a repetitive process, in which a variety of different data is compared to each other until a coherent connection is established.

In order to give a small insight into this exciting and varied work, the present article shows interesting facts on the topic of encoder. DTO conducted an own study on this subject about two years ago. The focus and subject of the market analysis was the industrial scope of encoders. Other applications of B2C goods were deliberately excluded. The market analysis carried out symbolizes the daily work in intransparent markets and is also a prime example when it comes to a very targeted segmentation or classification of sub-sectors in market analyses.

The encoder The encoder is a sensor that captures the current position of a mechanical movement (angle position and speed measurement) and converts it into an electrical signal. He sends the signal to an evaluation device. So the encoder is used wherever it is about the fact that an exact position of a movement should be known. The main application for encoder can be divided into two categories: drive technology and measurement technology. With a market share of about 80 percent, drive technology is the largest part of the market.

You distinguish encoders in so-called incremental encoders and absolute encoders. Absolute encoders indicate the actual position directly. A major advantage is that the sensor remembers its position before a possible power failure. Absolute encoders can be used for both position and speed detection. Incremental rotary encoders, on the other hand, produce the impulse gradually, whereby only the change can always be measured, the current position is not directly mediated. They are simpler and therefore also cheaper. The variety of applications of encoders therefore seems almost unlimited. From household appliances to heavy-duty shovel excavators.

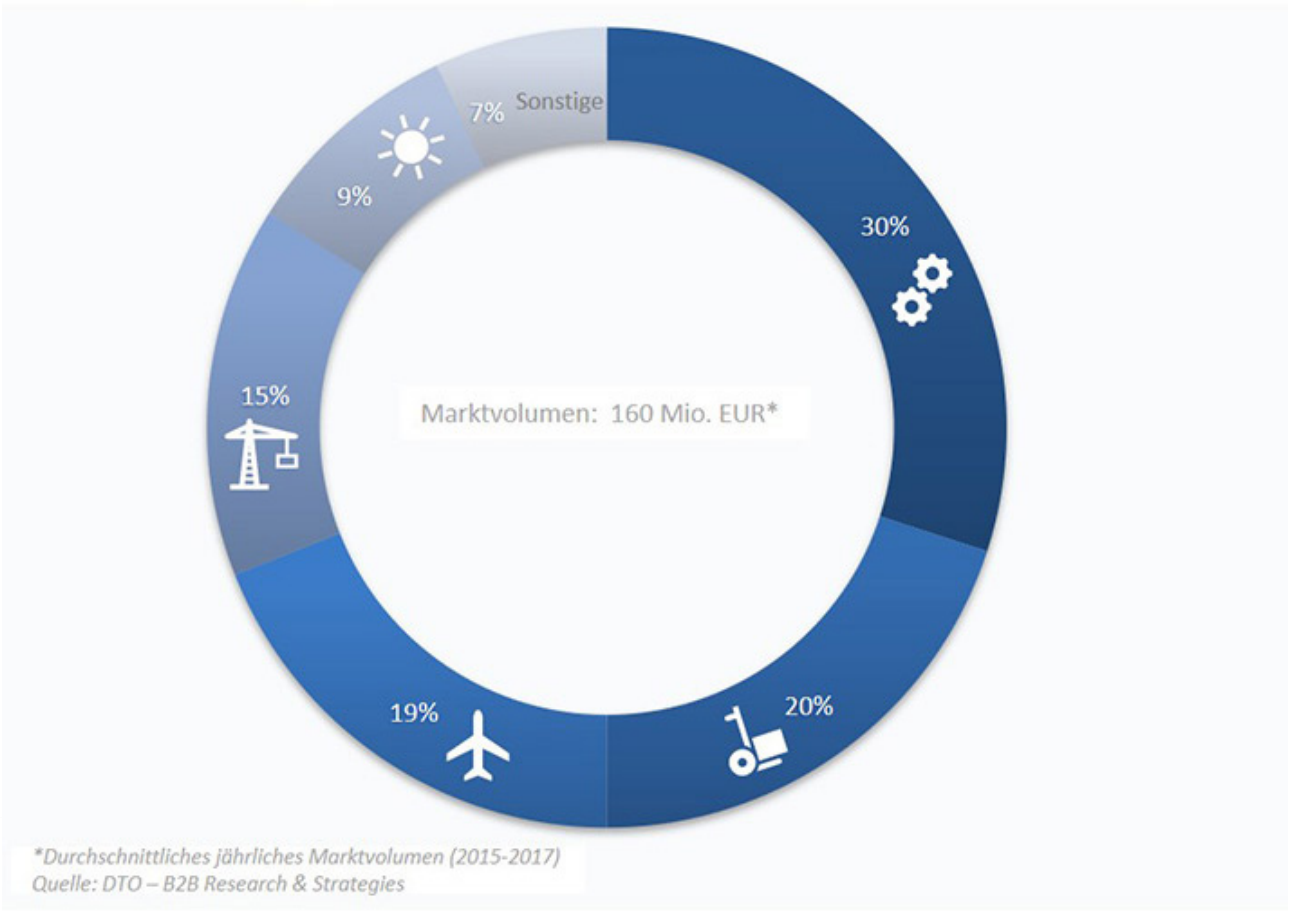
Market volume and market characteristics
In Germany, the market volume for encoders in the industrial field of application in 2018 was around 160 million euros. The market leaders include Heidenhain, Sick Stegmann, Baumer, Kübler, Pepperl & Fuchs and stallions. In Germany, however, there are more than 20 companies with significant turnover with encoders. Looking at the different markets, the largest share is accounted for by production facilities (30 percent). Absolute encoders with magnetic technology are usually chosen in machine and plant engineering. They make a significant contribution to ensuring safe processes and provide the required high accuracy.

For incremental encoders and absolute encoders, the material handling is the

Second most important industry. The encoder, which is supplied in plants for the goods and material handling, accounts for about 20 percent of the market. Suppliers such as SICK AG are even specialized in offering customer-specific solutions only for the logistics industry. In the transport sector (19 percent), the elevator market is a very important segment. Around 15,000 to 20,000 elevator units are built in Germany each year. Suppliers such as Kübler develop specially adapted encoders together with manufacturers of elevator control systems.

In heavy machinery construction and in safety areas (15 percent) a so-called SIL certification is common (classification of a safety integrity level in levels 1-3). Many manufacturers invest in the certification of an SIL 3 encoder, which is the highest SIL accreditation for

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Safety applications

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Conveyor belts
Pick-and-place machines
Automated guided vehicles

Renewable energy

Wind turbines
Photovoltaic systems

Transport

Aircraft
Railway technology
Lifts

The encoder is equal to the encoder. However, the development and certification process is expensive and some customers do not want to spend any additional costs on such certification. Alternative methods include the use of two encoders, preferably from two different manufacturers. With around 9 percent, the renewable energy sector is also one of the main industrial sales sectors for encoder, for example, each wind turbine accounts for four to five encoder.

The trend High-resolution incremental encoders are often used in drive technology, as the performance of these encoders can only be slightly influenced by external conditions. They withstand high operating temperatures, high vibration and shock loads as well as high speeds. Although the market for measurement technology is the smaller share compared to the drive technology, growth in the market for measurement technology is expected due to increasing automation. With a continuous increase in automated processes and systems, especially in the German production industry, the increasing involvement of measurement technology becomes a necessity.

Sales to OEM companies play a very important role as they make up the main share of the sales market. The more technical adaptation features a customer needs, the more complex the sales process becomes. This sales process is usually accompanied by extensive advice.

Due to the fact that absolute encoders have the ability to determine precise positions, these are often used in metrological applications. With a growth of the market for measurement technology, therefore, an increase of the absolute encoder is to be expected.

Key rotary encoder customers in drive technology (selection)

- ABB
- AMK
- Baumüller
- Beckhoff
- Dunkermotoren
- Lenze
- Rexroth
- SEW Eurodrive

Source: DTO – B2B Research & Strategies

Hydrogen in practice: Development projects in the field of hydrogen are increasing! (2020)

Hydrogen is becoming more and more important. Last but not least, the current support measures in connection with an expansion of alternative energy sources make the issue move on to the corporate agenda for more and more companies. The questions of the companies are on the one hand about trends, future concepts or in general about market potential for certain product solutions. However, companies often also rely on external support for such issues.

The Düsseldorf-based market research and consulting company DTO – B2B Research & Strategies also has an increasing interest in companies from the industrial environment that deal with hydrogen. It should be noted that, in many cases, companies already have some general information on hydrogen, but often lack a precise concept of how to turn to the market and which points of contact are promising.

The crucial point of such a project is that, in order to take an economic view, the respective technical possibilities and prerequisites must always be examined, so that a consulting project can be truly fully successful. DTO – B2B Research & Strategies therefore cooperates with the southern German development service providerenders GmbH, which brings the technical know-how with it to develop product solutions in a goal-oriented manner. The present subject article should not only provide a practical insight, it should also describe in detail how a technical product can be developed and launched on the basis of current market developments and market research.

Intelligent thermal management system for commercial vehicles and mobile working machines Ymer Technology and its development partnerenders GmbH started the development of an intelligent thermal management system (TMS) for battery-electrically driven and hybrid vehicles. The focus was on commercial vehicles and mobile machinery.

The aim of the development was above all to increase the efficiency of the overall system, as well as an adaptive regulation. To this end, a component-based standardised system has been developed to reduce customer and vehicle-specific development costs and to enable faster construction. As a result, an increase in battery life can also be achieved. In the course of the project, modular, customized prototypes were developed, constructed and tested. The first series TMS are now available at Ymer Technology.

The temperature management system In the TMS, all heating-cooling circuits of the vehicle are regulated by, among other things, the use of waste heat of the main and auxiliary units in such a way that the respective components can be kept at their ideal temperature level. Furthermore, the TMS provides the driver's cabin with the necessary media (refrigerants and hot water)

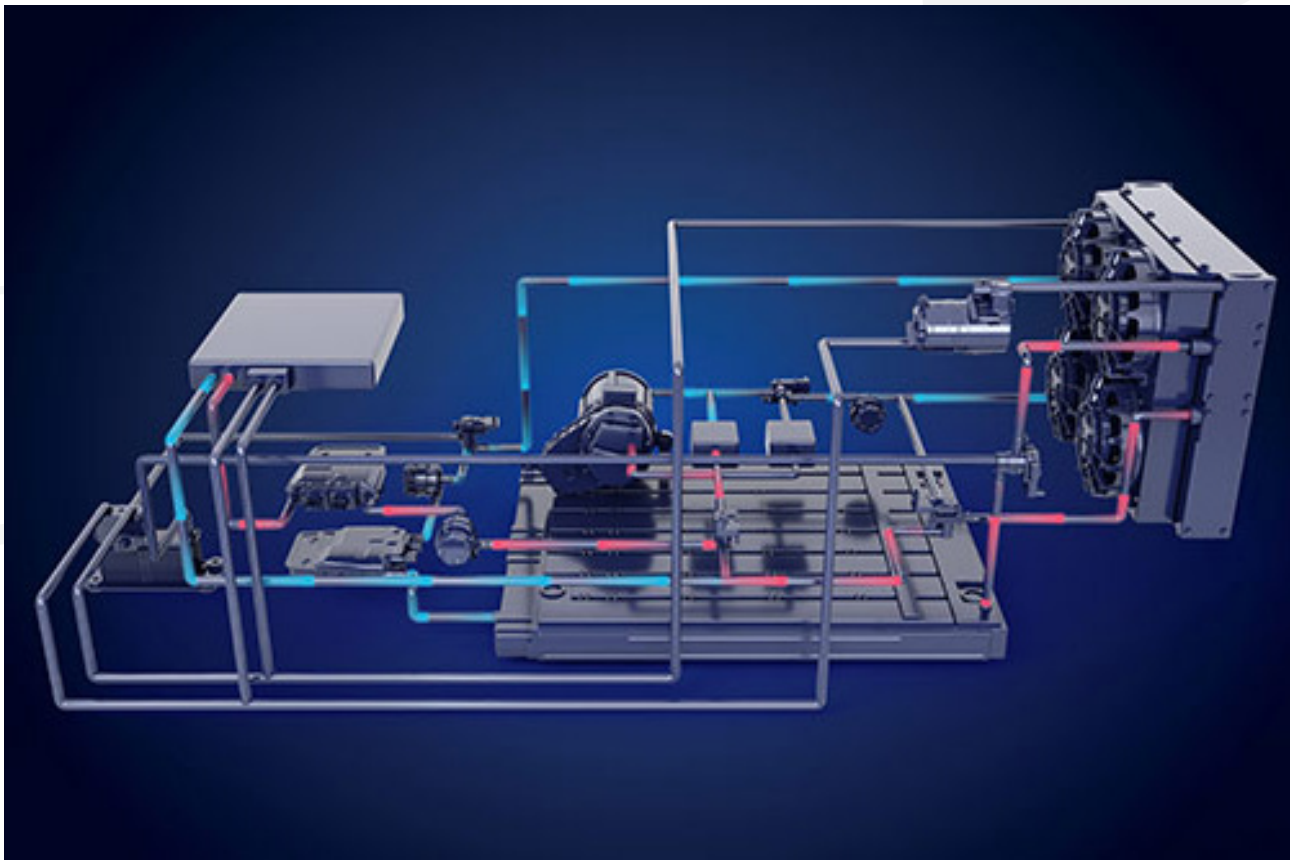
and regulates it. To further increase efficiency, main components of the TMS, such as heaters and coolers, are directly linked to the battery's high-voltage system in order to avoid conversion losses.

Further development Fuel cell vehicle In Q3 2020, Ymer Technology and mores are launching the further development of the TMS as a variant for fuel cell vehicles. The aim is to test a prototype derivative in a production vehicle in Q2 2021 and to parametrize the intelligent control system.

Hydrogen is expensive – efficiency is a key factor Due to the relatively low efficiency of the fuel cell, a correspondingly higher usable level of waste heat is released, which can make the use of a TMS even more profitable. An extension of the TMS with, for example, a heat pump is conceivable. This waste heat can not only be used to maintain a temperature level

are also used for lifting and lowering temperature levels, e.g. in the driver's cabin.

Efficiency through intelligence Do you pursue the goal of positioning yourself on the market in the long term and successfully with innovative products and technologies? The implementation of your specific requirements requires special support and high-tech know-how?Anders is your partner for the secure external implementation of strategic development projects. As a long-standing specialist, we support our customers in product and process development, prototype construction and production-ready products. We have always been driven by a passion: with interdisciplinary expertise and creativity, accepting challenges and creating great ideas.



Source: Ymer Technology

Hydrogen: status quo and current developments (2020)

At present, what developments are considered realistic and what are the current chances of hydrogen per se and/or hydrogen per se? Hydrogen is increasingly used as the starting point for e-fuels? We would like to address this question in a short market check and address the potential in the various areas of application.

Production and market development First of all, one thing has definitely not changed, namely the origin of hydrogen. If it is not produced by renewable energy sources, its use in larger quantities is quite pointless, because the production of hydrogen requires a considerable amount of energy. And exactly the subject of the production of the (still) expensive gas is still the central problem. Because only with an expansion of the regenerative energies, can be produced by excess energy of cost-effective hydrogen. This in turn happens primarily with wind power, hydro power or photovoltaic power. However, there is also the possibility of extracting hydrogen from natural gas or biomass. But even more unusual methods are currently being researched. Researchers at Kiel University have now found a method of producing green hydrogen by means of bacteria by photosynthesis. However, in order to make the last example marketable, some time will pass.

The two major themes of alternative energy sources and hydrogen are therefore directly linked

The expansion of alternative energies acts as an accelerator for the production of hydrogen. At present, some factors suggest that hydrogen production will become an increasingly important issue. Policy decisions on future energy production and climate neutrality, as well as European support programmes that subsidise energy companies when they offer CO2-neutral electricity, act as a strong market driver for the relevant institutions to continue investing in green energy. At the same time, the expansion of the hydrogen infrastructure with auxiliary and/or auxiliary power stations will take place. Support packages are supported. Some countries are currently or will soon invest in hydrogen infrastructure (with the simultaneous development of alternative energy concepts), which will increase the global demand for hydrogen. The Gulf States are also increasingly being forced to tackle alternative business areas for oil production and are already investing heavily in the expansion of mega solar plants.

In short, for some of the obstacles that still exist, it can be said that in the medium term (<10 years) there are already expected to be stronger reductions in the production costs of hydrogen, which will ultimately increase the volume of sales and promote alternative propulsion concepts mainly in the industrial context, as well as for commercial vehicles, ships and aerospace. There has already been a sharp increase in the production of hydrogen. In Germany alone, the electrolysis performance of power-to-gas plants that are in operation or in planning has increased tenfold within a year.

Examples of world-wide hydrogen projects • In the Dutch city of Vlissingen, one of the largest hydrogen plants in the world is to be built by 2030 for more than one billion euros. The electricity from offshore wind turbines is to be used. The project is a partnership with Gasunie, Groningen Seaports and Shell Nederland. The energy generated is expected to produce 800,000 tonnes of hydrogen per year.

• In 2022, a public hydrogen network will supply industrial companies in NRW and Lower Saxony with hydrogen from alternative energy sources. The project of the partners Evonik, BP, RWE, Nowega and OGE could lead the way for the German industrial landscape.

• Portugal is investing EUR 7 billion in the development of hydrogen infrastructure by 2030, which will significantly reduce natural gas imports.

• In Denmark, a major project for the production of sustainable fuels from wind power is to be implemented by 2030. The construction of one of the world's largest electrolysis plants is planned for this purpose.

• The Cleantech start-up SGH2 aims to build a production plant in California by 2023 with a technology based on plasma torches and waste, producing 3.8 million tonnes of hydrogen, especially for the heavy industry there.

• In North Africa and the Gulf States, work is also being carried out on infrastructure and the development of alternative energy concepts, so that on the one hand the existing infrastructure on natural gas pipelines is used can, or also the transport of liquid hydrogen by tanker is possible.

• At present and with some delay, the Federal Government was able to agree on the cornerstones of the planned hydrogen strategy. Especially under the pressure of the COVID-19 crisis and the resulting stimulus package, the main points of dispute between the two ruling parties could be settled. A total of around 9 billion will be invested in the promotion of hydrogen technology. International partnerships, for example with Morocco, will also be established to meet increasing needs.

Potential and fields of application Even though hydrogen has so far been regarded as an overpriced luxury product that currently serves niche markets, the global expansion of alternative energy sources will only drive forward the full potential of this gas. It will also play an important role as a storage medium for renewable energies.

We will examine how the exciting topic "hydrogen" continues in further technical articles. The question should also be asked about the effects of China's current hydrogen focus. In May 2020, the National People's Congress adopted a national economic and social development plan, which also deals with the development of industrial hydrogen use. In this context, the impact on the car sector should also be kept on the screen. We will be happy to keep you up to date on this topic.



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Connecting the German manufacturing industry to 5G: What is the current state of 5G technology and why is its industrial development so important? (2020)

2025 is the recently decided target year for 5G. Until then, countries such as Germany are seeking a significant expansion of the 5G network so that at least one third of the world's population can access this fast network. But what can we expect from 5G? What added value will Industry 4.0 bring? In this article, we will look at the development of 5G so far, the potential for the manufacturing industry and the strategies that need to be taken to achieve this potential. Interested? Then: Let's get connected.

The development of 5G 5G is the "fifth generation" of the mobile phone standard based on the existing 4G LTE standards. Unlike the previous generation, this generation offers a higher bandwidth and a very low latency time. This leads to a better, faster and more reliable connection among users as well as between objects and machines, such as self-driving Teslas or intelligent buildings. 5G enables data collection and analysis in real time, making it a valuable tool for artificial intelligence (AI) and the Internet of Things (IoT).

Why will 5G take such a high priority in manufacturing? To put it simply: A smooth networked production is only possible with 5G. The fifth generation enables a 100-times faster data transfer (in Compared to LTE), real-time communication between people, systems, sensors and machines. But what difference does this make for manufacturing? The potential of 5G enables manufacturers to develop their competitiveness initially through continuous efficiency improvements. Using such connectivity, assembly machines can work with the highest precision and transport systems can detect obstacles even at high speeds. However, 5G not only improves old processes and devices that can be operated with 4G, but also creates a potential for completely new technologies. New process innovations can achieve higher profitability in the company. For example, connected or intelligent products offer the opportunity to create new services with added value for the customer, which is becoming increasingly important for manufacturers than the products themselves. Demand for new manufacturing services is one of the main drivers for 5G in the manufacturing industry.

Factory 56 The European 5G Observatory stated that by December 2019, 28 EU Member States had carried out 181 5G tests and pilot projects alone. One project that has attracted a lot of attention is the "Factory 56" project by Mercedes in Sindelfingen. As part of the project, Mercedes-Benz will work together with Telefónica Deutschland and the

factory equipment manufacturer Ericsson developed the world's first plant, which uses the 5G network for automotive production. The 5G systems make it possible to optimize the production processes even more strongly than before by enabling functions such as tracking products on the assembly line. In addition, the data of the test scenarios are processed faster and mobile communication between the production machines (M2M) is improved. All in all, the production processes have not only been optimized, but are also flexible and fast enough to adapt to short-term market conditions.

Strategic rollout of 5G Although the potential of 5G in manufacturing seems very attractive, there is some restraint on the part of mobile operators. The added value resulting from the 5G possibilities and the implementation of IoT practices in manufacturing (estimated at around USD 113 billion in 2026) leads to a large investment in infrastructure. However, conservative investment behaviour is due to the expected increase in benefit over the next five years, not a proper option. Fortunately, mobile operators and private investors are not the only parties involved. The government has developed strategies to act and invest properly in this generation of technology.

The signal that will connect us all Which leading manufacturers will soon implement 5G in their production processes? When will 5G reach the German middle class? We will continue to look at the development of 5G to find answers to these and other questions. Despite the difficult times, manufacturers should look forward. Technological progress will not slow down and innovative thinking is particularly important in times of crisis. 5G can be the reason that companies have to successfully reposition themselves or close their doors forever. 5G will soon help shape the market: Are your manufacturing processes prepared for this?

Case study: Germany

In autumn 2016, the German government announced its 5G initiative. The programme has five actions to support early development and rollout of 5G by 2025. These steps include:

1. Accelerate network rollout
2. Provision of spectrum based on demand
3. Promote cooperation between telecoms and user industries; include their needs, ideas and solutions in Standardisation
4. Targeted and coordinated research
5. Introduce 5G in cities and municipalities at an early stage

Alongside these steps and a 2019 decision to invest EUR 6.5 billion in 5G, the government aims for market leadership.

Now meets the future: Who benefits from the new era of corporate and production processes? (2020)

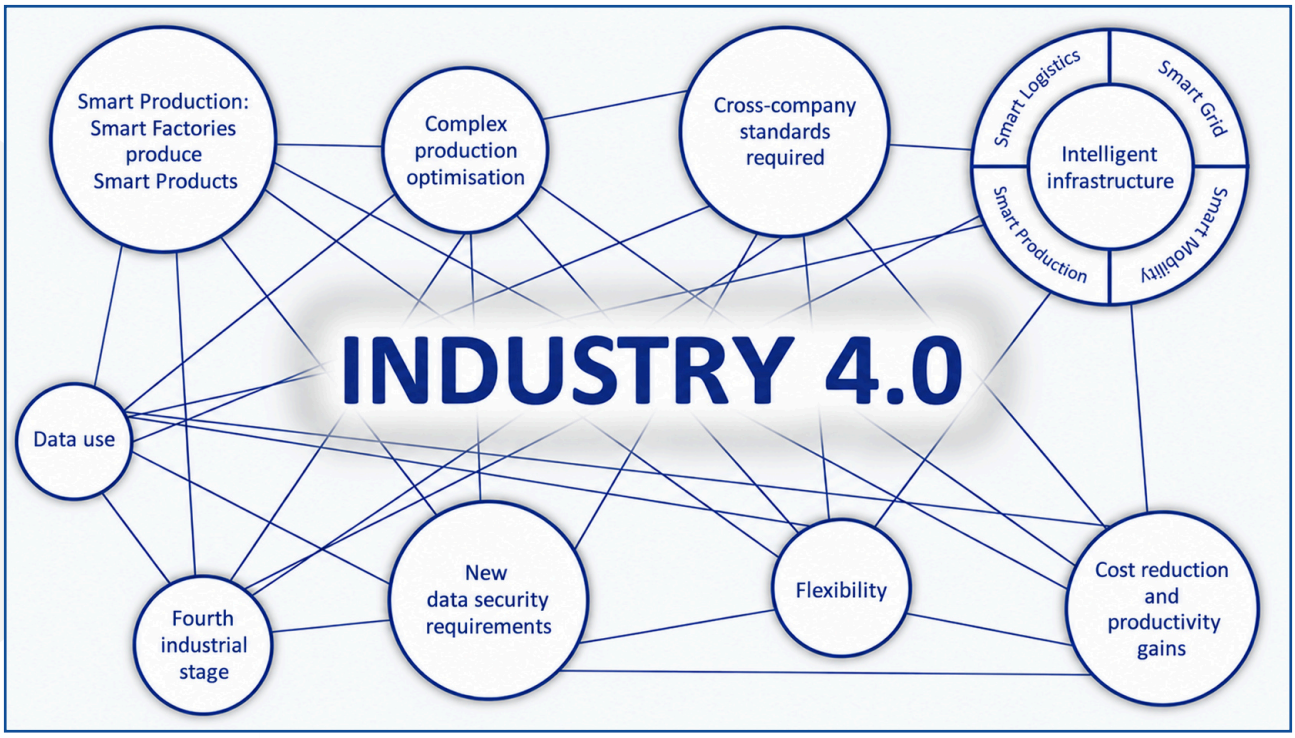
More and more car manufacturers are adapting their production processes – from assembly line production to modular assembly. In 2016, Audi already switched the production of the R8 to modular assembly. Driverless transport systems move the car under construction from one workstation to the next. This new way of producing is driven above all by the ever stronger individuality of the vehicles, the origin of which lies in the tens of variants of the vehicle configuration when buying a car. It has therefore become extremely rare that there are only two completely identical vehicles on the assembly line.

Productivity despite individuality Classic assembly line production can therefore quickly reach limits. Vehicles must pass through certain production stations for different lengths. This is at the expense of productivity. Especially for vehicles of the upper middle and upper class, it is therefore worthwhile to switch production towards modular production after a short time. Because the more complex the vehicle is and the higher the variance, the sooner a conversion of production makes sense. In addition, the step towards modular assembly is fuelled by the increase in production of electric cars.

Industry 4.0 becomes tangible In September of this year, Mercedes will open Factory 56, one of the most modern automotive production facilities in the world, in Sindelfingen. Not only that the production is carried out flexibly and modularly will be used and driverless transport systems. On a production area of more than 20,000 square meters, 5G is also available as the latest standard for mobile Internet, so that the most modern technologies can be used and function smoothly. Employees are also involved in the processes more flexibly and individually. In this way, it is possible to better consider the individual employees in planning, in terms of shiftwork and staff composition.

As so often, applications and systems in the automotive industry serve as pioneers for new or alternative forms of production or process processes for other industries. It is therefore conceivable that not only the new form of production has an influence on the supplier landscape for production systems, machines and equipment for so-called smart factories. But what potential lies behind this increasing change in production and business processes and for which market players are market players? Sales opportunities?

A market for everyone? Above all, there is an increasing need for networking solutions between production and logistics, whereby suppliers such as Bosch benefit greatly. In 2019 alone, Bosch generated sales of around EUR three-quarters of a billion with networking solutions for production and logistics. This corresponds to a growth in sales



In the first half of the year, the rate of increase was 25 per cent on the previous year. Such networking solutions represent enormous potential not only for large companies such as Bosch. Many SMEs are also entering a promising market with specialization in this area. The promising thing about it is that it is not just about capital goods that are a necessity for production. With intelligent networking, costs can rather be saved across all operating levels, as processes can be optimized and adapted without any planning effort.

The future is already being written today However, there is much more to the topic than a good advice, because whoever remains competitive in the future and wants to retain or expand his customer circle does not get around networking. This also opens up opportunities for equipment manufacturers, machine and plant manufacturers, including robot technology and driverless transport systems, planning offices, security, software and communication companies, as well as IT and consulting companies.

With the requirements and questions that are triggered by the Industry 4.0 theme, the opportunities and opportunities that almost every industry is confronted with are also growing. This development will progress precisely because the upcoming change is more than just a network between manufacturing and logistics. Industry 4.0 aims to ensure that raw materials or workpieces are no longer controlled top-down, but that they carry and communicate with themselves the necessary information. This is essential for the entire value chain of a product.

Even if this scenario may sound like future music for some people at the moment, the developments are palpable and the market dynamics are suddenly increasing. The times when output is increased and "only" more efficient will be replaced by more flexible, individual and communicative business and production processes.

Lack of skilled workers in mechanical and plant engineering: A study of the German labour market of engineers (2020)

The present study examines the situation of skilled workers within machinery and plant construction. In particular, the situation of the engineers is examined in more detail. The main causes of a shortage of skilled workers are gaps in education, demographic change and cyclical fluctuations. The consequences of a shortage of skilled workers are reflected, among other things, in the entire labour market, as well as in the innovative, competitive and active capacity of companies.

Looking at the vacancies and the engineers looking for work, it is clear that the relationship between these positions has increased steadily in recent years. Compared to this, the average wages of engineers decreased last year, while the wages of the entire industry increased. On the one hand, more engineers are needed, on the other hand, there is no shortage of skilled workers due to wage developments. Various recruitment measures provide the basis for ensuring the need for skilled workers in the future.

Labour and skilled workers

Requirement level I Helper and learning activities (helpers) Helpers do not need special expertise. They mainly carry out simple and workable activities. Usually, no formal qualifications are required for this level or only a small amount of formal qualifications. As an example within mechanical engineering, occupations such as mechanical engineering workers are considered.

Level of requirements II Skilled activities (specialists) Skilled workers need sound professional knowledge and skills. Activities include, but are not limited to, the manufacture of components for machinery and equipment. As a formal qualification, a two to three year vocational training or a comparable vocational or college degree is required. Examples of occupations within mechanical engineering are: precision mechanics – mechanical engineering and mechanical engineering mechanics.

Level of requirements III Complex specialist activities (specialists) Specialists perform essentially more complex tasks, which can only be performed with special knowledge and skills. Examples here are the operational planning of the equipment, maintenance of production facilities and quality control and assurance. This knowledge and skills are usually acquired in further education and/or further training. The formal qualifications include a technical or master's training or equivalent technical education or training. University degree. In addition, professional experience and other informal vocational training can also qualify for these activities. Examples in mechanical engineering are mechanical engineering technicians, maintenance technicians or mechanical engineering assistants.

Level of requirements IV Highly complex activities (experts) The highly complex activities include development, research and diagnosis.

the design of production processes and the construction of production plants. But management and management tasks are also part of the remit of experts. Since these activities involve a high degree of complexity, formal qualifications require at least four years of higher education and/or a high level of professional experience. A minimum of one master's degree, a diploma or a state examination is required. In some cases, the necessary qualifications will only be obtained if a doctorate or even habilitation is given. Examples within mechanical engineering are mechanical engineer, process engineer or engineer – applied mechanics.

The machine and plant construction is particularly characterized by the requirements levels II to IV. Around one third of the employees carry out complex or highly complex activities. The topic of securing and recruiting skilled workers thus has a separate and important role to play in order to be able to operate successfully on the market.

Possible causes of a shortage of skilled workers

Changes in qualifications and gaps in education • Areas such as research and development are becoming increasingly important, which is why employment is moving towards high qualifications.

• A decline in the number of low skilled workers, as more routine work tasks are automated for which less specialised knowledge is needed.

• Shortcomings occur when labour supply and demand develop unevenly.

• If the existing courses do not match the qualification requirements, the skills situation is exacerbated.

• A lack of or unwillingness to offer training opportunities can lead to shortages.

Demographic change • The change in the population structure reduces the labour force potential. Taking into account the increasing activity rates of women and older people as well as migration, the demographic effect is weakened, but cannot be fully absorbed.

• This may also lead to bottlenecks within the requirement level IV (experts) as the employment of academics is particularly supported by the middle age groups, which will leave work in the coming decades.

• This also affects the engineering occupations of machinery and plant engineering, as the age structure of academically qualified workers is not different from other sectors.

Economic causes • A cyclical downturn is often followed by a fall in recruitment rates. This can lead to a decline in student numbers. If the economy recovers, there will be bottlenecks, as too few graduates are available to the labour market.

• Shortages generally also lead to higher prices or wages. A demand shock occurs when an economic upturn suddenly increases the need for skilled workers.

• However, since wages do not adapt as quickly as the economic situation requires, a theoretically short bottleneck situation can lead to a cyclically induced long-term shortage of skilled workers.

Risks and effects of a shortage of skilled workers

Impacts on the whole labour market • To reduce one's own needs, companies often face a shortage of skilled workers through work densification and more automated processes.

• New industries need skilled workers who, among other things, are recruited from older sectors of the economy (including machinery and plant engineering).

• In both cases, the labour market is distorted if sufficient skilled workers are not available. This is due to the fact that the shortage of skilled workers also reduces or does not create new jobs that complement the skilled workers.

• Overall economic growth can result in an increase in unemployment, as less skilled workers are needed.

Innovation and investment barriers • Skilled workers exert positive external effects on other workers through knowledge transfer. The resulting knowledge contributes to the development of companies and industries. If this is not achieved due to a lack, decisions on growth and innovation will also be affected.

• Low capacity can sometimes ensure that new technologies are introduced to the market. products are dispensed with. In addition to lower growth opportunities, this can also put entire locations at risk in the medium term.

• If there is a shortage of skilled workers, investments already made cannot be used properly.

• In the event of a permanent shortage, further investments will be avoided in order to avoid innovation costs and losses due to a lack of capacity.

• Smaller enterprises are more affected by this.

Impacts on competitiveness • • Job orders cannot be handled to the desired extent by lack of skilled workers. In the worst case, orders must be rejected. The result is the loss of market share to less affected companies.

• Existing economies of scale may no longer be used and price competitiveness will be lost.

• Less skilled workers reduce productivity.

• A vicious circle can put jobs at risk and cause further problems in production processes.

• Finally, market changes can no longer be adequately addressed.

Wage development (total industry and engineers)

• On the basis of wage developments, it can only be said that there is a shortage if the wages of the engineers are increased.

There is a rise in wages than in the whole industry.

• Despite the overall poor economic situation in 2008/2009, the wages of engineers fell only slightly. Experts were still in demand compared to low-skilled workers.

• Between 2011 and 2015, the wages of the entire industry increased more than that of the engineers. A shortage cannot be said during these years.

• In 2015, engineering wages fell, while the industry as a whole increased by 2.6%.

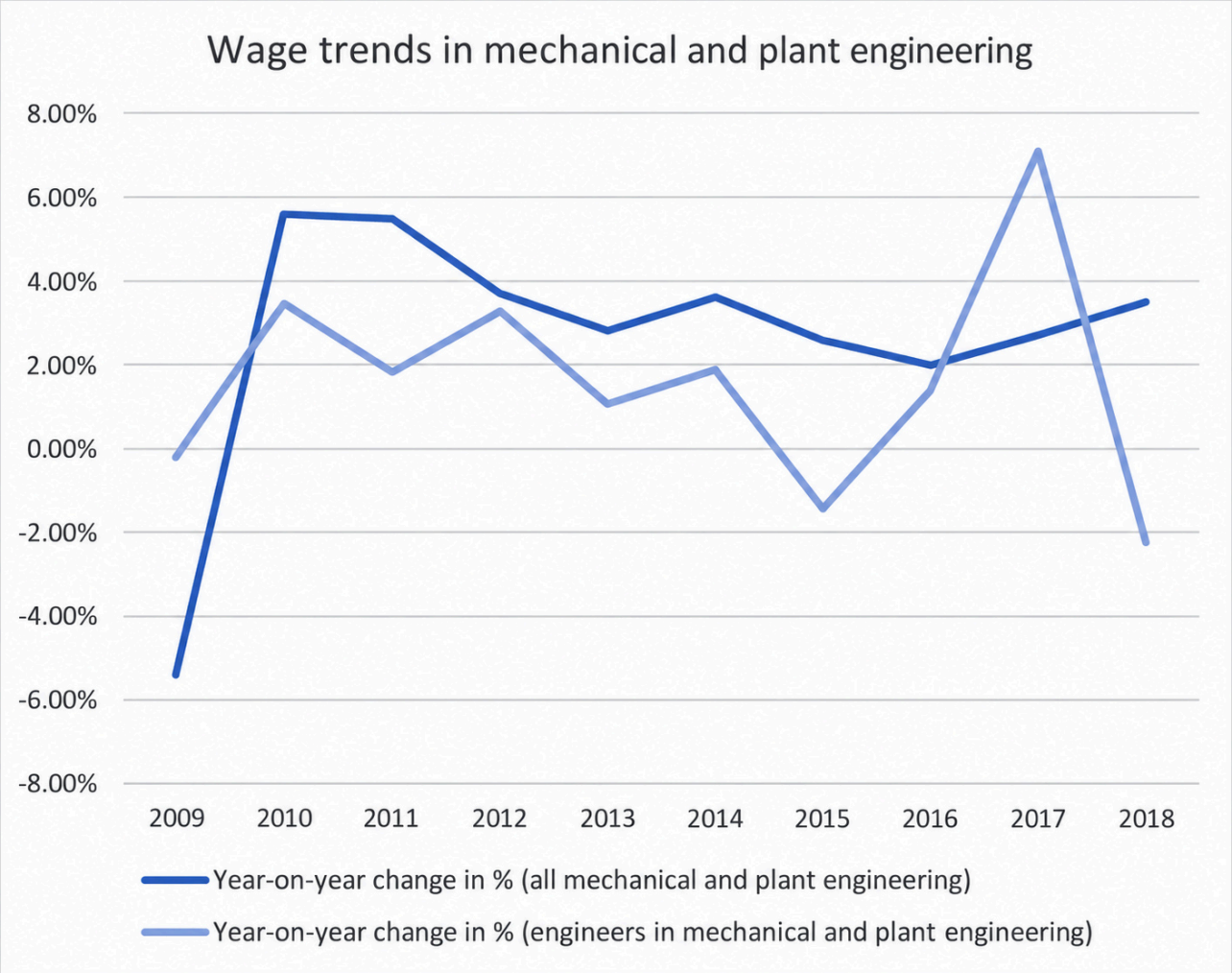
A lack of engineers cannot be detected when considering wage developments.

• In 2017, an increase in wages of 7.1% indicates an increase in the demand of engineers. In comparison, wages rose by only 2.7% throughout the industry.

Last year, average gross wages of engineers fell by 2.2%, while the industry as a whole experienced an increase of 3.5%. On the basis of the wage development, no deficiency situation within the engineering professions can currently be determined.

Our locations:





Skilled workers' situation from the point of view of companies

Current skills situation and potential risks from the perspective of personnel managers
• Comparedly high vacancy times found five of the eight companies surveyed. Especially in the areas of IT and electrical engineering, the range that it needs to occupy jobs increases.

• An increased demand is particularly evident in the IT sector. The need for engineers was largely unchanged, but a stronger fluctuation leads to vacant jobs.

• too little supply on the labour market is noted, especially among experienced professionals.

• All companies surveyed indicated that they had increased demands on computer scientists and engineers.

• General difficulties in recruiting and binding employees to the company are hardly identified.

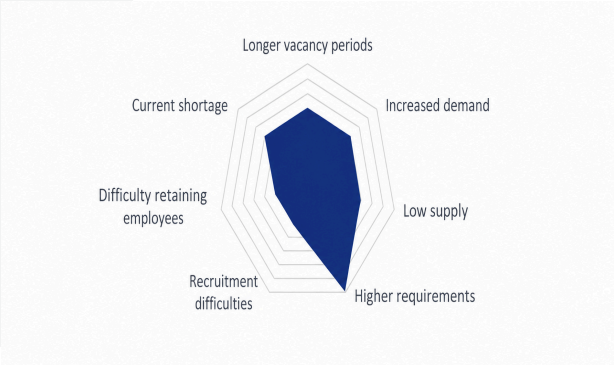
• In total, five of the eight companies indicated that they were currently confronted with a shortage of engineers and computer scientists.

• Overall, the risks of a shortage of skilled workers are considered to be low.

• Critically, possible orders and orders are mainly considered. Customer losses and reduced innovation opportunities.

• However, higher turnover losses are not expected for most companies.

• none of the companies surveyed assumes that there is a threat of existence due to a shortage of skilled workers.





Recruiting difficulties • Especially the location and the awareness of a company cause too few applications to be received and vacancies cannot be filled in a timely manner. Smaller, medium-sized enterprises are most affected.

• The lack of the willingness of the skilled workers to move and travel also means that jobs cannot be filled with suitable workers.

• Insufficient qualifications of applicants are observed comparatively less frequently.

Used channels for recruiting • To address the required specialists, online job exchanges such as Xing and StepStone are mainly used.

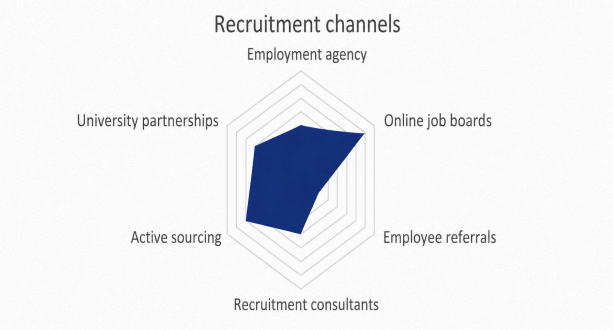
• In some cases, companies operate Active-Sourcing to target engineers and computer scientists.

• Staff advisers are mainly used as a complement.

• In rare cases, companies also try to reach new suitable professionals through the networks of their own employees.

• Through cooperation with universities, young people are trying to recruit.

• In principle, companies see the employment agency's offer as a possibility, but in most cases it is not suitable for recruiting highly qualified workers.



Measures to prevent and deal with bottlenecks • In the event of bottlenecks, the companies surveyed store parts of the orders to subcontractors or use external service providers.

• Short-term bottlenecks are also counteracted by the formation of overtime. However, overtime can only be used for overtime.

This is because it is at the expense of the workers.

• In one case, it was stated that capacity was not sufficient to accept additional orders.

Action to avoid bottlenecks • Training and further training of employees is seen as a core element in order to meet the increasing skill level.

• To meet the needs of skilled workers, the recruitment process within the company is continuously optimised. New departments will be formed for this purpose, for example: Inhouse recruiters respond to the need for skilled workers and monitor the labour market.

• In addition, cooperation with universities and other companies is aimed at avoiding bottlenecks.

• Information events (fairs, open day, meetings) should increase awareness and promote the company

The future development of the labour market from the point of view of the personnel managers • Overall, it is assumed that the requirements for engineers and computer scientists will increase further. The rapid development of technology requires, in particular, the competence to work independently in new topics and areas of work.

• In the IT sector in particular, bottlenecks are expected. The challenge was to provide IT skills to engineers across the board.

to defuse the situation. Interdisciplinary competences from IT and engineering will play a decisive role in the future.

• For the most part, it is assumed that the labour market will develop from an employer to an applicant market. The right recruitment measures must be adapted to this.

• Only a few companies assume that the situation in the labour market and the skills situation will relax.

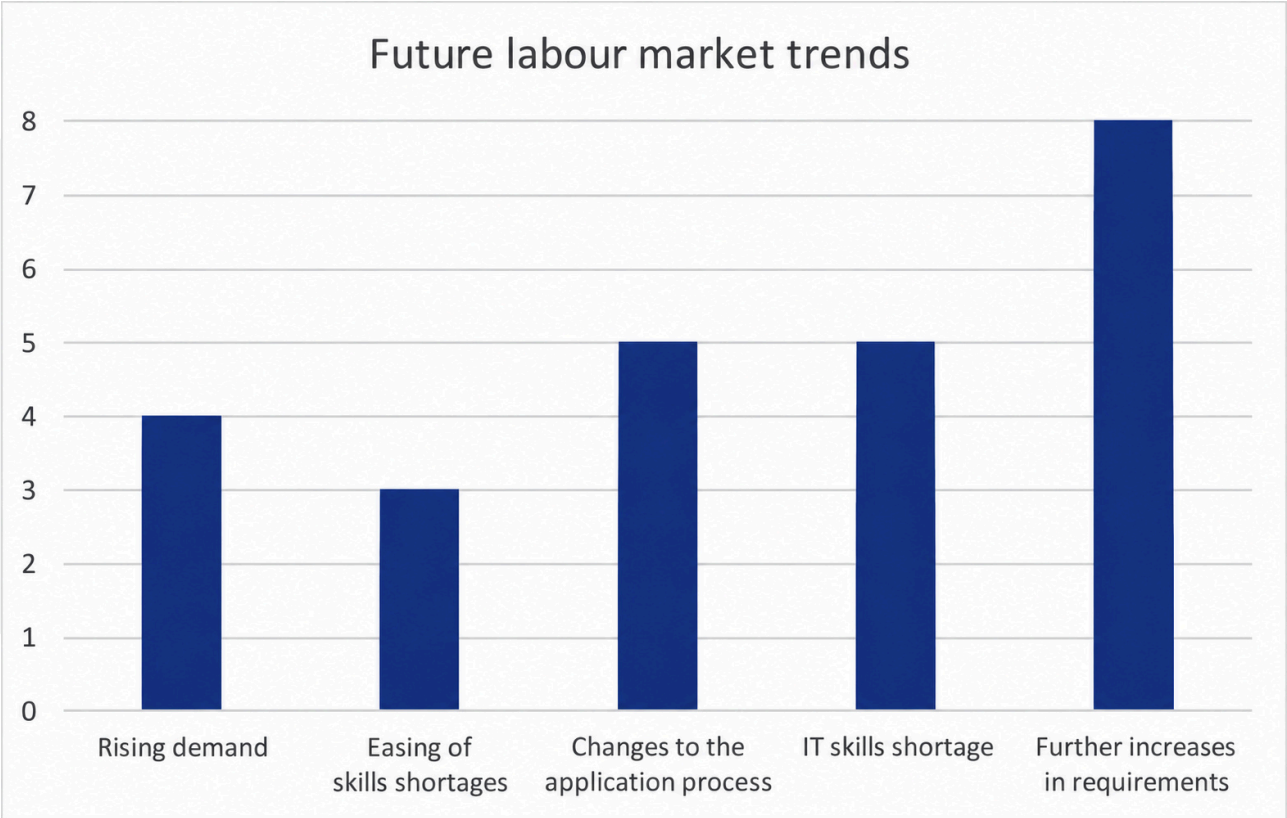
• Half of the companies surveyed see an increasing need for highly qualified workers such as computer scientists and engineers in the future.

Recommendations for action to secure skilled workers

Individual problem analysis The security of specialists is very dependent on the company. For this reason, strengths and weaknesses of the company should be highlighted before any action is taken.

By analyzing the reputation, image, location and its advantages and disadvantages, the recruitment strategy can be individually adapted and thus the chances of success can be improved.

Salaries and wages It turns out that hard factors such as salaries and wages continue to play the most important role in the choice of employers. Therefore, the salary and wage levels should be continuously monitored and adjusted at an early stage, depending on the level of requirements, in order to be able to secure skilled workers.



Long-term personnel planning A shortage of skilled workers is often the result of short-sighted personnel planning. In order to be able to meet demand in the long term, it is necessary to know as early as possible to what extent new specialists are needed. An analysis of the current workforce can provide information on which specialists will leave the company (e.g. However, it is not clear whether there is a need for a reduction in the number of employees. In principle, the earlier the requirement is known, the faster the recruitment can be started and a bottleneck can be counteracted.

Benefits, employer attractiveness and employee retention In addition to harsh factors such as salaries and wages, employees increasingly pay attention to the employer's additional benefits. These can be decisive in the choice of the company. In this context, it should be noted that, in order to achieve the objectives set out in the Directive, it is necessary to ensure that the following conditions are met:

This is the case in the Netherlands, where the number of persons employed is higher than the number of persons employed. This can also be combined with a range of leisure activities to strengthen the cohesion and commitment of employees to the company. In addition, a high level of appreciation should be given to employees and the meaningfulness of their work should be brought closer. This can be achieved, for example, through regular discussions with managers.

Networking In order to counteract bottlenecks, it makes sense to create external networks and strengthen existing ones. Cooperation with universities can be the basis for finding suitable young people. Existing contacts with former interns and thus potential workers should be maintained and, where appropriate, maintained. Job offers e.g. in the form of cooperative Bachelor's or Master's

(keyword: talent relationship). But also fairs, meetings and information events are suitable to increase the company's awareness and to draw potential employees' attention. In order to bridge an existing bottleneck, cooperation with service providers and companies in the same sector can be sought.

Recruitment paths and adaptation of the recruitment process In general, as many channels as possible should be used to recruit jobs to be filled. The company profiles on the usual online job exchanges and social media pages have to be maintained and kept up to date. By forming appropriate recruiting departments, candidates can be targeted and experienced professionals can also be recruited. In the event of insufficient capacity, it is recommended that external staff advisers be involved. If a candidate does not fit 100 % of the job to be filled, however, the

A corresponding job offer should be made and the candidate should be supported by training and further training. Recruitment measures can be continuously improved. For this purpose, the recruitment process of the entire market can be monitored and the own strategy adapted to it. If necessary, the international labour market can also be used and the potential of migration can be exploited through training or similar.

Promoting and furthering existing employment relationships Continuing technical progress can only be useful if skilled workers are able to master and use new technologies. Further training is the basis for this. Accordingly, skilled workers should be given the opportunity to take advantage of a wide range of training courses. Thus, room for manoeuvre remains open in the future and market changes can be reacted accordingly.

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Cleaning Markets

For cleaning products, equipment and cleaning machines



Medical Markets

For medical technology, medical consumables, OTC products and medical services



Automotive Markets

For automotive suppliers, manufacturers and automotive-related services



Logistic Markets

For the areas of road, rail, air and sea as well as intralogistics



Energy Markets

For renewable energy, gas and oil industries and other energy sectors



IT & Telecommunications Markets

For technology service providers, IT service providers, telecommunications, software and consulting companies

Logistic Markets



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Buyers and supply chain managers in the electrical industry are facing the big challenge: the COVID-19 crisis! (2020)

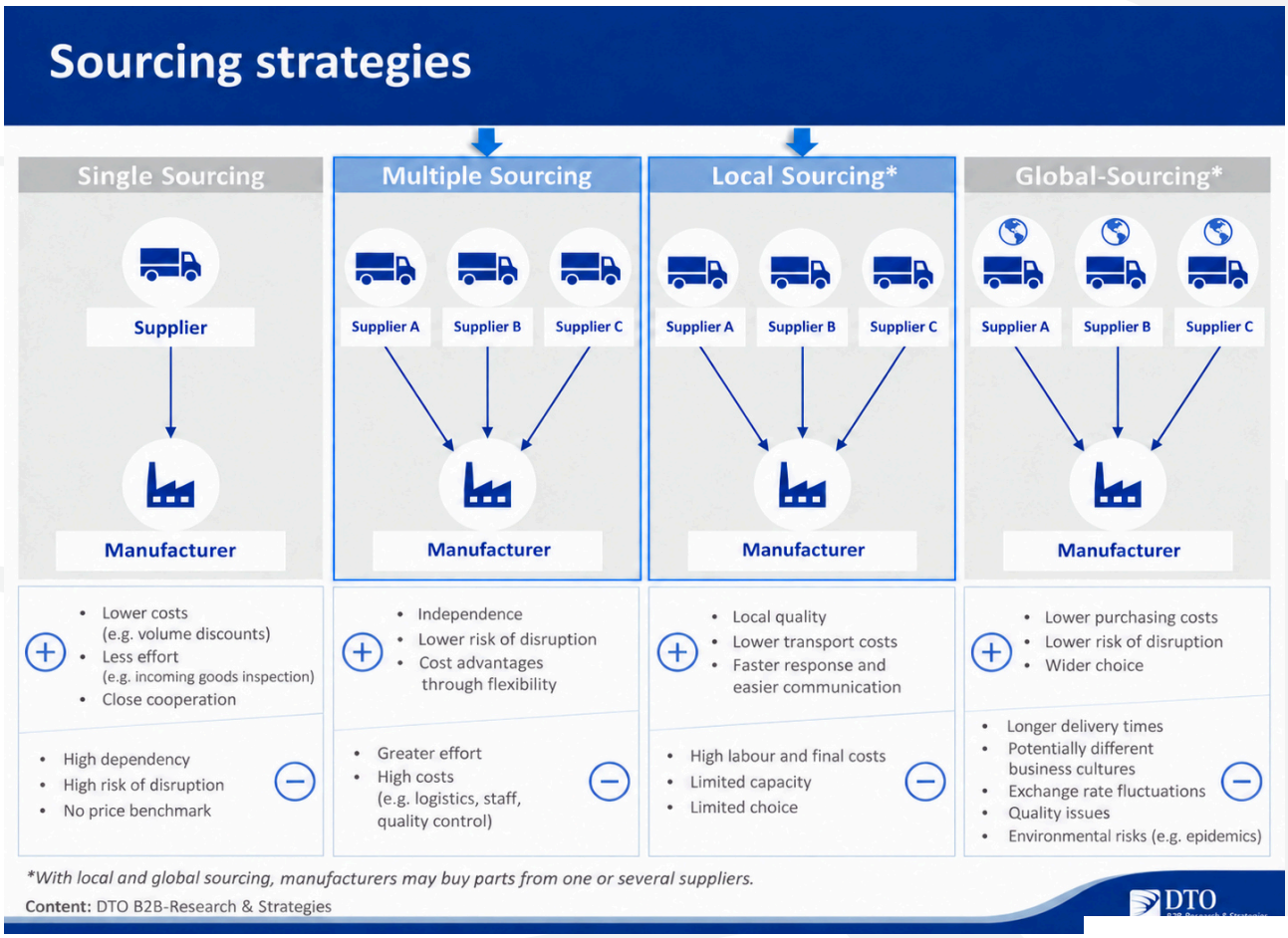
Where do we get the raw materials we need for our company? How can we avoid delivery failures? Which procurement markets are still attractive? Is Local or Global Sourcing the right decision? Unfortunately, most companies are not prepared for the current crisis and are looking for ways to eliminate the weak points in the supply chains. Without a doubt, the procurement strategy is decisive for business success!

Industry information The electrical industry in Germany has a total of 888,000 employees and a total turnover of 191 billion. Euro last year, among the most important industries in addition to mechanical engineering and the automotive industry.

Declining development and revenue declines The electronics industry was already facing major challenges last year. Changes in the leading markets, such as automotive, energy, health, etc., have a direct impact on the demand for electronic components. The decline in car registrations last year (-1.4% compared to 2018), Brexit, trade disputes between the US and China and now the emergency situation caused by the current COVID-19 pandemic are directly at the expense of Germany's second largest industry. The recently published data of the Central Association of Electrical Engineering and Electronics industry e. V. (ZVEI) shows that in April 2020 the German electrical industry received a total of 20.8% fewer new orders than in the previous year. Sales in the electrical sector also declined, reaching 12.5 billion in April 2020. Euro, 17.5% lower than in the previous year. The total turnover for the first four months d. J. points to a somewhat milder decline compared to the previous year at 6.3%.

Fast and short-term action is absolutely necessary! In a recent study, DTO found that a large number of German companies in the electrical industry announced a restructuring of the supply chain. Those responsible stressed the importance of digital risk management in the future in order to ensure a transparent overview of the entire supply chain.

The cards are being remixed in the industry and other factors such as delivery reliability, reliability, quality and storage overtake the most important goal so far: "Low procurement costs". A number of electrical engineering manufacturers criticize the disrupted supply chains due to border crossings and report weeks-long delivery difficulties. Individual assemblies, which had a subordinate role in the supply chain as a whole, remained on the track during the shutdown phase and suddenly caused severe impairments for the companies concerned.



Is Global Sourcing supplanted by the COVID-19 crisis? The results of the study also confirm the trend towards local sourcing and show that manufacturers want to avoid potential risks such as delivery failures by looking for alternative suppliers and switching to multiple sourcing. In particular, the local markets of Germany, France, Eastern Europe, the Baltic States and the Scandinavian countries are emerging as attractive procurement regions. However, the benefits of global sourcing should not be overlooked too quickly. Sustainable and sustainable

Balanced risk management helps master the current crisis and provides stability and planning security.

DTO will be happy to support you and your company in strategic crisis management and will find tailored solutions for your company or for your supply and logistics chains in order to emerge even more strongly from the resurgence phase and to ensure long-term company success.

Green Logistics *(2020)*

Green logistics has many synonyms such as sustainable supply chain management (SSCM) or sustainable logistics, but a common goal: the environment should be protected and as little affected by goods transport as possible. This objective includes inseparably sustainable production.

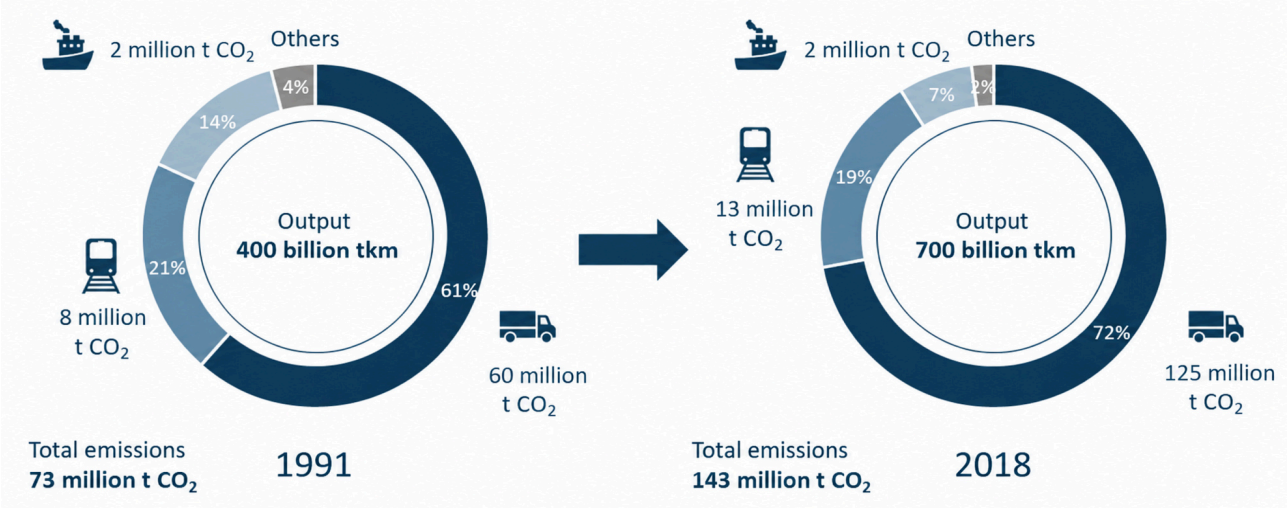
A mathematical example to get a sense of scale: your mobile phone has seen the whole world, because on average it consists of 62 chemical elements. A mobile phone contains about 10g copper, 0.1g titanium, 0.05g cobalt, 0.03g gold and about 0.005g gallium in combination with arsenic (gallium arsenide). The corresponding mining sites are most common in Chile, Japan, Congo, Australia and Russia in the same order. All of this comes together for further processing in East Asia, for example at Texas Instruments in the Philippines or at Osram in Malaysia. In addition, the production of a mobile phone generates a CO2 emission of about 70Kg (average values of iPhones 11 to 5). This corresponds to an empty journey of a 40t truck from Düsseldorf to Frankfurt (235km at 300 g/km CO2 emissions of the empty truck).

In this example, SSCM can take a number of places: • Local raw materials: SSCM can mean converting products and production in such a way that they require fewer raw materials that have to travel a long way.

• Centralized supply chains: Also, SSCM can mean pooling many processing sites in one or less locations, ideally close to consumers.

• Sustainable transport: The greenest CO2 footprint is the ship with less than 50 g/tkm, freight trains can emit over 100 g/tkm, trucks emit up to 250 g/tkm... Air freight causes CO2 emissions of 600 g/tkm (long-haul flights) to over 1,800 g/tkm (domestic flights).

• The paragraph above makes it clear: the faster the means of transport and the smaller the lot size, the more polluting it is. In reverse, emissions can be saved by predictive planning. However, the reality in Germany is that domestic goods transport is becoming increasingly polluting. In 2014, for example, transport by truck accounted for around 87 percent of CO2



However, only 72 per cent (1991: 61 per cent) contributed to the total output.

• Less Empty Transport – Export Import: Did you know that every fifth truck you overtake on the road is empty? The total number of freight statistics in Germany in 2018 is 23.8 billion. Kilometers that do not bring logistical added value. This corresponds to roughly 15 million tonnes of unused CO2 emissions. For example, longer service life would bring with it, and so, just as the points before, is a question of money.

• Night transport – not only CO2 is emitted: the supply chain includes "the last mile at the end". In the B2C sector this is the way to the customer's doorstep, in the B2B sector it is the way to the point of sale. The latter rarely occurs at night, among other things, because points of sale are subject to certain noise restrictions near home... The worst for residents are truck doors that exceed the permissible sound pressure most. Green Logistics does not just mean focusing on CO2 or other harmful gases. As in this example, very different environmental pressures can be taken into account.

• Retour management: With the last mile, unfortunately, only rarely "the end is reached, there are also returns – as with a climber: after reaching the summit, there is still some work left. There are roughly three options for returns in e-commerce. It can be reintegrated back into the commodity management system, it can be offered at a discount in the aftermarket (e.g. It can be destroyed, or it can be destroyed. The latter is reported to be the common practice of Amazon, Otto and Zalando. The same reports estimate that today goods worth 7 billion. EUR annually is destroyed in Germany.

These seven examples show part of the diversity around Green Logistics and SSCM... We have not yet discussed the working conditions of warehouse workers, sub-entrepreneurs or other employees in the supply chain. One can already see that SSCM needs to be considered holistically, that organizations need to develop agile, analytical solutions and that the cost-driven downward spiral of climate change can only be reversed with an additional amount of financial resources.

Ready to take off? New mobility concepts take shape (2020)

"The flight taxi has just flown away from me." This sentence could soon be heard if you look at the current developments in aviation. In recent years, innovative development concepts for the carriage of passengers in short-haul air transport have increased dramatically.

A small aircraft or aircraft intended to carry passengers or cargo on short distances is hidden behind a flight taxi. In conjunction with flight taxis, one often speaks of so-called (e)VTOL (vertical take-off and landing). Due to the future-oriented concept and the mostly scheduled use in urban areas, the propulsion concepts of the flight taxis are usually hybrid or full electric or are based on fuel cell technology (e = electrical). The aircraft are mostly designed for two to five passengers and can – as the abbreviation VTOL already reveals – take off vertically and land what benefits they have in their use.

in urban areas and in urban areas.

A variety of suppliers The marketing concepts of the manufacturers are of different nature. The key market players are often start-ups that are still fully in the development phase and have not yet achieved sales through other products, but are subsidised by renowned companies, often from the automotive or aerospace industries. The list of providers is long. In the meantime, it is estimated that between 150 and 200 companies worldwide are working on the design of flight taxis. While companies such as Lilium tend to focus less on transport within a city and instead focus on connecting cities and villages without having to invest in expensive transport infrastructure, the Californian company Archer, for example, focuses more on passenger transport in urban centres.

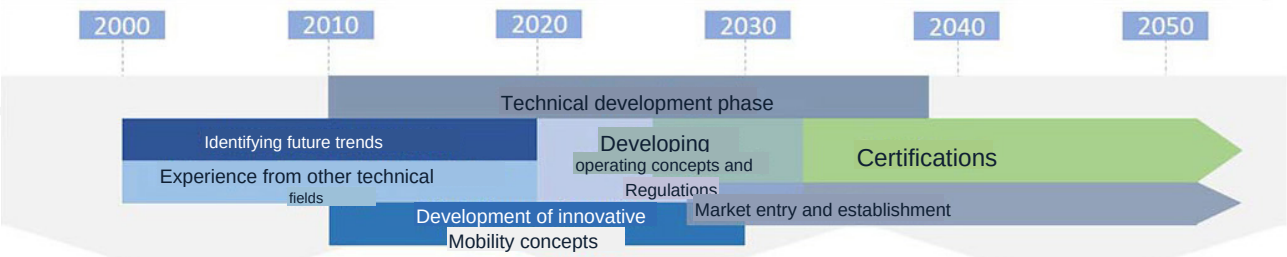
Providers	Investors/partners (among others)
Airbus	Various Airbus projects; Audi withdrew in 2019
Archer	Marc Lore
Aurora Flight Sciences (Boeing)	Porsche, Boeing
Bell	Partner: Safran, Thales, Garmin, Moog, EPS
e.SAT	MTU
Joby Aviation	Toyota
Lilium	Baillie Gifford, Freigeist Capital, Tencent, Atomico, LGT
Skai	BMW Designworks
Uber Air	Partner: Bell, Embraer, Hyundai, Pipistrel
Urban Aeronautics	Partner: Boeing
Volocopter	Daimler AG, Geely Holding, Lukasz Gadowski

All beginnings are difficult Despite positive appearances, the market still harbours a number of obstacles, such as legal aspects and safety regulations, technological as well as societal issues. Recently, for example, researchers from the Technical University of Munich and the Technical University of Ingolstadt have outlined a rather negative scenario for the greater Munich area regarding the rapid use of these means of transport. They assume that air taxis remain primarily a niche application. The reasons: air taxis do not aim to replace other means of transport, since they exist in parallel with other transport infrastructures. In addition, the prices that should be in the range of common taxi prices are too low for the concepts to be worthwhile.

So if you look at the current market, it just seems that under an engineering-driven development force you have invested in a market that is not yet existing, in the hope that it will be created by the investments at all. This is where the

Legally, the question is: why is a large number of companies investing in this new market? From DTO's point of view, when assessing market potential, several factors that either speak for or against market establishment should first be considered individually and then regrouped in their proportionality in order to meet derivatives for the future.

Where's the trip going? The use of flight taxis will develop differently globally. While some countries are already working on concrete implementation plans for aviation concepts, other countries and cities will be much more difficult to implement and will not use air taxis by 2030. In the end, it is an interplay of many conditions that must be met so that the use of flight taxis is not only possible, but also profitable. Even from a technical point of view, there are still some homework for the developers so that the aircraft can perform their service safely and efficiently. Especially in the Asian region and in the Arab Emirates is currently distinguished



- Megatrends indicate future trends and broad possibilities for technical innovation.
- Experience from related fields such as the automotive industry also influences development processes for technical innovation.
- Mobility concepts combine both General trends in development as well as Social changes.
- Regulators also develop concepts that can be seen as a precursor to their formal regulations.
- In July 2020 the FAA published a development concept for urban mobility in dedicated air corridors (urban air mobility (UAM) in UAM corridors).
- Regulators build rules on operating concepts.
- The first market-relevant certifications can be expected from 2025 to 2030, with a slightly delayed entry into the market; and growing market adoption.
- It can be assumed that the regulations will be adapted to changing market conditions.
- Uncrewed concepts will also play a growing role (drones).

Assessing market potential (air taxis/eVTOL)

+	−
· entry of large investors, e.g. the Investment Management Company Baillie Gifford.	· Only about 20% of the 150·200 companies currently developing air taxis are expected to enter the market.
· Diversification: automotive and aircraft manufacturers discover the market for themselves.	· Of the remaining providers, very few will be certified by the relevant authority (e.g. EASA).
· More and more start-ups are dedicated to the market for air taxis and invest large sums in the development of aircraft.	· Novel transport concepts are often lacking still or still have to be ready for the market and establish themselves in practice.
· By 2030, over five billion people are expected to live in major metropolitan areas. Alternative mobility increasingly includes air taxi services, which can be faster than ground travel and cheaper than helicopters or conventional aircraft).	· Regulations for airways in low altitudes must be created and controlled and.
· Global transport of goods is increasing. Also for CEP services could involve the use of Air taxis have been shown to be efficient.	· Many developers speculate on flight taxis to ensure that the storage technology of Lithium-Ionen batteries in the course of the next years. At present, many concepts would simply be impractical.
· Manned flight taxis are a precursor for the unmanned use of these flying objects.	
· Through the inclusion of hydrogen as alternative drive technology comes a stronger momentum in the market. Hydrogen drives could move into the next 10-15 years.	

the greatest potential. Countries such as Singapore are already making progress in this regard. A deployment of flight taxis around 2025 seems to be realistic there. The dust-loaded city state plans to relieve the traffic network as soon as possible and to increase the quality and speed of transport. In October 2019, the Baden aircraft manufacturer Volocopter completed a test flight with its Volocopter 2X in Singapore and is in close consultation with the local authorities. For Singapore, it is a prestige project that competes with Dubai to be the first country to offer a permanent flight taxi. But by no means must one be regarded as a German

Manufacturers of a flight taxi must travel to distant Asia to meet hearing. In 2019, for example, a contract was signed in Germany between Volocopter and Fraport AG, which provides for the development of concepts for ground infrastructure and the operation of air taxis and cargo drones at airports. Although one or the other damper is certainly to be expected in the market launch of air taxis and the world regions will open up to different degrees to this concept, it is already a billion-dollar market that will gain momentum sooner or later.

Cleaning Markets



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The cleaning industry in Germany (2021)

The cleaning industry in Germany is more conservative in international comparison. However, there is also a slow change driven by new technologies. In particular, the progressive digitalization enables manufacturers to offer innovative services that lead to an increase in efficiency and better control possibilities for building service providers. The automation of the cleaning processes is also discussed intensively, although the use of e.g. At present, it is still the everyday problems such as cost pressure, regional staff shortages, control problems or the high comparability of the performance that make building service providers create. New products and services that offer significant optimization here are likely to be the fastest to enforce themselves. The topics of sustainability and environmental protection are also driven by society.

Sustainability Sustainability in the industry is more important and taken into account in many new products and services as an elemental aspect. For example, in the case of tenders, the topic is strongly driven. For example, for the provision of cleaning services to external service providers, sustainable conditions account for about 15–25 % of the content of public tenders. However, there are still shortcomings in implementation and control.

Manufacturers of cleaning products have recognized sustainability as a distinctive feature for themselves. Even if the saving of energy and chemistry is only a small

Although this represents only a small share of costs, its communication impact is considerable. This trend is likely to strengthen and drive the development of comprehensive sustainability plans for cleaning.

Price pressure and appreciation The market remains strongly price driven. However, product prices in market segments such as cleaning chemicals have now become highly stimulant, which makes a further fall in prices rather unlikely. Therefore, it is all the more important for product manufacturers to differentiate themselves credibly with their products and services and to highlight the additional added value.

Although the low level of appreciation among customers for cleaning services is slowly improving, the price remains a key criterion for the competitiveness of service companies. Calls for tenders and calls for proposals are often designed to ensure the highest possible comparability of performance. Differentiation in maintenance cleaning is often difficult for service providers. This is often difficult for smaller companies to implement, for example by extending property protection, human resources services, catering or facility management services.

Automation and robotics The entire industry agrees that automated cleaning processes are the future due to a high proportion of robotics. At the moment, robotics is more of a marketing topic in Germany. So

almost all of the major machine manufacturers have a robotics solution on offer and place it accordingly in the specialist media. However, the operational use of these machines by the building service providers is very low. The high machine costs, the low problem-solvability, the limited cleaning functions and the inadequate building infrastructure are highly inhibiting factors. The current robotics concepts are more suitable for cleaning large areas, e.g. It is designed in shopping centres, airports or logistics halls, for example. Here, the fastest establishment of robotics is to be expected. The systems are not yet suitable for the mass market.

Digitalization Looking at the supposed innovations in the industry, digital solutions are currently the most popular. Here, a high added value is recognisable relatively quickly for the building service provider and services such as order systems, digital cleaning plans or training apps can be easily adapted and multiplied. The combination of hardware and software in the machine sector is also becoming increasingly important. Mainly there are developments in the maintenance and control area. However, the first tools in the AR & VR segment are already close to market launch. In the training area in particular, there are enormous potentials due to the use of technology. Thus, trainings can take place spatially and temporally unbound and content can be further underpinned by videos etc.

With all the digital hype, however, the cleaning forces and their needs must not be forgotten from the beginning. Products and services should also be kept as intuitive as possible.

Innovation pressure for manufacturers Many product and service innovations have failed in the past. This was not least due to the very conservative nature of the market and the unrecognized added value of the building service providers. Due to the high level of market saturation and the strong competition for displacement, most segments are faced with competition for displacement and a concentration on a few suppliers. The expectations of the building service providers regarding new innovations are low, which also makes it difficult to generate new product and service ideas. Manufacturers often try to declare marginal product changes as innovations.

As already described at the beginning, however, digitalization and robotics will lead to more freedom of innovation for manufacturers. For manufacturers, it is important to address these issues early on and also to involve developments in building automation in their innovation strategy. The same applies to a stronger integration of building service providers and in-house cleaners into the innovation process. This will also lead to manufacturers being able to avoid the still very high price pressure through meaningful differentiation.

Staff The greatest task of service providers is still to recruit and train operational staff – for this purpose, full employment and restrictions due to legal requirements are certainly in considerable conflict with the emergency situation in the area of personnel.

As long as the market reacts only to downward price pressure and upward performance increases, no improvement will occur in the medium term.

The qualification and relief of the employees at object ladder level can lead to relaxation in the short term. However, only the simultaneous reduction of QM services and the qualification of the cleaning personnel together with the use of digital aids in the machine and equipment sector will lead to greater satisfaction for the client and the contractor.

Conclusion While the market has changed little in recent years, sustainability efforts and automation will rapidly change in the future. This applies both to cleaning products and to the professional image of the building service provider. Companies that develop an innovation strategy at an early stage and examine how they can benefit from future developments will definitely generate a competitive advantage. The long-managed status quo will definitely not be maintained.

Experts in these industries:

- Industry Markets
- Machinery Markets
- Cleaning Markets
- Medical Markets
- Automotive Markets
- Logistic Markets
- Energy Markets
- IT & Telecomm. Markets

Construction and control of hygiene concepts in pandemic times (2020)

What we can and should learn from the last few months The Corona Pandemic has been busy for several months now. After the comprehensive Lock-Down, the infection protection measures were relaxed in many places in order to establish a certain normality. The measures taken and the high level of compliance in the population with regard to infection protection measures have allowed the spread of the corona virus to be successfully slowed down for the time being. However, with the start of summer time and the associated holiday trips as well as increased leisure activities, we see how compliance with hygiene measures is reduced in many places. At the same time, the number of infections in Germany is again increasing significantly.

and where there is potential for improvement. Especially in view of a possible second wave of infection, it can be very helpful to take adequate measures faster to avoid a new lock-down. From past projects, we know that successful infection prevention and hygiene concepts are subject to certain success factors in order to function. The basic principle of these findings, which have been gained in the health sector, can be transferred to other companies or to society. Basically, it can be determined that prevention is better than having to identify and interrupt chains of infection after mass tests or app solutions. Nevertheless, both areas in the current pandemic are essential building blocks of an overall concept.

This is what we want to take as an opportunity to look at what can be seen from the development of the

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Note: Only routines lead to lasting success

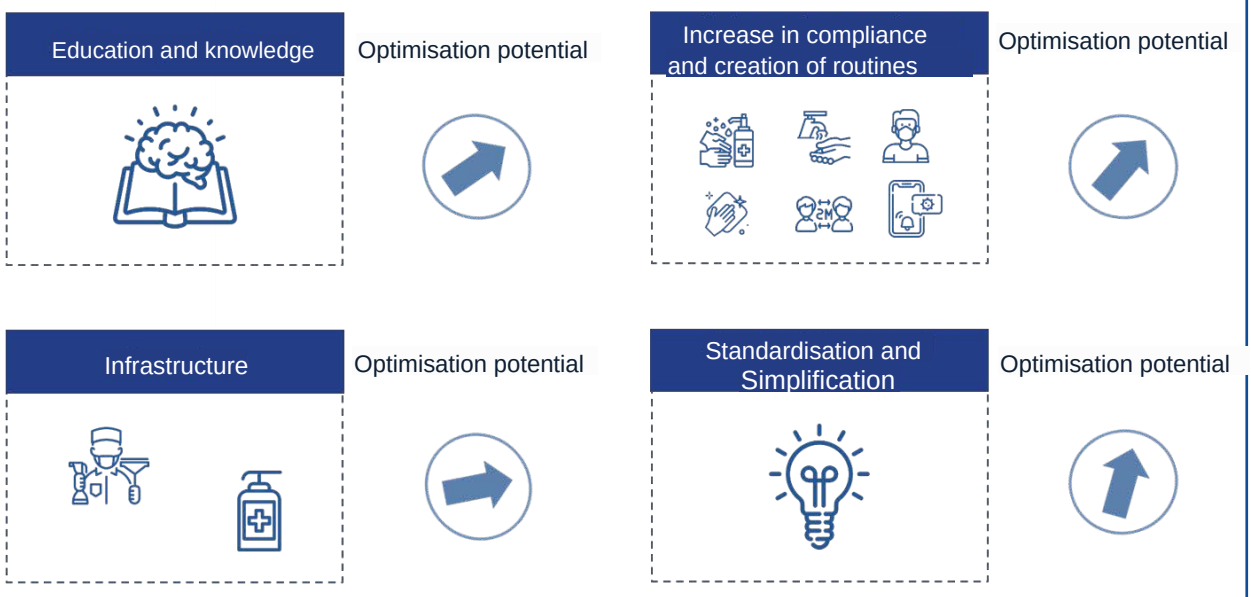
·Knowledge alone is not enough: compliance must also improve permanently through changed behaviour. Routines help make the most important hygiene rules everyday habits. Hygiene is a system of interdependent individual measures.·

And here, too, we have reached an essential point. Hygiene and infection protection only work as a system. This can be illustrated very well by the example of a hospital. Even if 99 percent of all actors adhere to infection protection rules, a very small percentage of people who do not follow rules to cause an outbreak is enough. Transferring to the current situation means that even if 90 percent of all people adhere to hygiene rules, they can sit in a cinema, restaurant or theatre with infected people of the other 10 percent in doubt. Although politicians repeatedly stress that most people follow hygiene rules, the system must work to minimise the number of infections.

Successful hygiene systems and how these work Functional hygiene concepts have essentially four success building blocks, which you can imagine in parts like a process of evolution. All building blocks are interdependent to each other. If there are deficits in a building block, this can lead to the system not working properly.

To illustrate this, we would like to give you two examples: • • In a restaurant with a buffet, guests would like to disinfect their hands. However, there is no disinfectant for this. Compliance would be high here, but the infrastructure would not exist. • A person buys a disinfectant in the drugstore market and applies it regularly, but with poor wetting success. The drug is not effective against coronaviruses and eliminates only 99 percent of all viruses and bacteria. In this example, compliance would be high and a product would be available, but neither the knowledge about the right product nor the application would be correct.

> Success factors for the development of nationwide hygiene concepts and measures



Source: Own representation according to World Health Organization (2009) Guide to Implementation. A Guide to the Implementation of the WHO Multimodal Hand Hygiene Improvement Strategy.



1

Understand the unfamiliar world of germs

© cookelma/123rf.com



2

Know how to protect yourself and others

© Elnur Amikishiyev/123rf.com



3

Master hygiene techniques

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Knowledge and Enlightenment as a basis
We are now already at the first building block "Knowledge and Enlightenment". This forms the basis for a functioning hygiene or infection protection concept. In this context, it is important to distinguish between those who create and implement concepts, i.e. the frameworks and those who implement the corresponding measures or measures. The European Parliament has a duty to ensure that the rules are implemented. For example, responsible politicians and business decision-makers who primarily need the most important facts and information, how and why a concept/framework has to be built.

This building block should e.g. Answers to the following questions include: • Why is it important to deal with the topic of hygiene concept and infection prevention? • What must a concept include and how to build it? • How should information be transported to citizens or employees in the best possible way or how should they be prepared? • How can concepts be implemented across the board and compliance with concepts be ensured?

In the case of citizens and employees, it is primarily about creating basic knowledge in the field of microbiology and teaching the most important hygiene rules and techniques. As there has been no acute need for this, training and teaching materials were missing from the beginning of the pandemic, for example, for nationwide use. This is particularly true in schools or companies.

The following should be included in this building block: • The world of germs for all simply explained: e.g. How do viruses and bacteria behave on animated and inanimate surfaces? • How do hygiene and infection prevention work?

In the private and workplace context? • Which products should be used and how to use them? • How do the most important preventive measures and hygiene techniques work? • How can you practice techniques yourself and where can you find appropriate training material?

From many of our projects on hygiene and hygiene A. in the healthcare sector or in the office environment, we know that the building block "Knowledge and Enlightenment" is strongly underestimated, especially in Germany. We believe that we can safely control and implement the most important hygiene rules and measures, while investigations here regularly show an opposite picture. We would like to give a well-documented example from the healthcare sector. According to expert estimates, we have e.g. Approximately 500,000 infections from hospital germs in Germany with approximately 15,000 deaths per year. About a third of this could be prevented by better hygiene. It must be said that compliance with hygiene rules is much more important here than in other areas of society.

That is why we see high optimization potential in the areas of "knowledge and enlightenment" in Germany also in relation to a second infection wave. In addition, there is another very basic point that we know from the field of corporate management. (for example, in the case of restructuring or cost optimization programmes, not sufficiently explained or not understood, resistance often arises. Non-uniform infection protection rules, unnecessary relaxation debates and lack of information have also led to uncertainties and a negative attitude towards infection protection and hygiene rules in parts of the population in the current pandemic.

Standardisation and simplification Here we are already at the next point, which is necessary for a functioning hygiene and infection protection concept, namely "Standardisation and simplification". Concepts must be as standardised as possible and be kept very simple. This is particularly important in order to create a general understanding, facilitate the establishment of routines and to be able to implement and control concepts across the board. Since we do not have a uniform level of knowledge about hygiene and infection prevention in Germany, it is important to provide as many people as possible with an understanding of the topic and the most important measures in the short term. Studies in recent months have repeatedly shown that many measures are not understood, since they are too complicated in the national regulations or simply too confusing. In order to achieve a sustainable learning effect also for future pandemics or disease outbreaks, for example, in the annual flu wave, to achieve and implement hygiene measures permanently, a strong simplification and standardisation is necessary. This also has the effect of increasing compliance and minimising resistance to the measures. The AHA formula published by the Federal Ministry of Health is well-meaning, but cannot work for various reasons. Standardization is available and in many cases infrastructure, but there are shortcomings in knowledge, routines, technology (e.g. Hand disinfection and hand washing) and compliance. Masks are an exception to compliance. These are properly supported by the vast majority of people.

The construction of a hygiene infrastructure As the next building block, we want to address the topic of infrastructure. This includes the availability of hygiene products (e.g. This is the case in the United Kingdom and the United Kingdom, where the number of persons employed is higher than the number of persons employed. Examples are the disinfectant dispenser at the entrance of the supermarket or the soap dispenser in the laundry room of a school. Within the framework of a hygiene or infection protection concept, risk areas would be identified at this point, as shown in the graph below, and the corresponding infrastructure would be created. On this point, Germany's largest

improvements. In many schools, facilities have been renewed or greatly improved; in other places, such as airports, railway stations and supermarkets, new facilities have been installed. Whether these changes will last and what will remain after the COVID-19 pandemic is still uncertain. Similar improvements took place during the swine flu outbreak, but

was not sustainable. However, experts assume that Corona will have a lasting positive effect on the hygiene infrastructure in some areas.

Implementation into everyday life The last building block deals with implementation. This is about selecting the right measures and ensuring their compliance. If all previous building blocks have been sufficiently taken into account in the preparation of the hygiene and infection protection concepts, a flexible package of measures can be implemented according to needs. In general, the

The most important measures for a hygiene and infection protection concept are the correct hand and surface hygiene, distance and sufficient ventilation. In the case of the Corona pandemic, the wearing of a mouth and nose protection, the isolation of infected people, the use of the Corona warning app and a corresponding test strategy are added. A very essential factor for this building block is the creation of routines. This means:

· Identification of risk areas: examples



and that measures of basic hygiene, such as: For example, the right hand hygiene (How? When? With what?), pass into daily habits. It is not only a question of communicating knowledge and providing infrastructure, it is also a question of clever concepts to ensure that the measures are adhered to in the long term. The WHO assumes that the creation of routines and the associated system changes can take years. We have been observing similar things for years with our own studies in healthcare, but also in other industries.

Conclusion and recommendations for action To conclude this article, we would like to take a critical look at the current situation on the basis of the findings of this article and evaluate it and derive some "learnings". In Germany, the Corona pandemic began early on. To implement infection protection concepts. Among other things, the Corona images from China or Italy quickly recognized a need for action and the awareness of the population and the acceptance of the protection measures was very high. Due to the very strict implementation of the measures, the spread of the virus could be rapidly slowed down. However, the time between the first implementation of measures and the easing has not been used optimally. In this case, one would have been much more intense in the transfer of knowledge. It is important that we have to work on education and the establishment of routines. A uniform approach to the development of hygiene concepts and a clear simplification of regulations and their communication would also have been helpful. It is assumed that, as described, hygiene as an evolution

The concept works and can bring lasting benefits, so opportunities have definitely been lost. If one looks at the most prominent medial outbreaks of the last 20 years, it quickly becomes clear that SARS-CoV-2 will not be the last virus we have to deal with. The current Corona pandemic and the initially extremely high awareness of the population could have been used to build up sustainable knowledge and implement appropriate structures across the board. The importance of infection protection and hygiene could also have been significantly increased. In many areas hygiene is still seen primarily as a cost factor. The cost of disease-related failures at the company's flu times is enormous.

Hygiene as a closed system An additional very decisive error was also made. Hygiene only works as a system and should also be understood and implemented as such. In Germany, exactly the opposite has been done and is concentrated primarily on individual measures. This becomes particularly clear when one looks at the regulations of the state governments, in which one tries to describe a solution for each situation down to the smallest detail. What is certainly understandable and comprehensible from political thinking, however, contradicts the basic functioning of hygiene systems. These must be kept as simple as possible and involve all stakeholders. This is the only way to ensure long-term high compliance.

Innovation management in the cleaning industry: Why so many innovations fail! (2020)

The cleaning industry is one of the more conservative sectors in Germany and is characterized by a strong price pressure, which e.g. This will be reinforced by, for example, public tenders. Among cleaning workers, there is a significant proportion of low-skilled staff and high turnover. The comparability of services, particularly in the classical maintenance cleaning sector, is large and the market saturation is high, resulting in a considerable pressure for differentiation. However, the possibilities for building new business models are limited, especially for building service providers. A frequent integration of subcontractors also makes quality control not always easy.

While currently larger companies are increasingly dealing with digital solutions, smaller and medium-sized service providers often still have reservations and implementation deficits. In this market environment, it is not easy to develop and implement new and innovative products. However, the displacement competition among manufacturers makes it necessary to differentiate between product improvements and product new developments. This is not always easy, however, because of the conservative basic attitude of the purchasers and users.

The experience with certain cleaning products and machines by the sourcing decision-makers and cleaning staff is still a decisive factor in the acquisition of new products. The market is strongly influenced by established products. Brands and is in many areas due to rather high entry barriers

On the manufacturer side, however, the innovation pressure is high, in order on the one hand to counter the constantly increasing cost pressure and on the other hand to differentiate the own portfolio. Looking at the new developments and innovations in the past, you will soon find that many products and services have failed.

There are two main reasons for this: • The lack of acceptance by the cleaning forces, for example, due to too high product complexity or uncomfortable handling • The invisible added value in terms of time and personnel reduction compared to training and acquisition costs

Many manufacturers' innovation efforts are often marginal improvements to competing products and not breakthrough innovations. These do not reinvent cleaning and do not make it significantly better. This indicates shortcomings in the innovation and development process. Not infrequently, no or only a very small integration of the building service providers or in-house cleaners takes place here. Consequently, the functioning or "problem solution" often goes by the needs of the target groups.

Many manufacturers also do not have a mature innovation strategy that takes sufficient account of market developments and circumstances. This is also due to the fact that the need to collect systematic market information in the industry often played little role. While market analyses in consumer-seg-

These are part of the standard, in the professional segment for many manufacturers. Companies can use in-house sources to do so themselves. For example, key accounters and service technicians have permanent contact with procurement decision makers and users. However, many manufacturers do not have central knowledge management, where data and information are systematically merged and accessible for marketing and product development. This is also relatively easy for medium-sized companies to implement.

Many experts agree that the industry will change fundamentally in the coming years. Digitalization, IOT, VR & AR or robotics will redesign the cleaning processes and trades. However, the success criteria for innovations in the cleaning industry must also be observed here. Technically, many things are already possible today. However, the real benefit of new developments in the Focus. In the past, it has been shown that the products and services have been the most successful, which have solved fundamental problems in daily cleaning. Therefore, one should take a close look at the cleaning process, analyse weaknesses and take up the most common questions and tasks in optimization approaches.

It is best to involve users and market experts in the process as early as possible for product ideas. Many building service providers and in-house cleaning staff like to give input to innovations, as they benefit from meaningful products and services themselves. Also, these are usually surprisingly well-versed in technology and handling. Manufacturers thus minimize the risk of developing products and services past the market. If a systematic user feedback is only obtained in the prototype phase, it is often too late for fundamental changes.



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Basically, it can be determined that the risk of failure in innovation can never be ruled out 100 percent. However, a systematic and carefully planned innovation process can significantly minimise risk. The wheel doesn't have to force-

It is not a question of being re-invented in the long run. For manufacturers, a systematic "me-too" strategy can also be very successful. Only these manufacturers are often not perceived by customers as very innovative. This does not reverse or slow down the ever-increasing price spiral.



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The COVID-19 crisis: an opportunity for the cleaning and hygiene industry? How the industry can be sustainably strengthened from the crisis! (2020)

The COVID-19 crisis has hit many industries very hard. Sales are falling and demand is falling due to undersecurity over future economic developments. States are trying to stabilize companies with unprecedented aid packages and avert the worst. But for the cleaning industry, the current crisis could give rise to an opportunity.

At the moment, the need for hygiene may be as high as never before. Demand, for example, after disinfectants, it is difficult to satisfy the manufacturers. But if you look at the situation more closely, it quickly becomes clear that the measures in Germany but also in Europe resemble a patchwork carpet. A standardized approach of the individual countries or uniformly implemented hygiene processes is sought in vain. Hygiene also comes into play in the media and political discussions, if only as a marginal aspect. Unlike virologists, specialists and business representatives, hygiene experts have hardly been consulted so far to help solve the current crisis with their expertise. The industry has always been concerned with infection prevention and struggles with infection prevention. In hospitals, for example, for higher hygiene standards. However, the latter usually failed in the past because hygiene was still often regarded as a mere cost position. So instead of optimising the hygiene processes and reducing infection rates in hospitals, only the most necessary things have often been done. The political

At least in Germany, there was little will to change this situation. There are some positive examples in neighbouring countries, for example, in the Netherlands, which could serve as a basis for optimising hospital hygiene in Germany.

So if the discussion about better hygiene standards in hospitals and other medical institutions leads to resistance, it is not surprising that the will to create standards in other areas is even less. But the rapid and massive spread of the pandemic in Europe and the weaknesses in the system that have become visible from it could change a bit. However, the fact that the hygiene standards in their entirety develop into a positive one is considered rather unlikely. However, there are two key areas in which optimisation could take place in a sustainable manner.



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On the one hand, after the crisis, the pandemic plans must be fundamentally revised. While some countries in Asia have standardized processes for handling the virus

It took some weeks in Europe for adequate measures to be taken. For a long time, no uniform and coordinated approach has been visible here either. A fundamental component of Asian countries' response to the virus was the strong increase in hygiene measures. If the cleaning industry succeeds in integrating the partly existing concepts for infection prevention into the pandemic plans, this would have an extremely positive effect on the industry. It is also likely that policy awareness of the importance of systematic hygiene measures would be increased to other areas. This could be e.g. These include improved hygiene concepts for restaurants, shopping malls, universities, nursing facilities or airports. However, this would require policymakers and public administrations to act as consulting partners for the cleaning industry and to systematically seek support from them. In addition, the creation of temporary hygiene measures in order to relax the current "Shut Down" could also produce a sustainable effect. The question here would of course be how long this would last.

The second area in which the cleaning industry could benefit is the private sector. Many companies were simply overwhelmed by the need to take ad-hoc hygiene measures for their employees. Especially in the office environment, hygiene and cleanliness are often not topics that are discussed apart from tenders for object cleaning. As long as there are no hygiene deficiencies due to the work of the building service providers, and these usually clean outside office hours, these topics are not given a high priority in day-to-day business. This could change as a result of the COVID-19 crisis, provided that companies implement standardised hygiene processes and systematically train their employees. However, this requires offers from the hygiene industry, which go beyond pure product deliveries and maintenance cleaning. The players in the industry must develop step by step into a recognised hygiene consultant, who is also consulted for training of employees and holistic hygiene concepts. However, a simple offer of value-added services is not to be seen as a solution here, since in the past the willingness of customers to pay for these services was rather low. Rather, it is important to increase the knowledge of customers about the need for holistic and tailored hygiene processes and concepts and to become a recognized consulting partner for them.

Conclusion Whether or not a positive effect for the industry is expected in the long term will depend heavily on whether cleaning and hygiene processes are changed or optimized during and after the current crisis. In addition, the cleaning industry must speak with one voice and influence politics through a central representation of interests. Currently, this prevents the often very decentralised structures of the industry. As a result, hygiene often does not have the importance that would be necessary in the decisions. Examples are given here. * Official website* Official website* Official website

These two points will be decisive for whether the cleaning industry can emerge stronger from the COVID-19 crisis or settle at a level similar to that before the crisis.

Digital twins: an opportunity for the cleaning industry? (2020)

We are currently experiencing a real digitization boom in many industries. New technologies are also enjoying increasing popularity in the German cleaning industry, which has so far been characterised by conservative tendencies. One reason for this is certainly the compulsion for the companies triggered by the Corona pandemic. After an initial shock in the industry and a partly "strategic unification", many of the industry representatives are again working on forward-looking concepts.

A new technological approach that is currently being discussed in parts of the industry is the Digital Twin. This is a digital image, for example, a building or a cleaning machine that helps simulate processes, represent the planning process or identify sources of errors in advance. The digital twin can already arise if the real object does not exist yet. In practice, however, there is neither a general definition of technology nor a uniform understanding of the sector.

However, it seems certain that the use of digital twins could provide some very interesting opportunities for the cleaning industry. These relate, among other things, to the optimization of the current cleaning processes, but can also help to plan buildings in such a way that the cleaning of the future is taken into account in the building infrastructure. If it is assumed that in future cleaning activities will be carried out more by robots, then:

the creation of a corresponding building infrastructure is necessary for this purpose. Even if the technologies are not yet available, the necessary infrastructure can already be planned and thus future costs for technology implementation can be minimized. In addition, digital twins can help from the outset to better coordinate all the trades necessary for building operation and to understand a building as a whole system in planning and management. The cleaning would no longer be an autonomous structure, which would only be planned after completion of the building, but would be part of an interdependent overall system. However, this requires closer cooperation and the development of mutual understanding between the cleaning and building sectors.

Status Quo and Outlook As with many technological innovations, the majority of industry representatives are still reluctant about technology assessment and the initiation of test projects. As long as there are no best practice examples within the industry and no competitive disadvantages arise from non-use of the technology, this will probably change only slowly. The increased use of digital twins in the cleaning industry is probably driven by technology development outside the industry and achievable efficiency increase. Current study results show first trends that cleaning is increasingly being taken into account in the planning of buildings. In this context, the

Bring the industry into the discussions early on, develop cooperations and use their expertise.

Conclusion The technology of the digital twin is still at the very beginning in the cleaning industry. As with IoT, there are no relevant best practice examples or specific business models that make the use of digital twins financially lucrative in the industry.

However, a very attractive marketing effect can arise, especially for larger companies, for which the still rather high investments are easier to stem. In addition, these companies must not underestimate the learning effects that can create a competitive advantage in the future. However, it remains to be seen whether a technology adaptation happens out of the industry or whether a cross-industry technology transfer takes place.

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The cleaning concepts of the future: Why building technology and cleaning industry will grow together! (2019)

Anyone who has watched the film, Passengers, can permanently remember the small warnings of robots that clean up immediately as soon as an accident happens. What sounds like pure utopia in the movie could soon become reality. Many of the major cleaning equipment manufacturers are already developing robots of the future. However, there are still a few hurdles to be overcome before robotics can take hold in the cleaning industry.

Building technology plays an important role in this context. So far, the networking between the construction industry and the cleaning industry is still very fantastic. In the past, cleaning concepts were not adequately included in the building infrastructure. This often leads to cleaning staff having to improve on site. Newer buildings are usually planned much more thoughtfully considering technology. But even here, the rapid developments in the cleaning industry are not necessarily considered.

For fully automated cleaning solutions to be successful in the future, cooperation between the two sectors must be targeted.



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How will a cleaning robot look like in the future?

This affects both the condition of the building and the sensors in the buildings which requires a more intensive exchange of standards. At this time there are too many physical barriers that cause problems for the current technology.

Challenges: planning and integration
Currently, robots fail specifically at steps / stairs, cables or unreachable corners. They must also be manually moved between different floors within buildings. In recently planned buildings, either storage rooms for the robotics should be implemented on each floor, or an infrastructure for the free movement of the robotics within the building structure should be established. The negative effects of inadequate consideration of future technologies and customer needs can be seen very clearly in the smart home / smart building sector. A retrofitting of adequate technology is only meanfully possible in buildings with a core repairbishment. The currently offered technology in the classic retrofit area, which requires a much lower interference with the building infrastructure, is qualitatively much worm. The same will happen in the cleaning area without forward-looking planning.

It is important to also mention that the current robotic technology still has weak points. For example, if several robots are in use, the coordination with each other (swarm intelligence) must become more effective. This goes hand in hand with a further development of artificial intelligence. Cleaning robots should be able to situa-

(i) the need to improve the quality of life and to improve the quality of life; The restricted functions of today's cleaning robots are also limiting. In order to make the technology ready for the mass market, various cleaning activities must be able to be carried out by one machine. This includes e.g. wiping, vacuuming, drying, an intelligent selection of cleaning agents for certain types of soiling and/or the cleaning of vertical and horizontal surfaces. To complete these tasks robotically in the present world, you need several robots with different specializations.



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Physical barriers cause problems for the current technology

Fundamental change in years to come The cleaning industry will fundamentally change over the next few decades. While cleaners and their proper handling of machinery, equipment and chemistry are in the ground these days, the future will be more about the technical maintenance and programming of robotics. For example, these activities will most likely be taken over by the building management. Of course, this leads to a completely new requirement and qualification profile for the workforce. At the same time however, training and personnel expenses will greatly increase.

Until complete automation of the cleaning process, there will be some intermediate steps that will be marked as technical aids for the cleaning staff. Many digital innovations in this direction have hit the market in recent years and have already become established. Digital cleaning schemes, telematics solutions, video tutorials and training programs are just a few examples that can be mented here.

Smart building enables smart cleaning The smart building itself can use existing sensors and stored data to provide information that enables much more efficient, and therefore less expensive, cleaning than before. This focus on the degree of wear and contamination, as well as the changing weather conditions each year. This means that a building is cleaned based on (data) criteria determined in real time. Most of the newer buildings already have sensors for light intensity, solar radiation, degree of utilization and duration, as well as weather data (wind strength, wind direction, moisture, etc.). The use and evaluation of this sensor technology takes the cleaning of a building to a whole new level.

In general, the cleaning industry will also benefit massively from new technologies as long as they optimize the fundamental problems present in the cleaning process. Essentially these are error avoidance, controlling functions as well as time and personnel savings. This can happen through technical aids for the cleaning force or sensors in the buildings. There are several development projects in the VR and AR area. VR training tools can be used, for example, to create realistic training environments which make training possible even without the physical presence of the cleaner and the trainer. Repetitions of training are thereby also much easier and more effective.

The cleaning process can be optimized using container glasses systems with AR technology. Visual surface markings make

work progress visible, working hours can be recorded and presented, and tutorials can be recorded.

Infrastructure for future use In the area of existing building infrastructure, the sensors can help to make cleaning more effective. By detecting the degree of soiling or the general need for cleaning, the cleaning is carried out only in case of need. In the future, this technology can also be linked to robotics, which also minimizes the cost of personnel. In our article, we show possible scenarios where cleaning can develop, provided that an anticipated strong cooperation with the building services takes place. Although many things mentioned sound like pure utopia, the technical possibilities are no longer so far away from fully automated cleaning processes, even if their use in the mass market will take some time.

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Machinery Markets


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The future is now taking place – 3D printing is becoming increasingly important in the field of after sales for construction machinery companies (2020)

All major construction machinery manufacturers are working on the topic of 3D printing, especially for the after sales sector. The cost pressure, availability and flexibility of spare parts lead to rapid progress in the development of 3D printing. The competition between each other is high and none of the big manufacturers wants to enter the topic too late. The fear of being technologically abandoned is very high, as the after sales area is very important for the selection of the brand or brand. Machine when buying is, but also for manufacturers is one of the most important sources of revenue.

For construction and mining companies all over the world, downtime in machines must be avoided by high cost factors and as far as possible. A machine that does not work only costs and does not produce productivity. Therefore, the processes of the manufacturers and their service partners are highly optimized so that the standstill is as low as possible.

High investment in development The world's largest construction machinery group, Caterpillar Inc., maintains three 3D printing research laboratories in the US alone. In these laboratories, about 400 employees are working on the series maturity of the new process. Caterpillar is also working on the progress of technology in Europe. Three years ago, a joint venture was launched with the additive manufacturing company FIT AG. John Deere, XCMG or Komatsu invest significant resources in development.

Two different systems Significant investments will be worthwhile. The After Sales segment accounts for about 15% to 35% of the total sales of construction machinery groups. Cost optimization would have a significant direct impact on profits. Different methods are currently being tested. We have already discussed in other technical articles which technology prevails, whether SLM, LFM, EBM, LMD or MPA. This article aims more at the systematic integration of 3D printing. Two systems will prevail. There will be a stationary and a mobile version in the future. In the stationary system, 3D production facilities are set up at logistical locations. The spare part is produced by code transfer and delivered to the destination as soon as possible. The mobile solution provides that trucks are equipped with 3D production facilities and can produce smaller to medium-sized spare parts on site. This saves considerable resources. Warehousing costs are reduced and availability increased.

The future is now taking place The introduction of 3D printing has been working hard for years. The technology is available and the next few years will bring with them drastic changes. Also COVID-19

contributes to the acceleration. The supply chains are searched for alternatives due to supply problems with components and other components at the time. The 3D pressure is one of them. However, the transition will be fluid. The first individual projects are implemented and thus the 3D pressure is slowly being introduced into the spare parts deliveries worldwide. Not even each component or product is suitable for 3D printing, this depends, among other things, on the size, material or production figures. The conventional manufacturing methods (including storage) will have their validity for many years to come. The 3D print simply offers a good additional alternative to solve the spare parts problem.

Create and understand commercial vehicle markets

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Megatrend or just marketing trend? The autonomous work of construction machines takes shape (2021)

The functional autonomous work of construction machinery is one of the central objectives of the large construction machinery companies in the coming years. Agriculture is once again playing a pioneering role. In this area, under the term "Smart Farming", there are a variety of different autonomous solutions. In some countries, such as the USA, automated machines are increasingly being used to make machining large areas more efficient and faster. There are many reasons why autonomous work will first prevail here: large open spaces, standardized processes, no strong traffic and few to no people remain in danger.

Significant progress has been made in the area of passenger cars and road vehicles in recent years. In recent years, this trend has also prevailed in the construction machinery sector. As early as 2013, Komatsu introduced its first system for autonomous work in the earth movement sector. A short time later, manufacturers such as Caterpillar, Liebherr and Volvo followed suit and presented their own systems on the market.

The processes in many areas still cannot be completed without people. This is changing so slowly. In this way, heavy goods vehicles can be used in the mining industry. Sector without driver in the cockpit turn their laps and transport raw materials. Especially in opencast mining, with predetermined transport routes, the use of modern autonomous machines is suitable.

What is hidden behind the term automation? A few years ago, it would have been hard to imagine what construction machines can achieve in combination with sensors, electronics, GPS-based satellite navigation, plug-in technologies, multifunctional displays and minicomputers on board.

The first steps were taken with the GPS control in the area of dismantling. Today, these systems are predominantly a standard for the new generation of dozers, excavators, roller hoists, etc. Basically, the new construction machines are equipped with integrated high-tech systems in the form of GPS, camera technology, radar and software. The option of retrofitting is open for older equipment and machines.

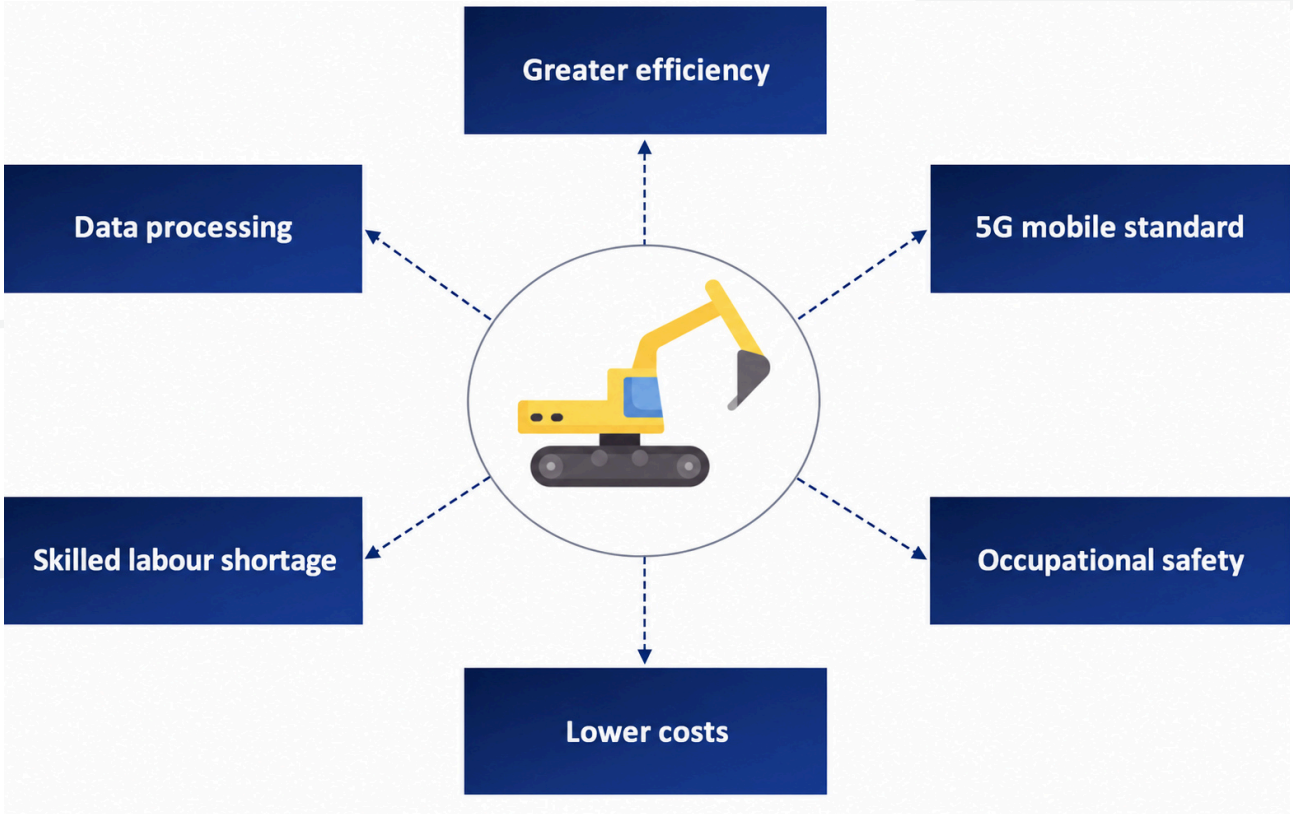
What will happen in the future? There are many factors that have a positive impact on the future development of automation in the construction machinery sector. In addition to the economic factors, occupational safety and the shortage of skilled workers are problem areas in the industry, which are to be reduced by autonomous work processes.

Digitization is also a very important factor influencing the construction machinery world. The most important prerequisite for automation is the procurement of innumerable information and its processing. The 5G mobile phone standard will make a very important contribution to success. Thanks to the fast transmission of large data packets, the machines can communicate with each other and, for example, make dismantling more efficient.

Currently, however, there is the problem that manufacturers rely on internal communication. This means that heterogeneous fleets cannot therefore be affected by the exchange of data between vehicles and vehicles.

This is because this is not always possible across manufacturers. Experts expect development progress over the next 1 to 2 years and the commitment of manufacturers who are already doing a high degree of research to further optimize their existing automation systems and develop new technologies.

Influences for autonomous driving



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