



IVAM. 2020 Economic Data Survey

- ▶ What drives innovation in microtechnology in 2020?
- ▶ What economic, political, societal or organizational challenges are high-tech companies facing in early 2020?
- ▶ These are questions that currently concern IVAM Microtechnology Network, the leading European microtechnology industry association, and which we addressed in our 2020 economic data survey.
- ▶ This survey was conducted among European companies and research institutes engaged in key enabling technologies like microtechnology, MEMS and semiconductors, nanotechnology and advanced materials, optical and photonic technologies, sensor and measurement technology.
- ▶ The survey was conducted in February and March 2020 before parts of the economy were shut down and the full impact of the coronavirus pandemic became apparent. This development has made business development forecasts invalid, which is why they have been excluded from evaluation.

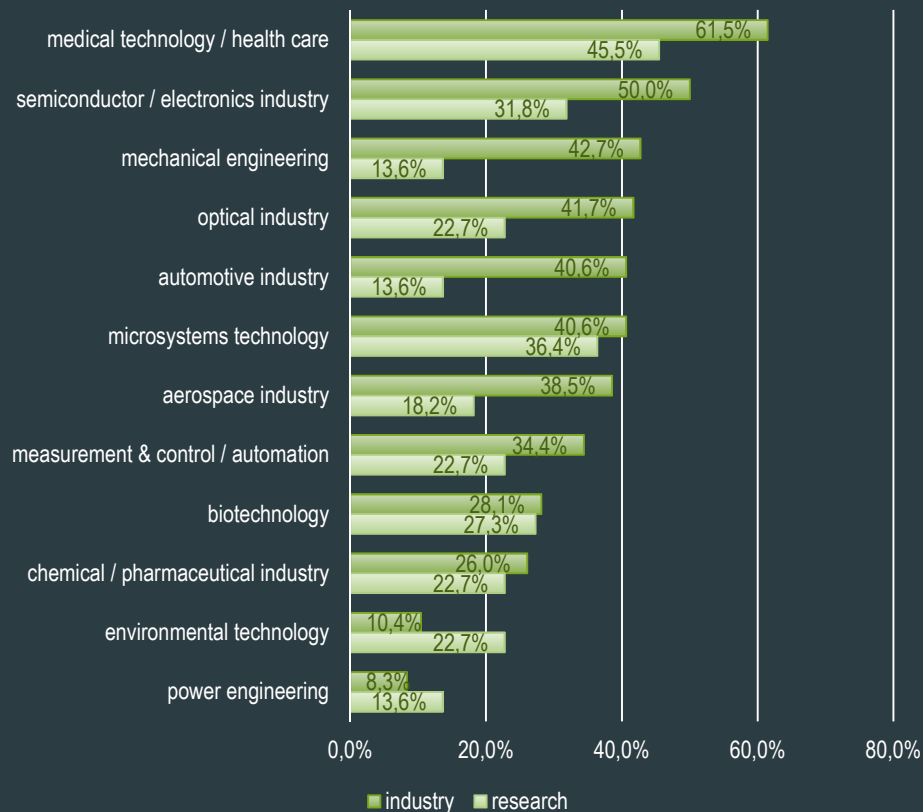


- ▶ Will medical technology continue to be the main market for products in micro- and nanotechnology in 2020 and in the next three years? For which areas are exciting technologies currently being developed?
- ▶ What is currently happening in the automotive industry? Is there a shift from classic drives to alternative drive technologies such as electric mobility?
- ▶ What significance do micro- and nanotechnologies have as key technologies for the automation of industrial production?
- ▶ Does the climate change, which has been a major topic in 2019, already have an impact on innovation in energy technology?
- ▶ A special part on trend and drivers focused on four application fields that appear to be particularly interesting in view of current technological, economic, political and societal developments and discussions.
- ▶ We have investigated the first two fields in 2017 already, so we can compare answers from today and back then.
- ▶ No comparative figures are available for the third and fourth field.
- ▶ Please note: *comments printed in italics are referring to a specific group of survey participants and indicate notable deviations from the average; this is why the mentioned figures do not match the figures in the graphs.*

Markets, trends and drivers



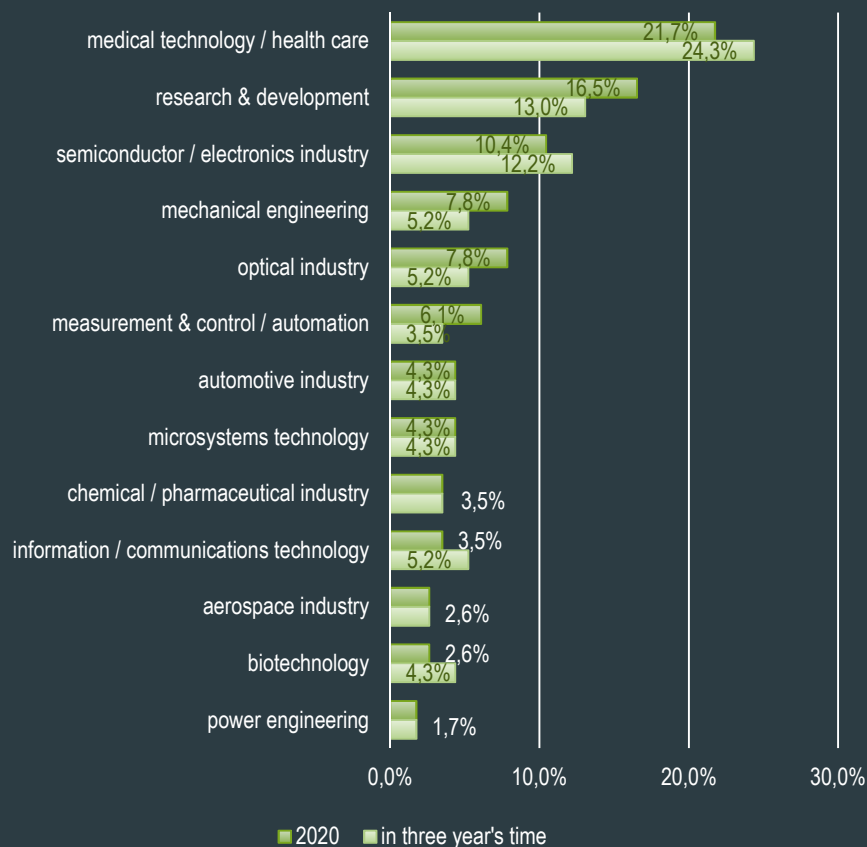
In which of the following industries are your products, technologies or services basically applied?



companies and research institutes, multiple answers included

- ▶ 61.5% of microtechnology companies and 45.5% of research institutes are active in medical technology
- ▶ 40.6% of companies and only 13.6% of research institutes are supplying or developing technologies for the automotive industry
- ▶ 42.7% of companies and only 13.6% of research institutes are providing mechanical engineering solutions
- ▶ 34.4% of companies and 22.7% of research institutes are providing automation (measurement & control) solutions
- ▶ a rather small share (8.3%) of companies is working on power engineering, in research, the proportion is higher at 13.6%
- ▶ the results show differences in the market maturity of microtechnology:
 - ▶ despite many market-ready technologies, there is still much potential for new applications in medical technology
 - ▶ the automotive market may be saturated with components such as ICs and sensors, but the demand for alternative drives has opened up potential for further new systems (see automotive drive engineering trends)
 - ▶ in automation/mechanical engineering, hardware components such as sensors and actuators are marketable, innovation is more likely to take place in data processing
 - ▶ microtechnologies for power engineering and environmental technologies are still at the R&D stage, as R&D institutions are currently more active than companies

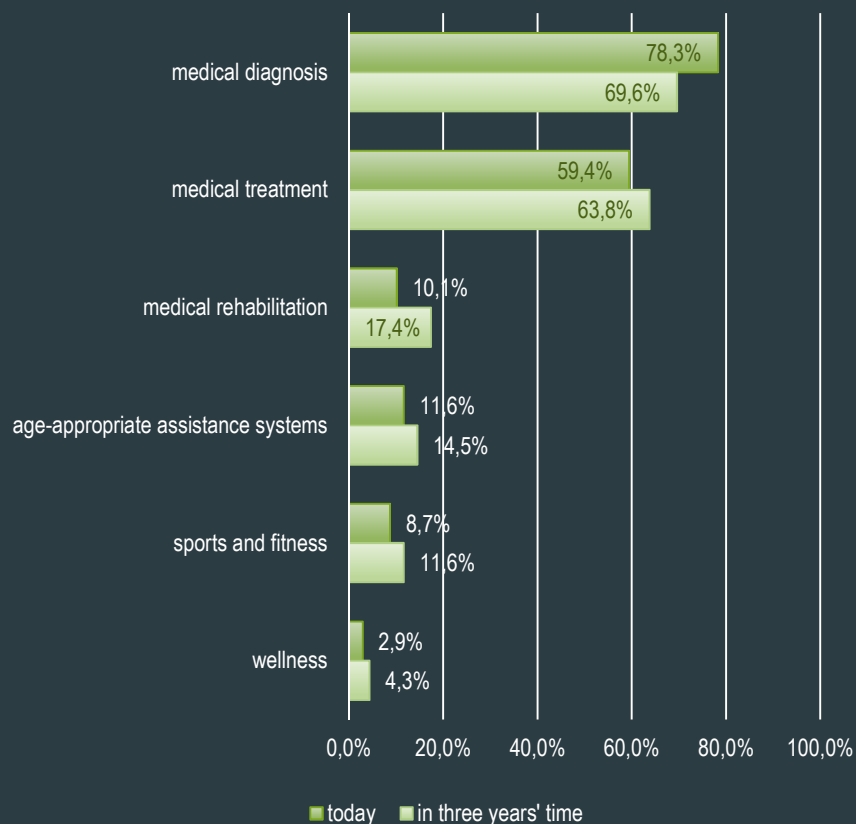
Which is / will be your most important target market?



companies and research institutes

- ▶ the upward trend in medical technology is continuing: in 2020, medical technology is the most important market for 21.7% of all respondents, for 23.7 % of companies and only 13.6 % of research institutions
- ▶ the upward trend will continue and medical technology is supposed to be the most important market in three years for 24.3% of organizations, for 28% of companies but only 9.1% of research institutions
- ▶ the share of organizations for which the automotive industry is the most important market is currently only 4.3% and will remain constant over the next three years
- ▶ the share of organizations for which automation (today 6.1% - in future 3.5%) / mechanical engineering (today 7.8% - in future 5.2%) is the most important market will decline in the medium term
- ▶ the share of organizations that mainly do energy and environmental technologies is very low at 1.7% and will remain constant

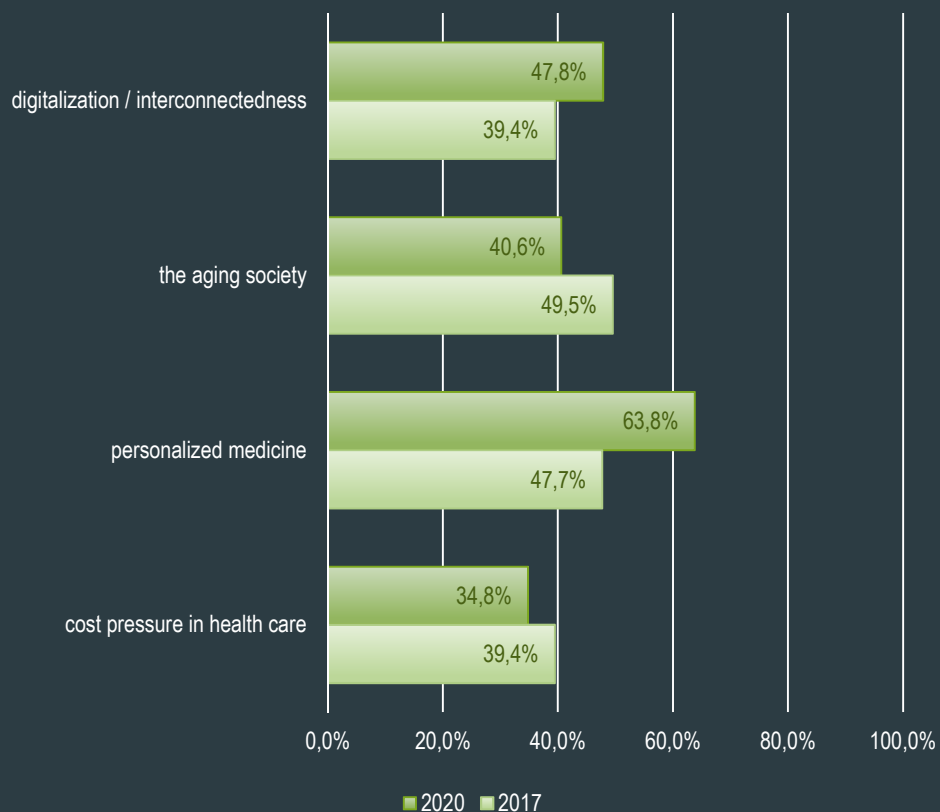
In which areas of medicine or health care are your products or technologies being / going to be applied?



companies and research institutes targeting the medical technology market, multiple answers included

- ▶ medical microsystems are mainly used in diagnostics (78.3% of organizations targeting the medical technology market) and treatment (59.4%) – this has hardly changed compared to 2017 and will not change much in the next three years: the share in diagnostics is expected to decrease, while the share in treatment will increase
- ▶ in rehabilitation (today 10.1%, in future 14.4%) and sport/fitness (today 8.7%, in future 11.6%) the share will increase in the medium term; *rehabilitation is to become more important as a field of application above all for research and development – R&R organizations expect an increase from 20% today to 60% in three years' time*
- ▶ the proportion of organizations supplying assistance systems for the aging population has decreased since 2017, contrary to forecasts (to 11.6% today instead of 19.3% as predicted in 2017 for today); a slight increase to 14.5% in three years is expected today, which is less than one might expect in view of the continuing demographic change
- ▶ applications in the wellness sector do not play a major role for the industry and have also fallen short of expectations

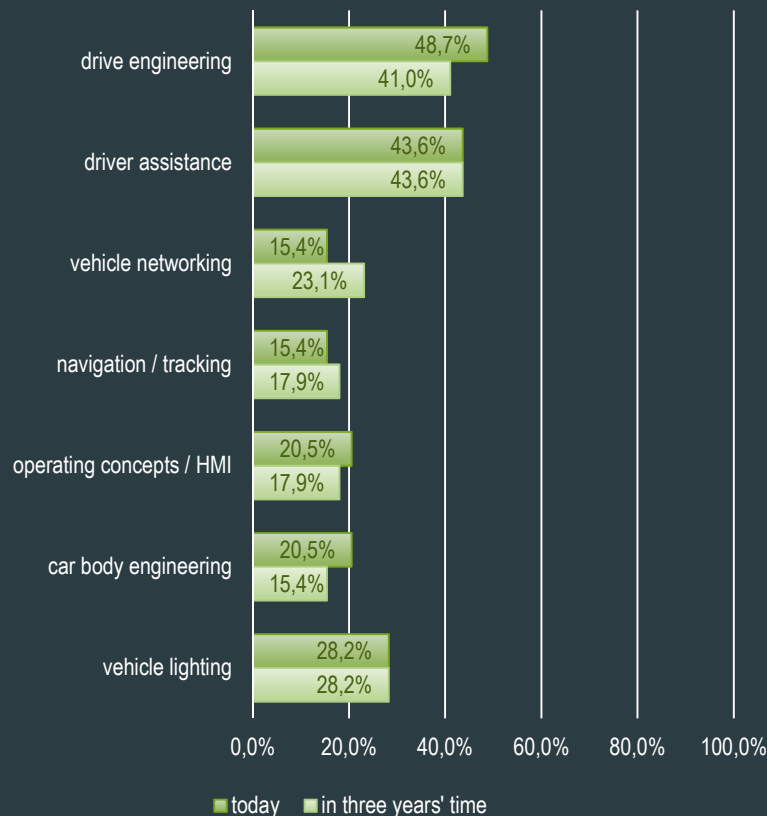
What do you consider to be major drivers for innovation in medical technology at this point in time?



companies and research institutes targeting the medical technology market, multiple answers included

- ▶ 63.8%, and thus the highest proportion of all respondents active in medical technology, now regard personalized medicine as a driver of innovation
- ▶ 47.8% see digitization as a driver of innovation
- ▶ 40.6% see the ageing society as a driver of innovation,
- ▶ 34.8% consider cost pressure in the health care system a driver of medical applications
- ▶ in personalized medicine, the most significant difference is evident compared to 2017: at that time, the share was much lower at 47.7%; on the other hand, a higher share in 2017 saw the aging society as a driver of innovation
- ▶ consistent with the reduced share and the expected medium-term increase in age-appropriate assistance systems (see previous question), demographic change is seen as a driver today to a lesser extent than in 2017
- ▶ *among companies, the proportion of respondents who see personalized medicine as a key driver has risen particularly strongly compared with 2017, from 36.9% to 59.3%*

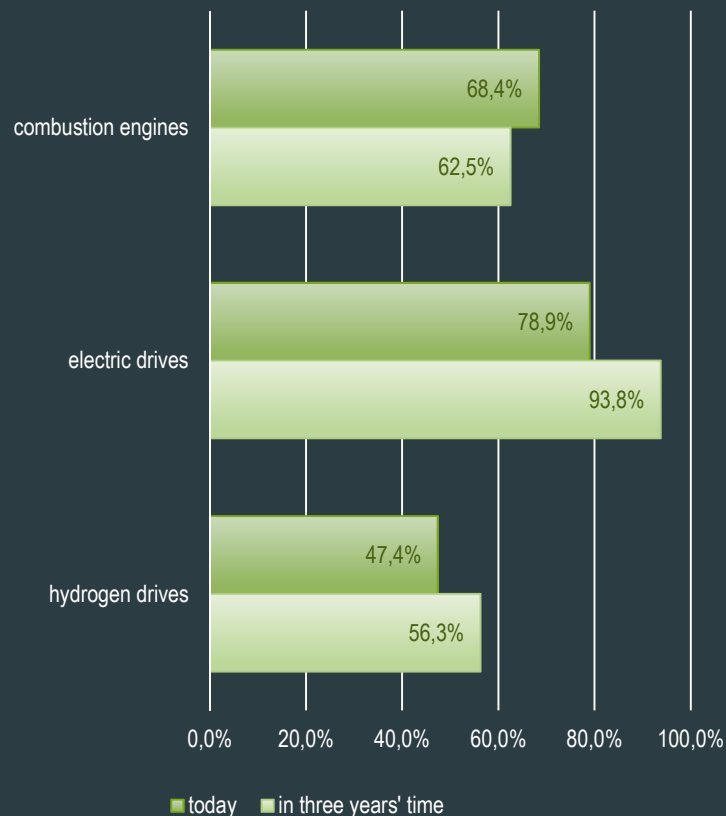
In which areas of automotive engineering are your products or technologies being / going to be applied?



companies and research institutes targeting the automotive industry
multiple answers included

- ▶ a total of 35.6% of companies and institutes are active in automotive engineering today
- ▶ today, 48.7% of the microtechnology companies and institutes active in the automotive industry are involved in drive engineering (in 2017 it was 42.7%) – a decline to 41.0% is expected in the next three years
- ▶ currently 43.6% of the organizations working in the automotive industry are involved in driver assistance – the proportion will remain constant over the next three years – in 2017 it was only 20% (the highest increase in this area since 2017)
- ▶ a higher proportion of companies and institutes than today and three years ago will probably be dealing with vehicle networking (2017 10.7% - currently 15.4% - in future 23.1%) and navigation/tracking (2017 8% - currently 15.4% - in future 17.9%) in three years' time

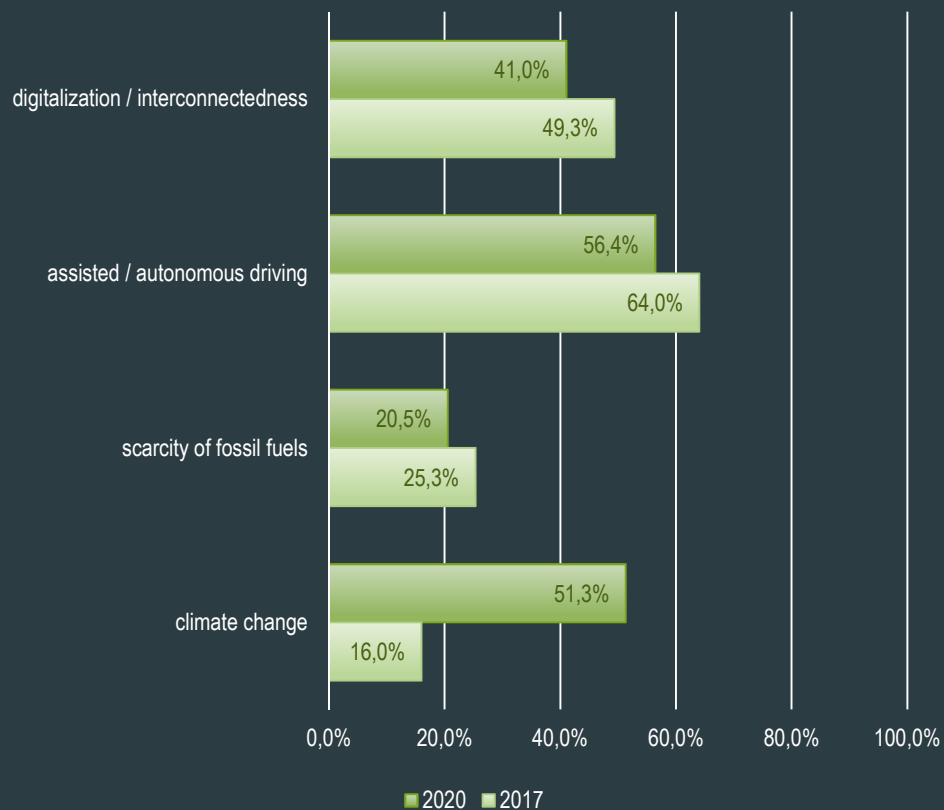
In which areas of automotive drive engineering are your products / technologies being / going to be applied?



companies and research institutes working on automotive drives
multiple answers included

- ▶ a little more than two-thirds (68.4%) of the microtechnology companies and institutes involved in drive engineering work on the combustion engine, and the proportion is expected to decline somewhat in the medium term to 62.5%
- ▶ however, a higher proportion (78.9%) are already working on the electric drive; this proportion is expected to rise to over 93.8% within the next three years
- ▶ almost half (47.4%) of the companies and institutes involved in drive technology are working on hydrogen drives, and the proportion is expected to rise to over half (56.3%) within the next three years

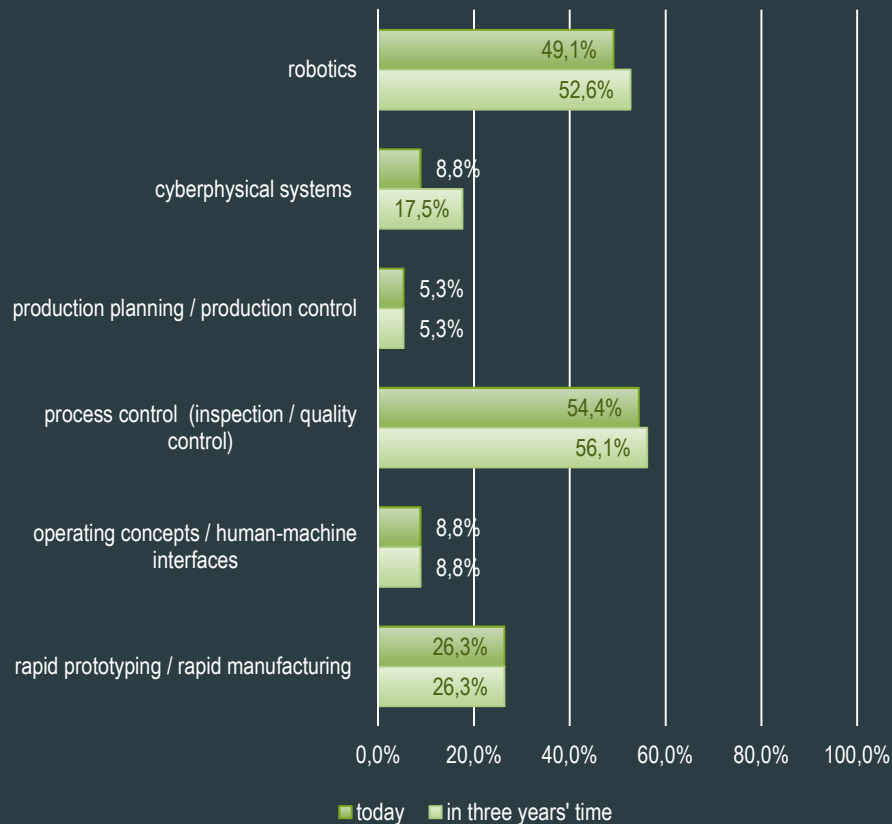
What do you consider to be major drivers for innovation in automotive engineering at this point in time?



companies and research institutes targeting the automotive industry
multiple answers included

- ▶ assisted / autonomous driving is now considered to be the strongest driver of innovation in automotive technology, as it was in 2017, but no longer by quite as high a proportion (today 56.4%, 2017: 64%)
- ▶ 41% of the companies and institutions consider digitalization as a driver – in 2017 it was 49.3%
- ▶ the clearest differences compared with 2017 are concerning the climate change: 51.3% of those surveyed now see climate change as a major driver of innovation in automotive technology, compared with only 16% in 2017
- ▶ *two-thirds of German companies now see climate change as a major driver for innovation in automotive technology (2017: 14.7%), compared to 30.8% in other countries*
- ▶ it appears that "Fridays for Future" and the political discussion have – especially in Germany – lead to a reorientation that might not have taken place without "political pressure" (comment of a survey participant)

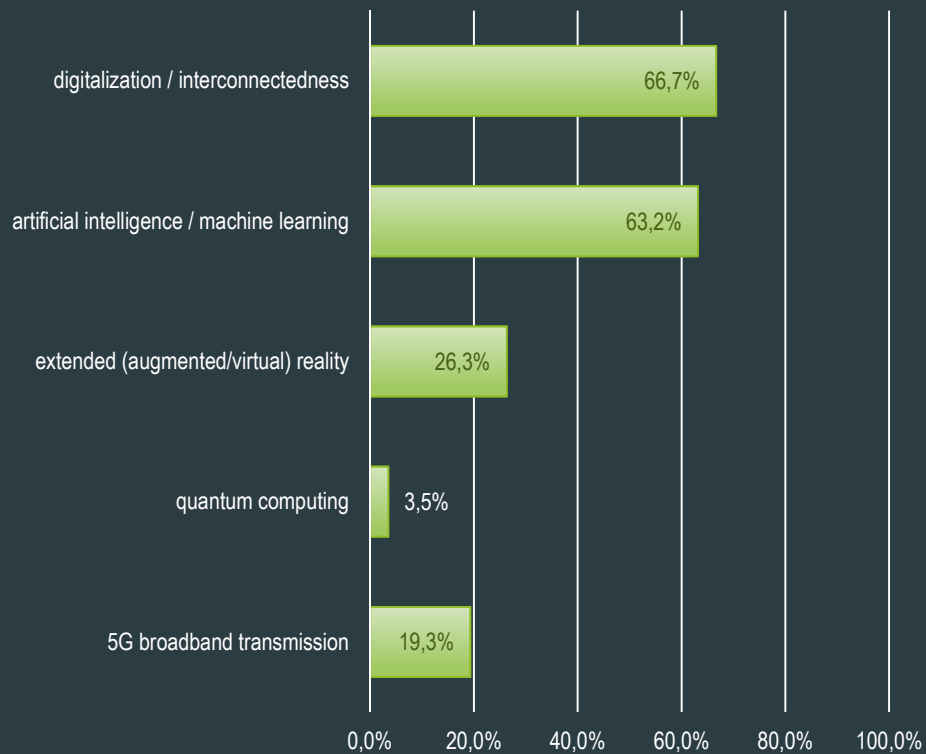
In which areas of automation / mechanical engineering are your products / technologies being / going to be applied?



companies and research institutes targeting automation / mechanical eng., multiple answers included

- ▶ this and the following question have been put to organizations that indicated either measurement & control / automation or mechanical engineering as a present or future target market
- ▶ in total, 32.2% of the companies and institutes are active in measurement & control technology / automation – 37.3% are active in mechanical engineering
- ▶ process control in the microtechnology industry is the most common application field in automation / mechanical engineering today: 54.4% of organizations supply this field, this share will increase slightly to 56.1% in the medium term
- ▶ robotics follows in second place with 49.1% – in three years' time it might be slightly more (52.6%)
- ▶ 26.3% of organizations are currently active in the field of rapid manufacturing/rapid prototyping, and this proportion will remain stable in the medium term
- ▶ regarding cyber physical systems, the current low share of 8.8% is expected to rise to 17.5% within the next three years
- ▶ in the other areas the share is and remains rather low

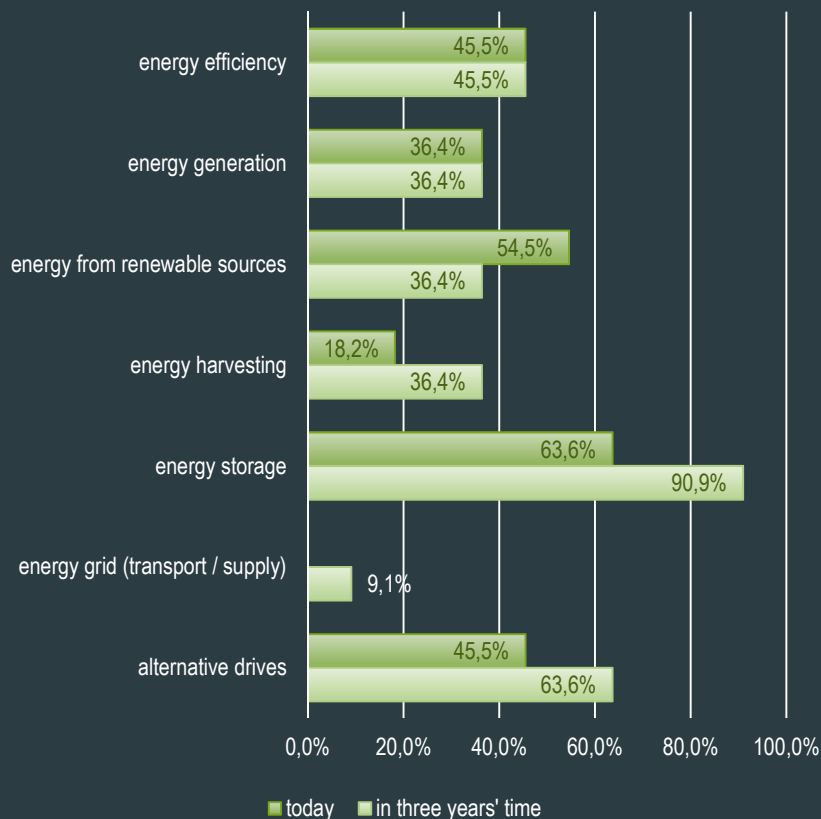
What do you consider to be major drivers for innovation in automation / mechanical eng. at this point in time?



companies and research institutes targeting automation / mechanical eng., multiple answers included

- ▶ two thirds (66.7%) of the microtechnology organizations targeting automation or mechanical engineering applications consider digitalization to be a major driver for innovation in automation / mechanical engineering
- ▶ slightly fewer (63.2%) see artificial intelligence and machine learning as essential drivers
- ▶ 26.3% consider augmented reality/virtual reality as a driver
- ▶ 5G broadband transmission is considered to be a key driver to innovation in automation / mechanical engineering by 19.3% of microtechnology organizations active in these fields
- ▶ the share of organizations that consider quantum computing as a driver for innovation in automation or mechanical engineering is very low at 3.5%

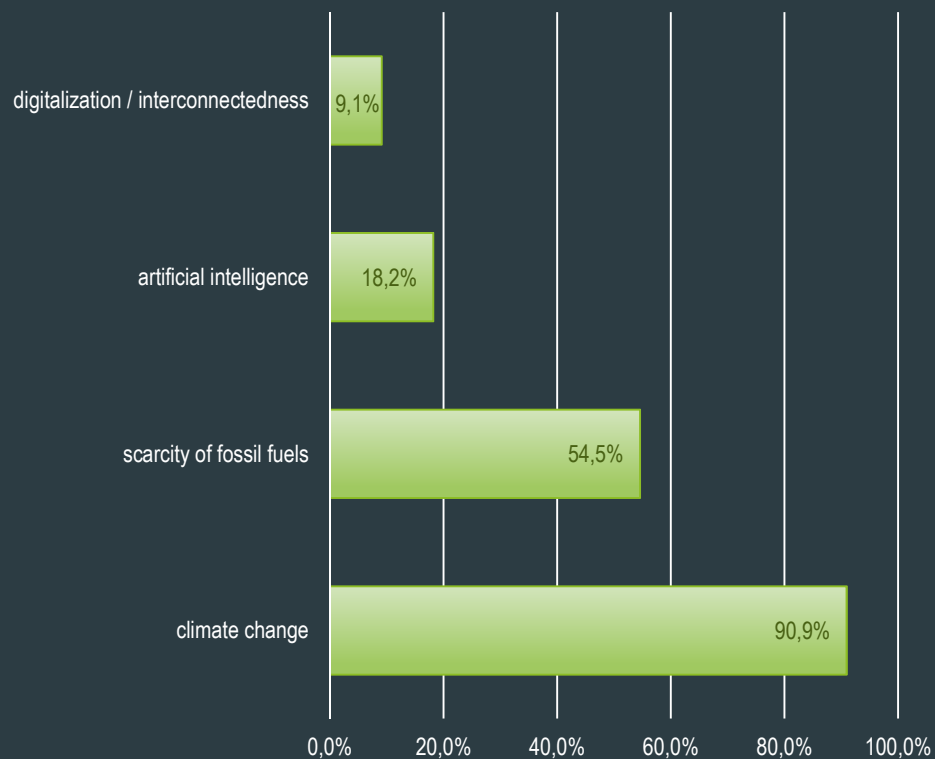
In which areas of power engineering are your products or technologies being / going to be applied?



companies and research institutes targeting the power engineering industry
multiple answers included

- ▶ this and the following question have been put to organizations that indicated power engineering as a present or future target market – overall, only a small proportion (9,3 %) of the responding companies and institutes are active in power engineering to date – this may explain the high dynamics apparent in the results
- ▶ energy storage is an attractive topic for the industry: 63.6% supply products and technologies for this area, in future it may be up to 90.9%
- ▶ the share of companies and institutes working on alternative drives will also rise from 45.5% today to 63.3% in three years' time
- ▶ more than half (54.5%) of the companies and institutes active in the field of power engineering are currently involved in renewable energies, although the share is expected to decline to 36.4%
- ▶ the proportion of companies and institutes working on energy efficiency (45.5%) and energy generation (36.4%) will remain stable within the next three years
- ▶ 18.2% of microtechnology organizations that target the power engineering industry are currently involved in energy harvesting, an increase to 36.4% is expected
- ▶ energy transport / supply will only become a topic for the microtechnology sector within the next three years

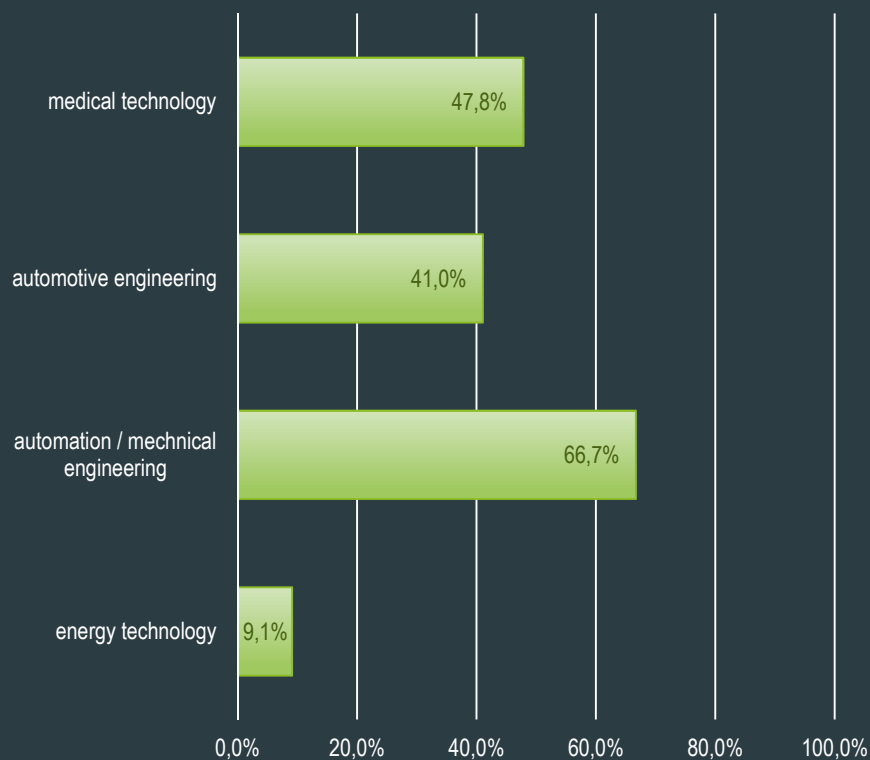
What do you consider to be major drivers for innovation in power engineering at this point in time?



- ▶ not surprisingly, climate change is considered to be the strongest driver for innovation in power engineering – 90.9% of the companies and institutes targeting this industry think so
- ▶ the scarcity of fossil fuels is considered to be an important driver of innovation by more than half (54.5%) of the companies and institutes active in power engineering
- ▶ 18.2% of respondents consider artificial intelligence to be an important driver
- ▶ only 9% consider digitalization / interconnectedness to be an innovation driver in energy technology

companies and research institutes targeting the power engineering industry
multiple answers included

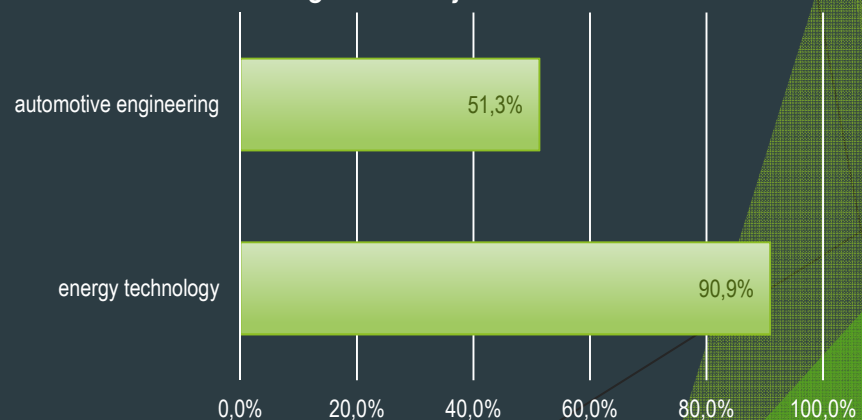
Digitalization / interconnectedness is a major driver for innovation in



companies and research institutes, multiple answers included

- ▶ of the four application fields, digitalization has the greatest influence on innovation in automation / mechanical engineering (66.7%), followed by medical technology (44.8%) and automotive engineering (41%) – only 9.1% consider digitalization to be an important driver of innovation in power engineering
- ▶ the microtechnology industry considers climate change to be a major driver for innovation in power engineering (90.0%), and to a lesser but still high extent for innovation in automotive technology (51.3%)

Climate change is a major driver for innovation in



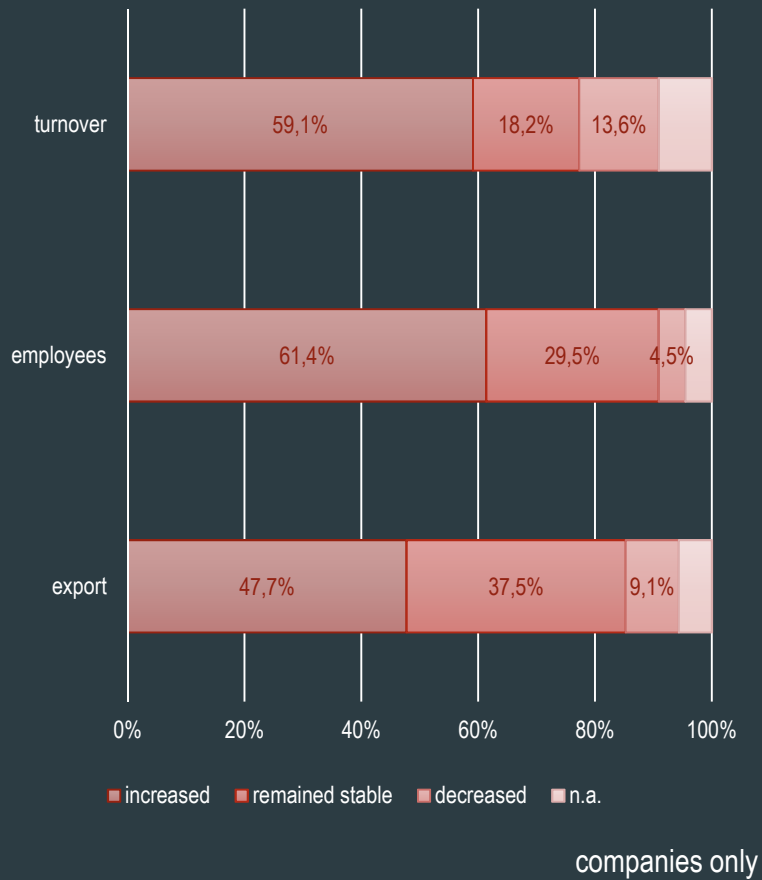


- ▶ Once a year, we ask the microtechnology industry in Europe about its economic situation.
- ▶ We ask the industry for the past and prospective development of turnover, employees, export and international markets.
- ▶ This year, we have excluded business development forecasts from evaluation due to the coronavirus pandemic whose impact on the economy became apparent only after the survey was finished.
- ▶ Prospective development of international markets are included but may, of course, change in the medium term due to current economic uncertainties caused by the corona crisis.
- ▶ However, according to another, more recent survey, IVAM members at present do not expect the corona crisis to have a lasting impact on the industry's performance. (Please read https://www.ivam.de/corona_krise)

Business development

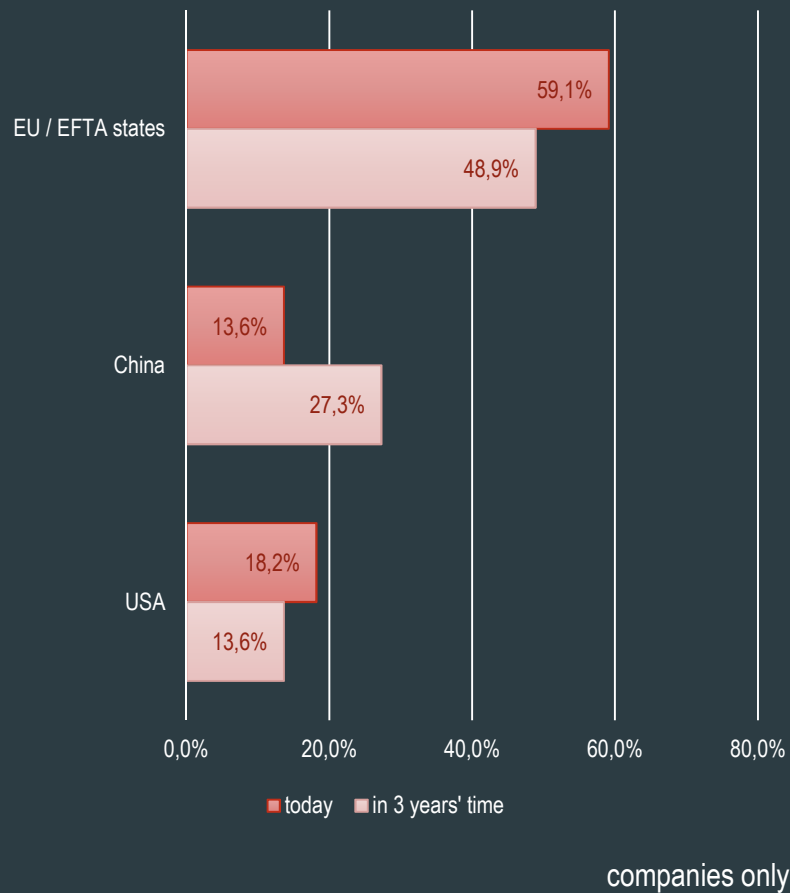


Business development in the European microtechnology industry 2019



- ▶ business development has been rather positive for the European microtechnology industry in the past year:
- ▶ 59.1% of companies have been able to increase turnover
- ▶ 61.4% of companies have increased the number of employees in the past year – on the other hand, a comparably large proportion (13.6%) of companies had to shed jobs in the same period
- ▶ *a large part of microtechnology organizations find finding and retaining qualified employees difficult (see last question)*
- ▶ just under half (47.7%) of companies have increased export in the past year (2019) – export has remained stable for 37.5% of companies

Which is your most important export region?



- ▶ for the European microtechnology industry foreign trade currently (early 2020), as in previous years, concentrates on the EU and EFTA states: for 59.1% of companies, this is the most important export region
- ▶ companies expect exports to the USA to decline – probably due to the current trade conflicts (see external uncertainties)
- ▶ at present, the USA is the most important market for 18.2% of companies; the USA is still ahead of China with 13.6%
- ▶ but in three years' time only 13.6% of companies see their primary export market in the USA, compared to 27.3% in China
- ▶ three years ago (2017) the industry predicted that China would be more important as an export market than the USA in 2020 – the uncertain economic growth in China has probably delayed this development (see external uncertainty factors)
- ▶ in other regions of Asia, such as South Korea, India and the ASEAN region, only a small proportion of companies have their main export market
- ▶ Japan is the most important export market for none of the companies surveyed

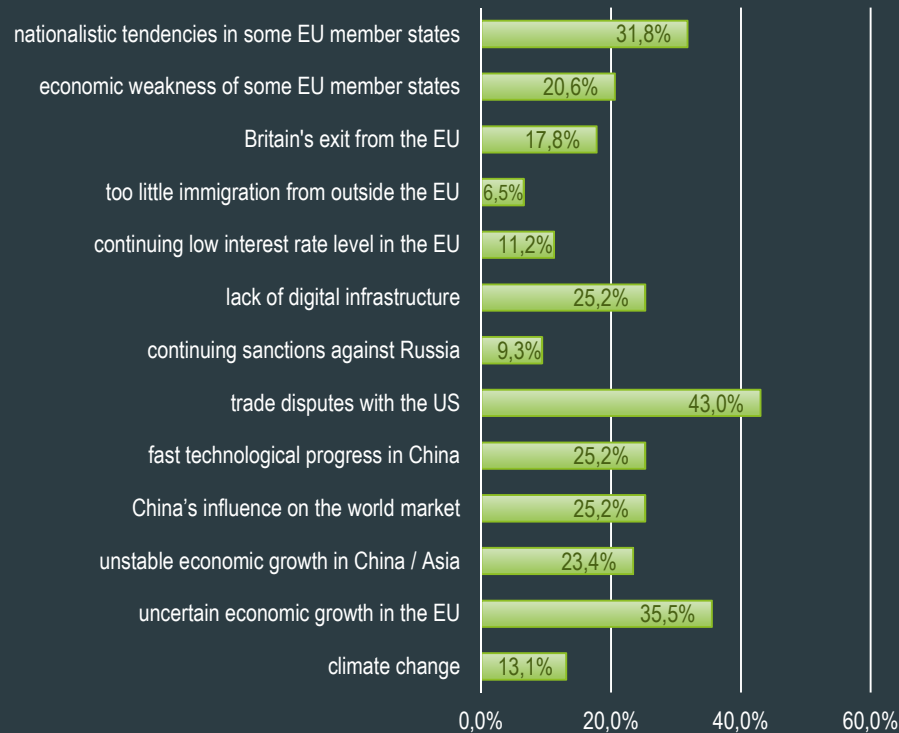


- ▶ What influence trade conflicts or legal regulations have on the microtechnology industry, and how the industry generally copes with necessary change processes?
- ▶ We have asked the following two questions in 2017 already, although with partly differing answer options, since some topics that were up-to-date back then have lost their relevance and some new ones have emerged since then.
- ▶ To read the results of the 2017 survey, visit https://www.ivam.de/research/economic_data/europe_s_microtechnology_industry_signals_growth and download the summary
- ▶ The coronavirus pandemic had not yet reached a critical stage at the time of the survey and was not included in the questionnaire – also, none of the participants mentioned it in the “others” comment option – this would certainly have been different a few weeks later.
- ▶ To examine the prospective impact of the coronavirus pandemic on the microtechnology industry, we have conducted a short survey among the IVAM member companies later in March 2020; to see the results, visit https://www.ivam.de/corona_krise
- ▶ Brexit has been a special topic in our 2019 survey; to read the results, visit https://www.ivam.de/research/economic_data/ivam_survey_2019_brexit

Uncertainty factors



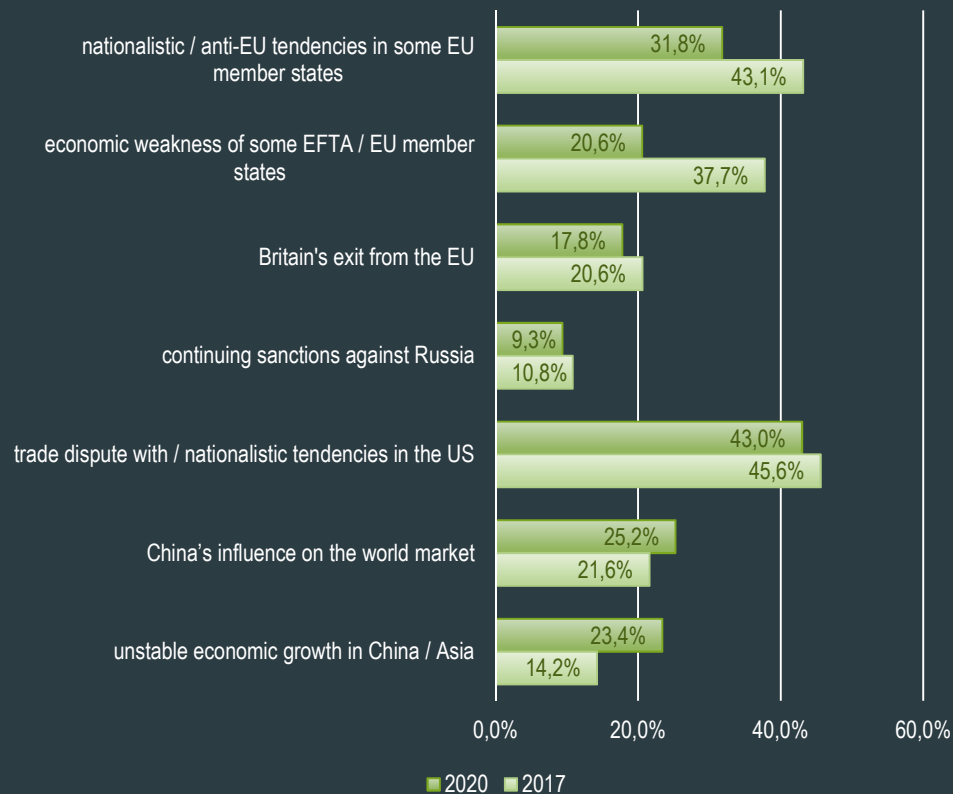
What do you perceive as a possible external uncertainty factor for the stability of your organization?



companies and research institutes, multiple answers included

- ▶ the trade dispute with the USA is the biggest external uncertainty factor for the European microtechnology industry (43%)
- ▶ *the trade dispute with the USA mainly affects **companies** (52.3%), again mainly in **Germany** (61.8%)*
- ▶ uncertain economic growth in the EU (35.5%) and nationalist tendencies in the EU (31.8%) also cause concern in the microtechnology industry
- ▶ *trade conflicts and economic uncertainties are greater factors of uncertainty for **companies** (evidently) than for research institutes*
- ▶ *fast technological progress in China and climate change are noticeably greater factors of uncertainty for research institutes than for companies*
- ▶ *Brexit is particularly problematic for companies in **Great Britain** (60%), but in total only for 17.8% of the companies and institutes surveyed*

What do you perceive as a possible external uncertainty factor for the stability of your organization?



companies and research institutes, multiple answers included

- ▶ anti-EU tendencies and the economic imbalance within the EU in some member states preoccupied the microtechnology sector even more in 2017 than they do today
- ▶ today, the trade dispute with the US bothers a slightly smaller proportion of microtechnology organizations than “nationalistic tendencies in the economic policy of the USA” did in 2017
- ▶ Brexit, now that has been executed, bothers a slightly smaller proportion of microtechnology organizations today than „pending Brexit“ did in 2017
- ▶ China has become an uncertainty factor for a larger proportion of microtechnology organizations since 2017 – its influence on the world market as well as its unstable economic growth
- ▶ to read the 2017 results go to https://www.ivam.de/research/economic_data/stat_88

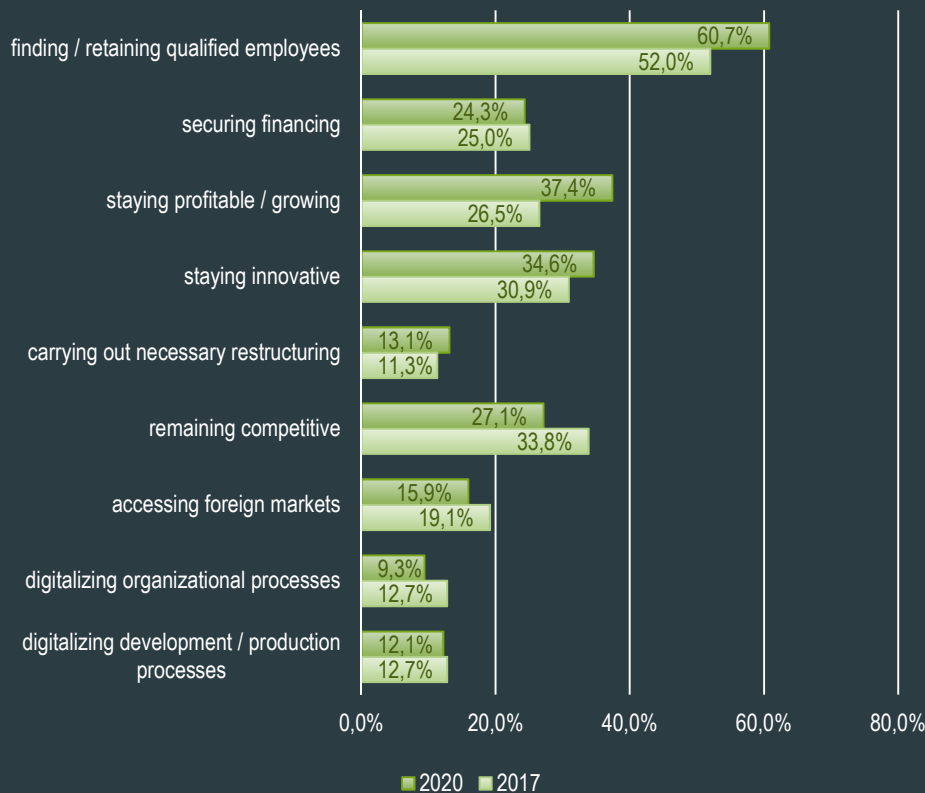
What do you perceive as a possible internal uncertainty factor for the stability of your organization?



companies and research institutes, multiple answers included

- ▶ competition for specialists is becoming apparent in the microtechnology industry: 60.7% of organizations see finding and retaining qualified employees as an uncertainty factor for the stability of their organization
- ▶ companies and research institutes alike are bothered by the need to find and retain qualified employees
- ▶ sustained profitability (37.4%) and innovative strength (34.6%) are factors of uncertainty for more than a third of microtechnology organizations
- ▶ 27.1% of those surveyed are concerned about their competitiveness
- ▶ *remaining competitive and innovative, the opening up of foreign markets and, above all, profitability are (evidently) factors of uncertainty that weigh more heavily on **companies** than research and university institutes*
- ▶ *the proportion of **companies** that are concerned about being able to operate profitably or grow is remarkably high at 45.3%*
- ▶ the proportion of companies and institutes for which legal requirements represent an uncertainty factor is rather low at 15%

What do you perceive as a possible internal uncertainty factor for the stability of your organization?



companies and research institutes, multiple answers included

- ▶ in 2017, the need to find qualified staff was the greatest internal challenge, just as it is today; however, the proportion of affected organizations has risen from 52% to 60.7%
- ▶ the proportion of organizations that worry about staying profitable and innovative has risen since 2017
- ▶ three years ago a larger proportion of microtechnology organizations was concerned about remaining competitive
- ▶ the proportion of organizations bothered by the necessity to digitalize organizational or production processes, was and still is rather low
- ▶ to read the 2017 results, go to https://www.ivam.de/research/economic_data/stat_89

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