



Fraunhofer
IPK

Study 2021

Impact of COVID-19 on production

About EPIC

The Centre of Excellence in Production Informatics and Control (EPIC CoE) was established with the objective to be a leading, internationally acknowledged and sustainable focus point in its field, representing excellence in research, development and innovation related to Cyber-Physical Production (CPP).

The big challenges of the new technological era when information and communication technologies are fundamentally transforming and revolutionizing production will be responded to by concentrating the multidisciplinary, partly overlapping, partly complementary competences of CoE partners from Hungary, Germany and Austria.

Content

Impact of COVID-19 on production	2
Method.....	3
Results.....	4
Manufacturing companies.....	5
Impact of COVID-19 on production.....	7
Impact of COVID-19 on digitalization.....	10
Recommendations for action	13
Online survey.....	14

Impact of COVID-19 on production

How can businesses succeed by means of digitalization in times of a pandemic?

The current COVID-19 pandemic has been shaping our everyday lives around the world, both in our private and business spheres. The economic effects are already visible in many places, but are very branch-specific. This study examined the direct impacts of COVID-19 on industrial production. The focus is on the question: How can digitalization help mitigate the impact?

The aim of the survey is to first review the situation and then look ahead to find out how manufacturing companies rate the future and would like to shape it. The current results of the study form the basis for recommendations for action with regard to technologies and supporting services for manufacturing companies.

The questionnaire was developed as part of the collaborative project »Centre of Excellence in Production Informatics and Control (EPIC CoE)«, funded by the European Union. The mission of EPIC CoE is to accelerate innovation, realize industrial solutions, train new generations of highly skilled professionals, and support the development of a sustainable and competitive European production ecosystem.

Method

Survey design and structure

The survey is composed of 29 individual questions divided into three main areas:

- **General information about the companies**
- **Effects of COVID-19 on manufacturing companies**
- **Impact of COVID-19 on digitization in industrial production**

The study was performed by a consortium of researchers from the collaborative project »Centre of Excellence in Production Informatics and Control (EPIC CoE)« and the Fraunhofer-Gesellschaft.

Participants in the study

The study was conducted as an online survey from March to July 2021. The results of the study are based on the responses of 63 participants from various hierarchical levels and functional areas in companies of different sizes and industries.

- The focus of the study was on **small and medium-sized companies**, called SME.
- The respondents were in the **manufacturing sector** of the industries.

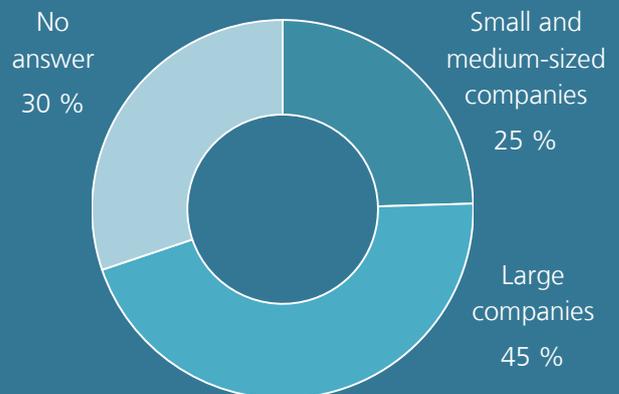
The survey explicitly addressed manufacturing companies. They were contacted via personalized e-mail addresses and LinkedIn profiles. All data have been rendered anonymous for evaluation.

The survey was intended to provide insights into the companies' self-assessment of the impact of Corona on digitalization in production. This means that SMEs (with up to 249 employees and annual sales of no more than € 50 million) and large companies (500 and more employees and annual sales of more than € 50 million) are presented comparatively. The classification of the companies into the group of SMEs is defined by EU Recommendation.

Proportion of SMEs

The participants by company size consist of 25 percent SMEs and 45 percent large companies, 30 percent of the participants did not specify the size of the company.

Considering the responses of companies headquartered in the EU, one third of the participants are SMEs (35 percent) and two thirds are large companies (65 percent).





Results



Manufacturing companies

The first part of the survey contains general questions about a company. At this point essential data on company size and the industry are collected, which are used in later steps to classify organizations. This introductory part contains information about the participants of this survey and about their position within the organization.

The survey was intended to provide insights into the companies' self-assessment of the impact of Corona on digitalization in production as well as the individual challenges and need for action.

Therefore, the information provided by SMEs as well as large companies was included in the comparison. As the following figure shows, 34 percent of the companies surveyed are small and medium-sized companies with a total revenue of no more than €50 million and 38 percent of large companies.

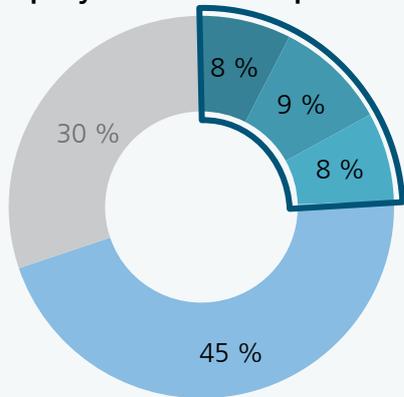
In terms of size, the results are distributed as follows: 25 percent are small and medium-sized companies (8 percent with 0-9 employees, 9 percent with 10 to 49 employees and 8 percent with 50-249 employees) and 45 percent are larger medium-sized companies with more than 250 employees.

Considering the responses of companies headquartered in the EU and classification of the companies into the group of SMEs according to the EU Recommendation, one third of the participants are SMEs (35 percent) and two thirds are large companies (65 percent).

The largest share of companies participating in the survey operate in mechanical and plant engineering (42 percent). In terms of a value-added focus, respondents are primarily distributed in research and development (24 percent), followed by marketing and sales (14 percent), management (12 percent), and manufacturing (12 percent).

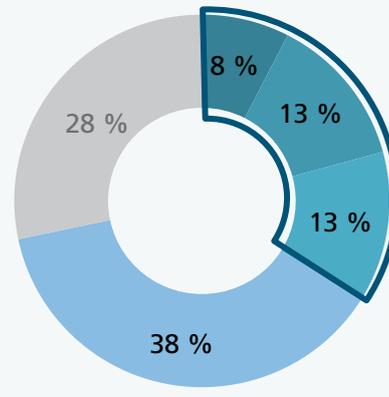
The companies were also asked about the central objectives of the companies. The important goals are efficiency increase, customer loyalty and technology leadership. In contrast, the topics of sustainability and employee satisfaction have a low relevance.

How many employees of the company worked in Europe in 2019?



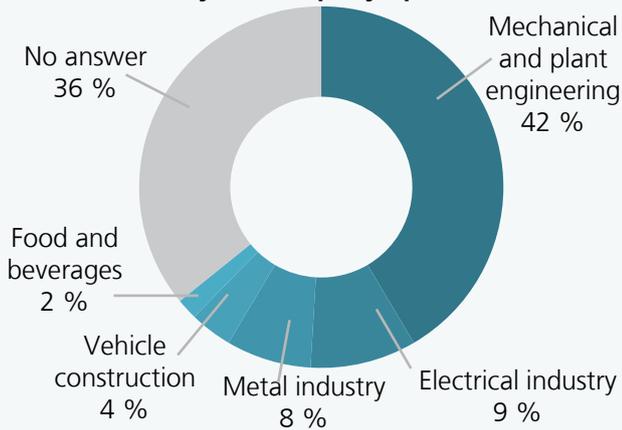
■ Less than 10 ■ 10 to 49 ■ 50 to 249
■ Over 250 ■ No answer

What was your company's total revenue in 2019?

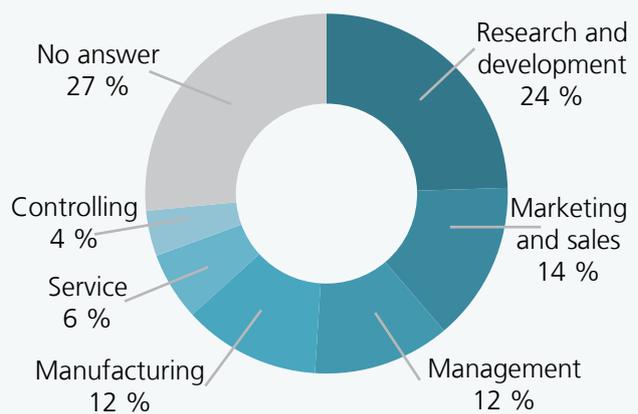


■ Less than 2 Mio. € ■ 2 Mio. € - 10 Mio. €
■ 10 Mio. € - 50 Mio. € ■ More than 50 Mio. €
■ No answer

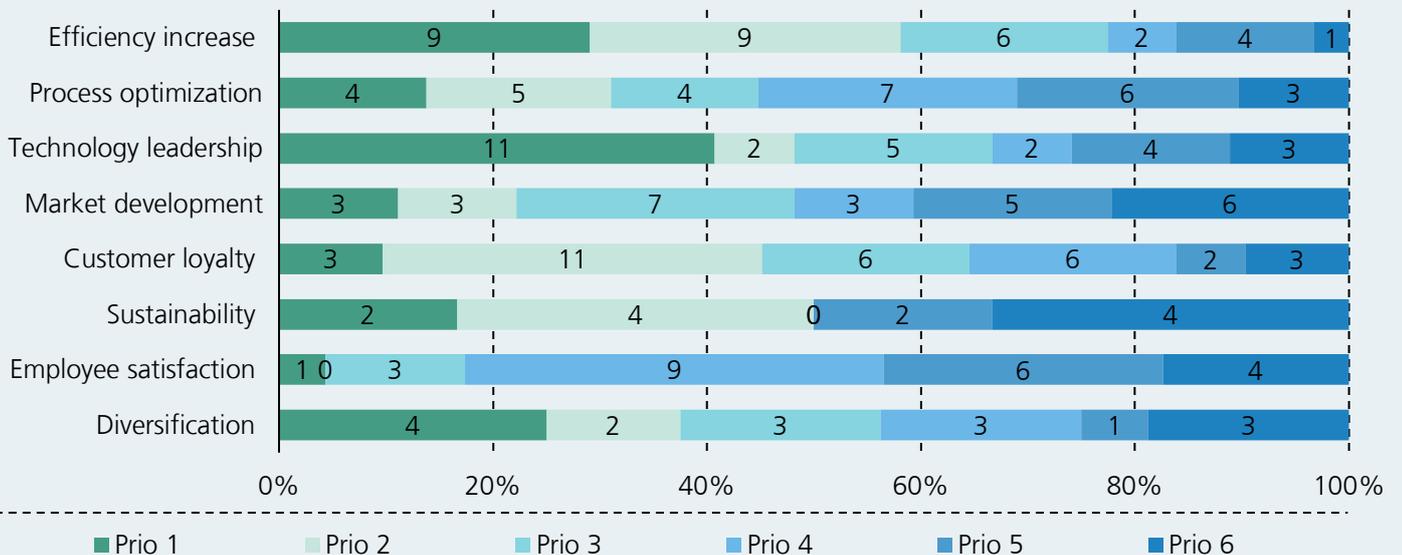
In which industry does your company operate?



In which area do you work in the company?



What are your company's goals?



Impact of COVID-19 on production

The second part of the survey focuses on challenges, goals and measures in production during the Corona crisis.

Challenges

Employee availability is currently the biggest challenge of the impact of corona for manufacturing companies. In contrast, supply bottlenecks (21 percent) and order declines (15 percent) present smaller challenges for companies.

Goals

The important goals are efficiency increase (21 percent), process optimization (21 percent) and technology leadership (13 percent). The Corona pandemic is resulting in a higher relevance for process optimization and a lower relevance for customer loyalty and technology leadership. For SMEs, compared to large enterprises, **employee management** is more relevant than customer loyalty. Sustainability has increased in relevance for large enterprises. For SMEs, sustainability is not relevant.

Measures

Companies are currently responding to the changes with **personal measures** and **process optimization**. Financial support measures are rarely used. In detail, the survey revealed the following sequence: short-time work (76 percent), Corona-compliant process optimization (60 percent), employee reduction (32 percent), participation in funding programs (28 percent), support emergency aid (16 percent), use of credit (16 percent).

Regulations

Hygiene measures and protective equipment as well as workplace design are most frequently used. This includes determination of hygiene measures and distance control, handling of suspected cases, provision of protective equipment, regulations on workplace design, cleaning and disinfection of the workplace and work equipment.

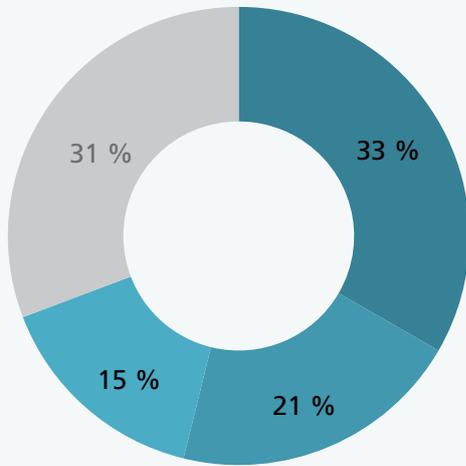


The Corona pandemic is resulted in a higher relevance for process optimization. For SMEs employee management is more relevant than customer loyalty.«

Continuity

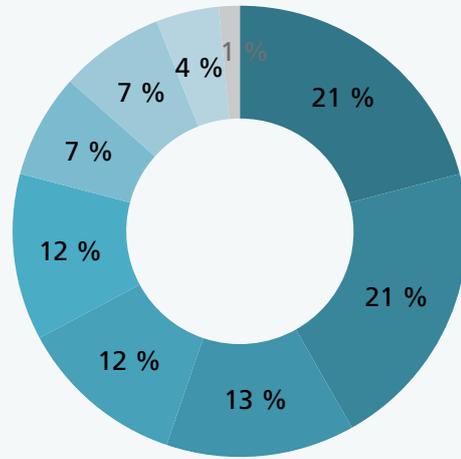
Companies estimate that the impact will be relevant in the **short to medium term**. Companies do not anticipate any long-term effects. This implies for the companies to flexibly and timely respond to new conditions.

What is currently the biggest challenge for your company?



- Employee availability
- Supply bottlenecks from suppliers / from the supply chain
- Decline in orders
- No answer

What goals changed or expanded in production?



- Efficiency increase
- Process optimization
- Technology leadership
- Customer loyalty
- Market development
- Employee satisfaction
- Sustainability
- Diversification
- Other

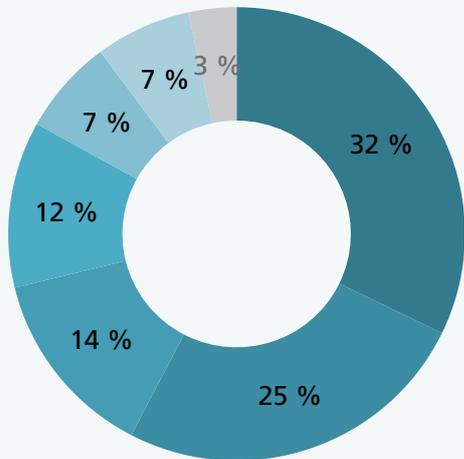
TOP 5 business goals

Corporate strategy

Impact of COVID-19 in production

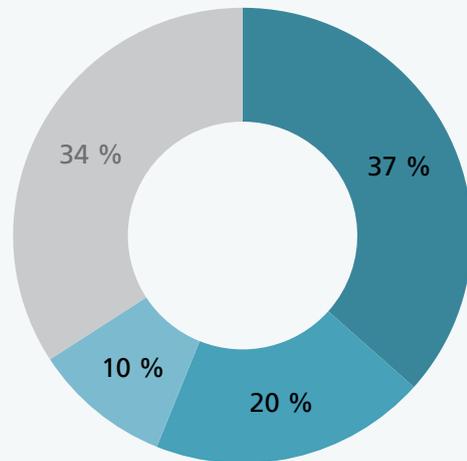


What measures are you implementing to reduce the impact of the COVID-19 pandemic?



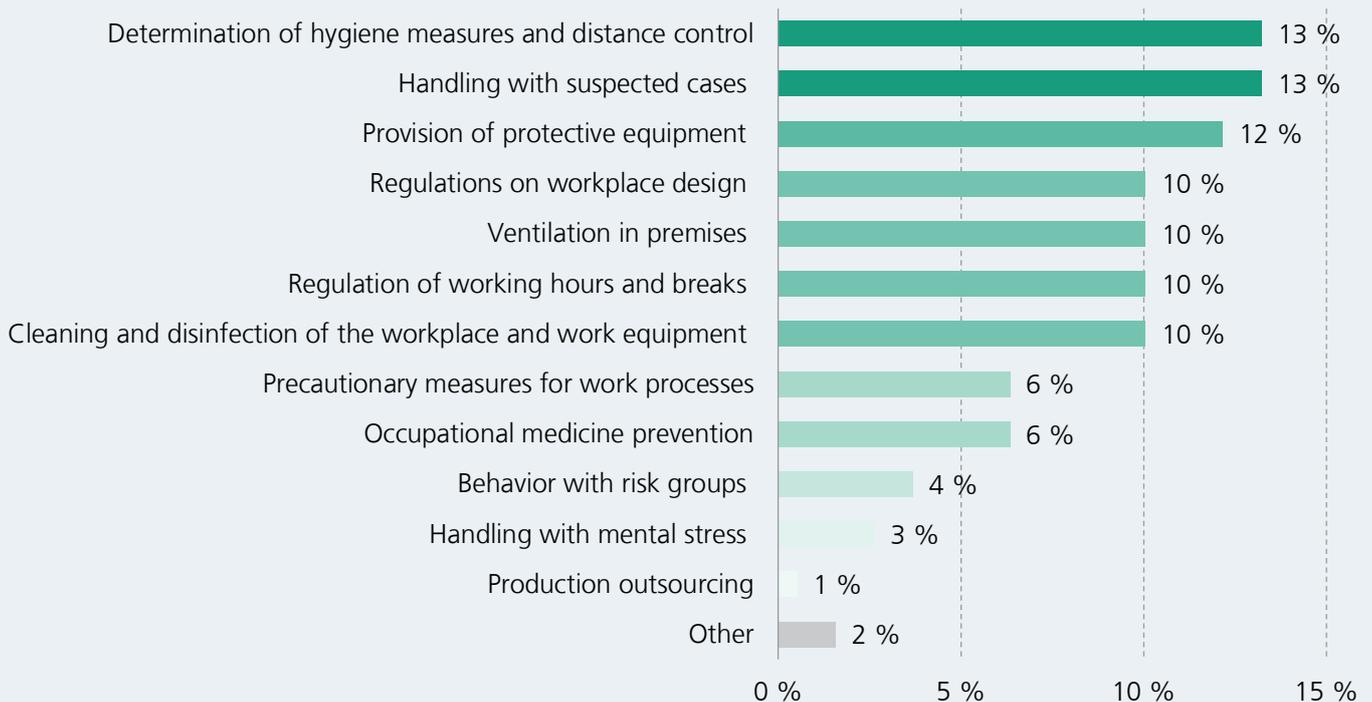
- Short-time work
- Corona-compliant process optimization
- Employee reduction
- Participation in funding programs
- Application for support measures to bridge liquidity bottlenecks (emergency aid)

How long do you estimate your company will be affected by the impact of the crisis?



- Short-term effects, which will be put into perspective again in the next 12 months
- Medium-term impact, that will affect the company in the next 3 years
- Long-term effects, that will affect the company over a period of more than 3 years
- No answer

Which of the following regulations does the company currently use in production?



Impact of COVID-19 on digitization

The digitization index already shows that the German economy has become more digital in almost all areas in 2021 compared with the previous year. However, this growth is rather short-term and does not indicate a comprehensive digitization of the economy. But which digitization measures helped companies to overcome the Corona crisis and what relevance do digital technologies have for business activities? These questions are examined in more detail in the following section.

Effects on flexibility, availability and capability

To what extent has digitization helped you in the pandemic-related situation? During the Corona pandemic, companies were able to benefit from the use of digital technologies. **Digitization had greatest effects on flexibility, availability and capability.** Digitization has small impact on resolving issues in the supply chain.

Digitization measures

The motives for digitization measures in a company are currently **increase in internal efficiency, cost reductions, transparency in processes, and new work and remote work.** The results show that digitization measures were primarily used for pandemic-related objectives of companies last year. Less significant are measures for customer loyalty, new business models and development times. Requirements of business partners and the possibility of economical, individualized production rarely make a difference for digitization measures.

Digital technologies

The following digital solutions are already in use: cloud computing, digital assistance, big data analytics,

augmented reality, internet of things, artificial intelligence. Digital twins, virtual reality and blockchain technology are rarely used in companies. As a result of the pandemic companies are using or planning to use augmented reality, big data analytics, cloud computing, digital twins, digital assistance, artificial intelligence, and virtual reality. The results show that augmented reality, digital twins and virtual reality have increased in importance. **The use of cloud computing, digital assistance and big data analytics is equally efficient in the Corona crisis.**

Importance of digitization

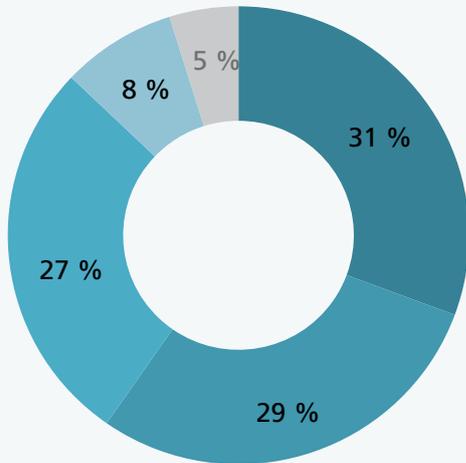
With regard to the importance of digitization, companies replied that **new products and services, virtual and digital services** and modification of existing products and services have the highest priority in relation to the business model. In contrast, digital platforms, individualized products and services, and customer involvement are less important.

For the business processes of a company, digitization has a high significance for **internal communication, structured evaluation of company data, digitization of paper files, use of ERP software.** For employees and their workplaces, digitization has an impact in terms of **flexible work design, promotion of digital competence and use of virtual meeting formats.**

Barriers

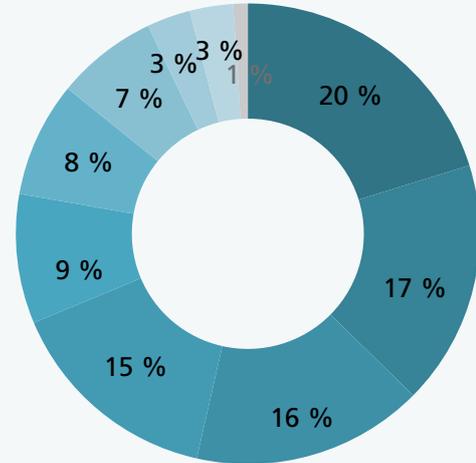
The main barriers for companies to use digital applications include **data protection, skilled workers and complexity. Investment costs are not a key factor** for digitization.

To what extent has digitization helped you in the pandemic-related situation?



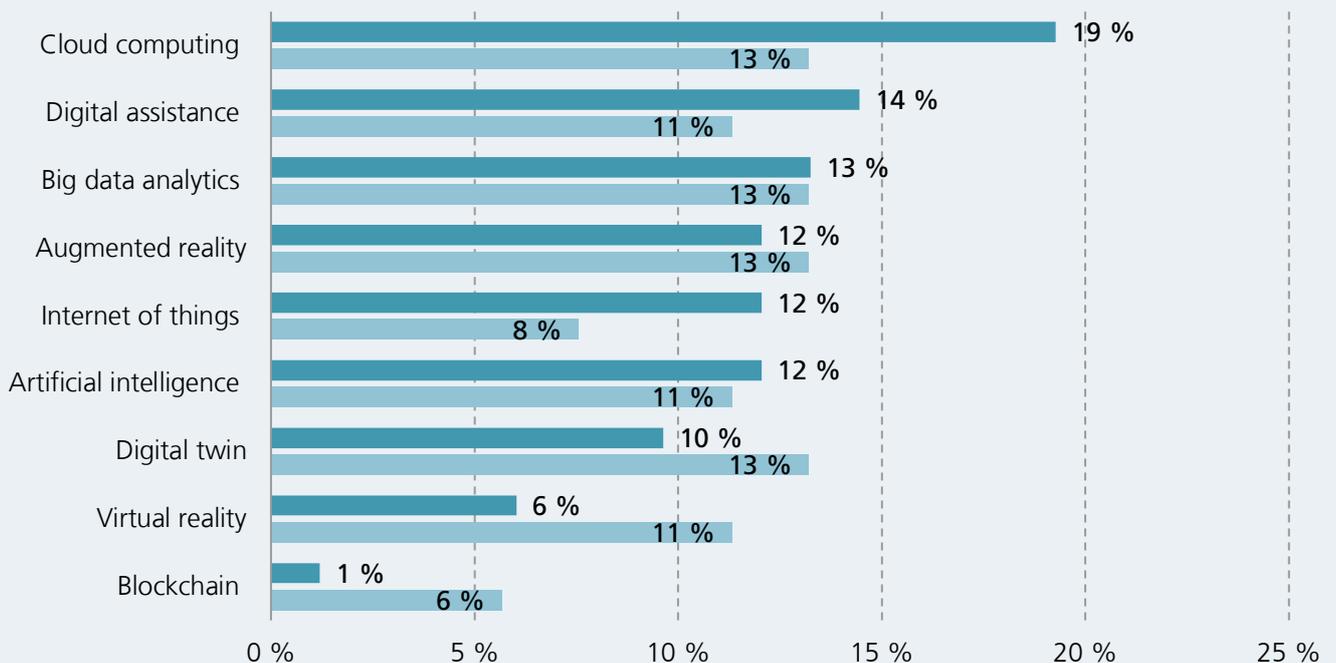
- It has allowed us to be more flexible.
- It has allowed us to continue to do the work.
- It has kept us capable of making decisions.
- It has allowed us to more easily resolve issues in our supply chain.
- Other

What are currently the motives for digitization measures in your company?

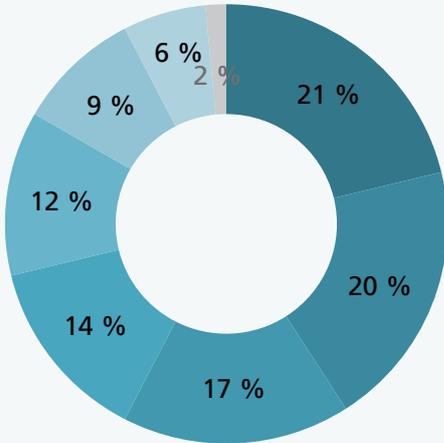


- Increase internal efficiency
- Cost reductions
- Transparency in processes
- New work and remote work
- Improvement of customer loyalty
- Increase sales by new business models
- Shortening of development times
- Requirements of business partners
- Possibility of economical, individualized production
- Other

As a result of the pandemic, which digital solutions is your company using or planning to use in the future?

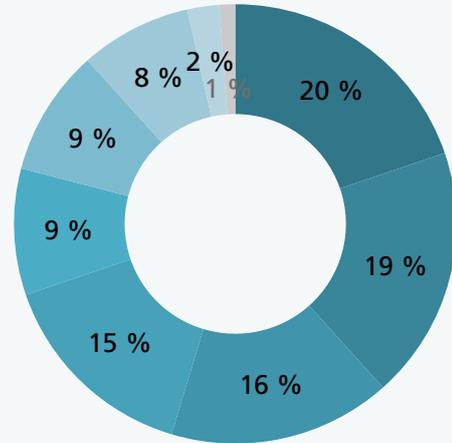


What is the significance of digitization for your company's business model?



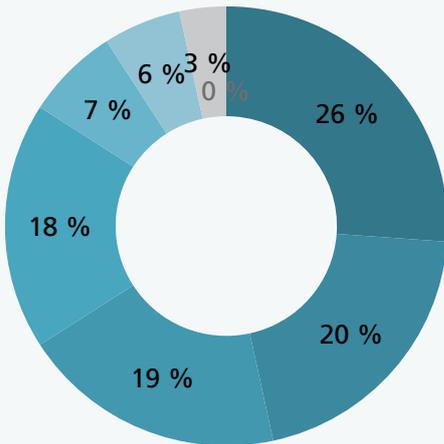
- Development of new products and services
- Expansion of portfolio for virtual / digital services
- Modification of existing products and services
- Offer of products / services on digital platforms
- Offer of individualized products and services
- Involvement of the customer (open innovation)
- Setting of certain products and services
- Other

What significance does digitization have for your company's business processes?



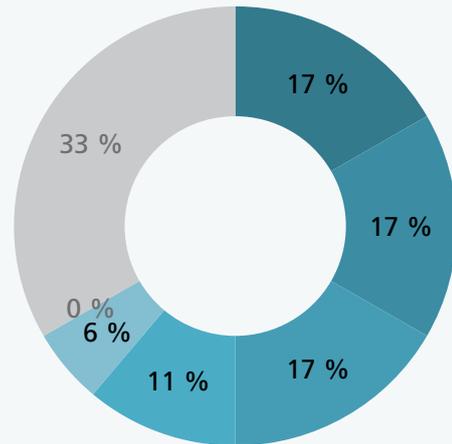
- Internal communication with group messenger tools
- Structured evaluation of company data
- Digitization of paper files
- Use of ERP software
- Use of mobile enterprise software
- Networking via platforms with suppliers / providers
- Introduction or use of electronic invoicing
- Electronic handling of tax / balance sheet transactions
- Other

What significance does digitization have for your company's employees and their jobs?



- Flexible work design for employees (e.g. home office)
- Promoting the digital competence of employees
- Use of virtual meeting formats
- Facilities of employees with mobile devices
- Recruitment of employees through online platforms
- No influence of digitization on employees / their jobs
- Use of external specialists for digitization
- Others

What are the company's barriers to using digital applications?



- Data protection requirements
- Lack of skilled workers
- Complexity of the topic
- High investment costs
- Missing legal framework
- Others
- No answer

Recommendations for action

How can companies be more efficient with the help of digitization in times of a pandemic?

The key findings of the present study are:

Impact of COVID-19 on production

- **short to medium term**
will be effected ist
- **employee availability**
is currently the biggest challenge
- **process optimization and employee management**
are goals with higher relevance
- **personal measures and process optimization**
are currently responding to the changes

Impact of COVID-19 on digitization

- **flexibility, availability and capability**
show most important effects
- **cloud computing, digital assistance, big data analytics**
are most efficient, especially in the Corona crisis
- **data protection, skills and complexity**
are main barriers for a company

Based on the results of the study, the following actions and technologies are recommended to address the challenges imposed by the pandemic:

Take action

- **fast implementation required**
- **improvement of employee availability**
- **flexible process design and workplace design**

Enabling technologies for corporate success

- **facilitate transfer through individual support**
- **easy handling for different**
- **enable quick measurable success**



Online survey

—

General information

In which industry does your company operate?

Please choose **only one** of the following:

- Metal industry
- Vehicle construction
- Mechanical and plant engineering
- Electrical industry
- Mineral oil, chemical, pharmaceutical, rubber and plastic, glass
- Furniture
- Textile, clothing, leather, wood, paper, printing industry
- Food and beverages

How many employees of the company worked in Europe in 2019?

Please choose **only one** of the following:

- Less than 10
- 10 to 49
- 50 to 249
- Over 250

What are your company's goals?

Please number each box in order of preference from 1 to 8

- Process optimization
- Employee satisfaction
- Technology leadership
- Diversification
- Market development
- Customer loyalty
- Sustainability
- Efficiency increase

Where is your company's headquarters?

Please choose **only one** of the following:

- European Union
- Non-EU country

What was your company's total revenue in 2019?

Please choose **only one** of the following:

- Less than 2 Mio. €
- 2 Mio. € to under 10 Mio. €
- 10 Mio. € to under 50 Mio. €
- More than 50 Mio. €

In which area do you work in the company?

Please choose **only one** of the following:

- Management
- Controlling
- Research and development
- Manufacturing
- Service
- Marketing and sales
- Other

Effects of COVID-19 on manufacturing companies

What percentage of total annual revenue does your company plan to spend on Corona protection measures by the end of the year?

Only numbers may be entered in this field. Please write your answer here:

..... percent of total annual revenue

What would help you in the current situation?

Please write your answer here:

.....

How is total revenue expected to develop by the end of 2021 compared to 2019?

Please choose **only one** of the following:

- Decrease of up to 25 percent
- Decrease of more than 25 percent
- No change
- Increase of up to 25 percent
- Increase of more than 25 percent

What is currently the biggest challenge for your company?

Please choose **only one** of the following:

- Employee availability
- Supply bottlenecks from suppliers / from the supply chain
- Decline in orders
- Other

What measures are you implementing to reduce the impact of the COVID-19 pandemic?

Please choose **all** that apply:

- Short-time work
- Employee reduction
- Corona-compliant process optimization
- Application for support measures to bridge liquidity bottlenecks (emergency aid)
- Participation in funding programs
- Use of credit
- Other:

How long do you estimate your company will be affected by the impact of the crisis?

Please choose **only one** of the following:

- Short-term effects,
which will be put into perspective again in the next 12 months.
- Medium-term impact,
that will affect the company in the next 3 years.
- Long-term effects,
that will affect the company over a period of more than 3 years.

What goals changed or expanded in production?

Please choose **all** that apply:

- Efficiency
- Customer loyalty
- Market development
- Employee orientation
- Sustainability
- Process optimization
- Technology leadership
- Diversification
- Other:

What is the percentage of employees in the production of the company?

Only numbers may be entered in this field. Please write your answer here:

..... percent of employees

What is the percentage of production employees who are absent due to external Corona regulations?

Only numbers may be entered in this field. Please write your answer here:

..... percent of production employees

Which of the following regulations does the company currently use in production?

Please choose **all** that apply:

- Handling with mental stress
- Regulations on workplace design
- Regulation of working hours and breaks
- Production outsourcing
- Precautionary measures for work processes
- Cleaning and, if necessary, disinfection of the workplace and work equipment
- Occupational medicine prevention
- Ventilation in premises
- Provision of protective equipment
- Behavior with risk groups
- Handling with suspected cases
- Determination of hygiene measures and distance control
- Other:

Do production employees worry about being infected in the workplace?

Please choose **only one** of the following:

- Yes
- Partial
- No

What are the most common reasons for pandemic-related employee absences in production?

Please choose **all** that apply:

- Notification of illness
- Confirmed Corona infection
- Contact with a Corona infected person
- Quarantine ordered by health department
- Entry from a risk area
- Corona app warning due to a high-risk encounter
- Child care due to closed daycare or school
- Child care due to ordered quarantine of child
- Other:

Impact of COVID-19 on digitization in industrial production

What are the company's barriers to using digital applications?

Please choose **only one** of the following:

- High investment costs
- Data protection requirements
- Lack of skilled workers
- Missing legal framework
- Complexity of the topic
- Other

What are currently the motives for digitization measures in your company?

Please choose **all** that apply:

- Increase internal efficiency
- Cost reductions
- Transparency in processes
- New work and remote work
- Improvement of customer loyalty
- Increase sales by new business models
- Shortening of development times
- Requirements of business partners
- Possibility of economical, individualized production
- Other

Which of the following digital solutions is your company already using?

Please choose **all** that apply:

- Augmented reality
- Big data analytics
- Blockchain
- Cloud computing
- Digital assistance
- Internet of things
- Artificial intelligence
- Digital twin
- Virtual reality

As a result of the pandemic, which digital solutions is your company using or planning to use in the future?

Please choose **all** that apply:

- Augmented reality
- Big data analytics
- Blockchain
- Cloud computing
- Digital assistance
- Internet of things
- Artificial intelligence
- Digital twin
- Virtual reality

To what extent has digitization helped you in the pandemic-related situation?

Please choose **all** that apply:

- It has kept us capable of making decisions.
- It has allowed us to be more flexible.
- It has allowed us to continue to do the work.
- It has allowed us to more easily resolve issues in our supply chain.
- Other:

What is the significance of digitization for your company's business model?

Please choose **all** that apply:

- Modification of existing products and services
- Offer of individualized products and services
- Expansion of the portfolio for virtual or digital services
- Development of new products and services
- Offer of products / services on digital platforms
- Setting of certain products and services
- Involvement of the customer (open innovation)
- Other:

What significance does digitization have for your company's employees and their jobs?

Check all that apply

- Please choose **all** that apply:
- Facilities of employees with mobile devices
- Promoting the digital competence of employees
- Flexible work design for employees (e.g. home office)
- Use of virtual meeting formats
- Recruitment of employees through online platforms
- Use of external specialists for digitization
- No influence of digitization on employees and their jobs
- Other:

What significance does digitization have for company's business processes?

Please choose **all** that apply:

- Structured evaluation of company data
- Introduction or use of electronic invoicing
- Digitization of paper files
- Use of mobile enterprise software
- Electronic handling of tax / balance sheet transactions
- Use of ERP software
- Networking via platforms with suppliers / service providers
- Internal communication with group messenger tools
- Other:

What percentage of total annual revenue did your company spend on digitization in 2019?

Only numbers may be entered in this field. Please write your answer here:

..... percentage of total annual revenue

What kind of specific support do you or your company need to improve the effects of COVID-19?

Please write your answer here:

.....

How is your budget for digitization expected to develop by the end of 2021 compared to 2019?

Please choose **only one** of the following:

- Decrease up to 25 percent
- Decrease of more than 25 percent
- No change
- Increase up to 25 percent
- Increase by more than 25 percent

Imprint

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