



EUROPEAN CENTER FOR  
DIGITAL COMPETITIVENESS

BY ESCP BUSINESS SCHOOL

# **SPOTLIGHT** **AUTONOMOUS MACHINES**



## » Preface

Autonomous machines, such as self-driving cars and self-controlling drones, are a key future technology. They are fundamentally different from specialised devices from the field of Industry 4.0, in that they are also used outside of factories and can perform everyday tasks, such as transporting goods and people. Autonomous machines will therefore profoundly change the economy and society – as well as military applications – in the coming years and decades.

For the digital sovereignty of states, autonomous machines have great strategic importance, and we only need to look at the USA and China to demonstrate this point. For years, the Chinese state has been investing hundreds of millions in Da-Jiang Innovations (DJI), the world's largest drone manufacturer. However, in December 2020, the United States accused DJI of abusive data collection and analysis, as well as high-tech surveillance, and blacklisted the company, thus making it much more difficult for DJI to access American technology.

Autonomous machines also have crucial economic importance, as they create opportunities for Germany and Europe. Unlike many consumer markets, such as online retail, search engines or social networks, this enormous growth market is still in its infancy and yet to be distributed fully, so there is consequently still great potential for Germany and Europe to take a leading role in this key future technology.

The urgency is extremely high in this regard, because the market for autonomous machines is developing very dynamically; nonetheless, there is still no public discussion of the field in Germany, let alone a clear positioning or strategies on how to respond to these technological developments.

We should learn from our experiences in autonomous machine consumer markets. We cannot afford inertia again, not this time. Instead, we need to act quickly, to avoid losing our footing in the global market.



Professor Dr. Philip Meissner

Berlin, June 2021

## » Authors



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Professor Dr. Renate Köcher is the director of the Allensbach Institute. The institute was founded in 1947 by Professor Dr. Dr. h.c. Elisabeth Noelle-Neumann (1916-2010). Today, it is one of the most renowned opinion and market research institutes in Germany and is owned by the Allensbach Foundation for Survey Research (Stiftung Demoskopie Allensbach).



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Professor Dr. Philip Meissner is the director of the European Center for Digital Competitiveness and the Chair of Strategic Management and Decision Making at ESCP Business School in Berlin. In addition to strategic decision-making processes, Professor Meissner deals with the influence and effects of digital transformation in companies and on society.



Prof. Dr. Klaus Schweinsberg

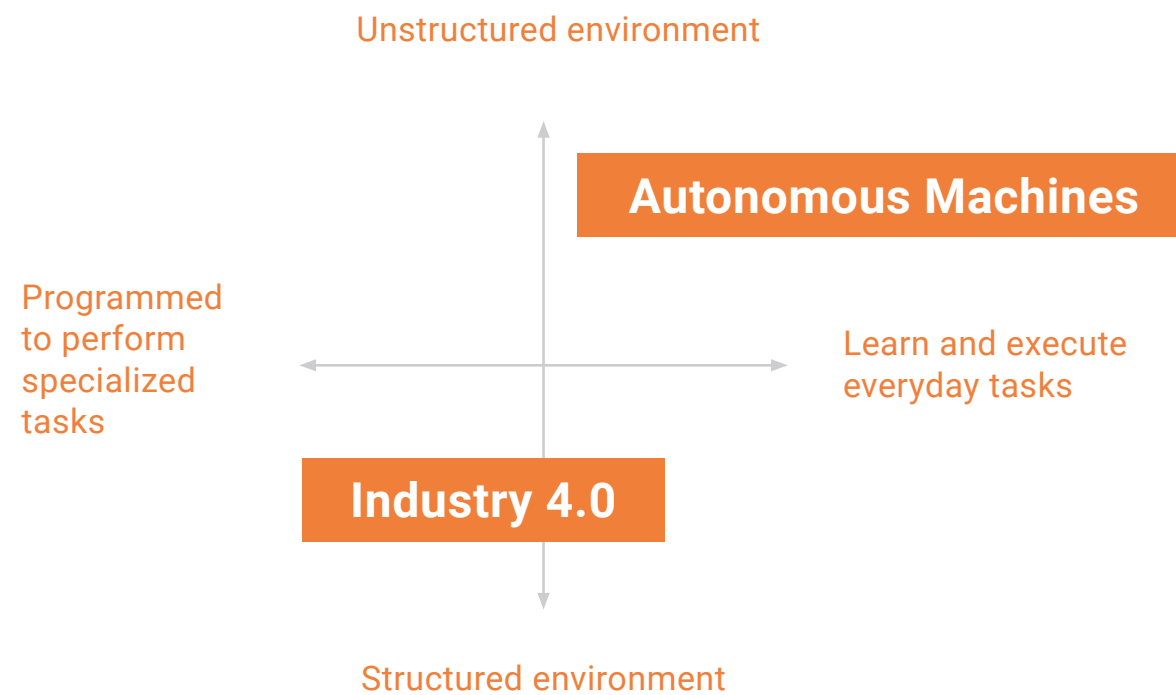
Professor Dr. Klaus Schweinsberg is the founder of the Centre for Strategy and Higher Leadership. As a personal consultant and coach, Professor Schweinsberg works for renowned entrepreneurs and top managers in Germany and abroad. In 2009, he was appointed to the circle of Young Global Leaders of the World Economic Forum. He is an Affiliate Professor at ESCP Business School.



Dr. Christian Poensgen

Dr. Christian Poensgen is director of the European Center for Digital Competitiveness at ESCP Business School in Berlin. Previously, he worked as the Senior Fellow Future of Work in the German Bundestag on various digital competitiveness projects, notably in the areas of continuing education, blockchain and agile administration. He is an ada Fellow and a mentor at a number of leading accelerators.

## » Autonomous machines are fundamentally different from Industry 4.0



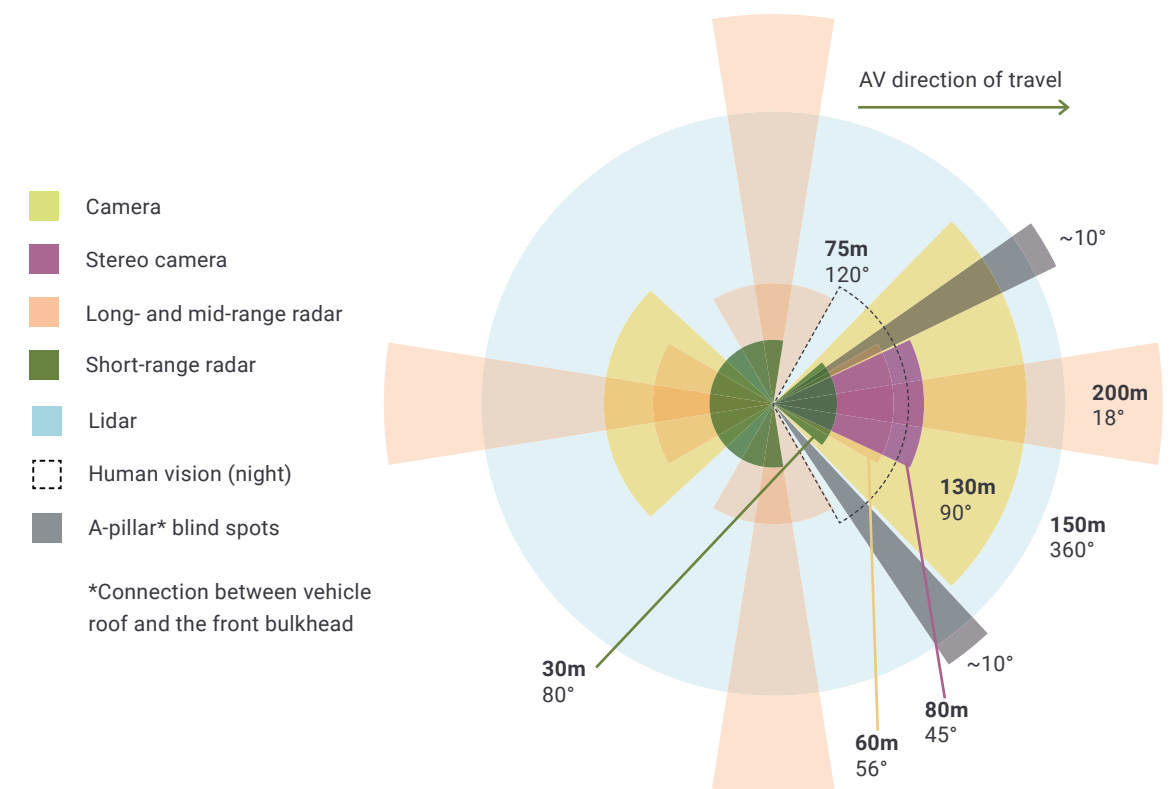
Systematisation of robotic systems along tasks and environment

Source: X Development (2020)





» Supported by sensors, autonomous machines collect in real time comprehensive data about the world

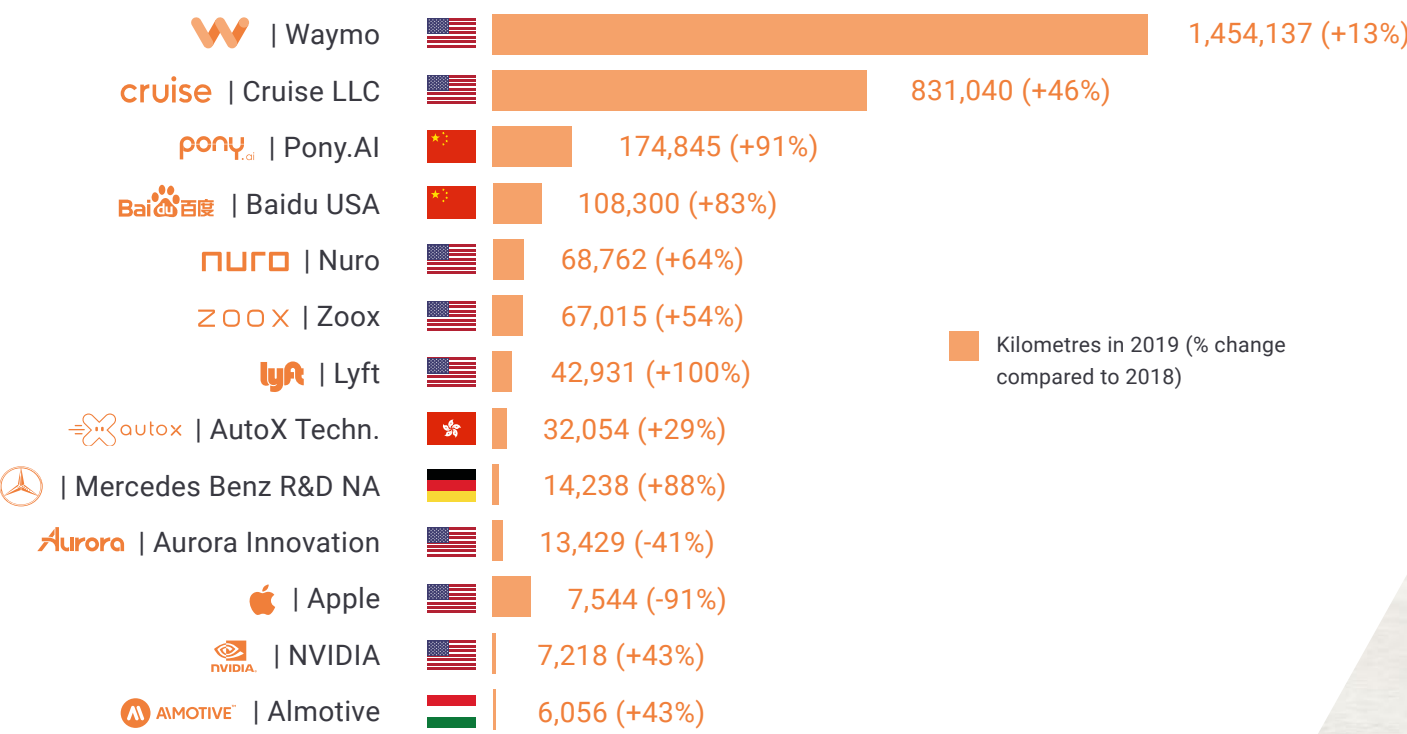


Overview of the environmental sensor technology used by autonomous vehicles

Source: University of Michigan (2017)

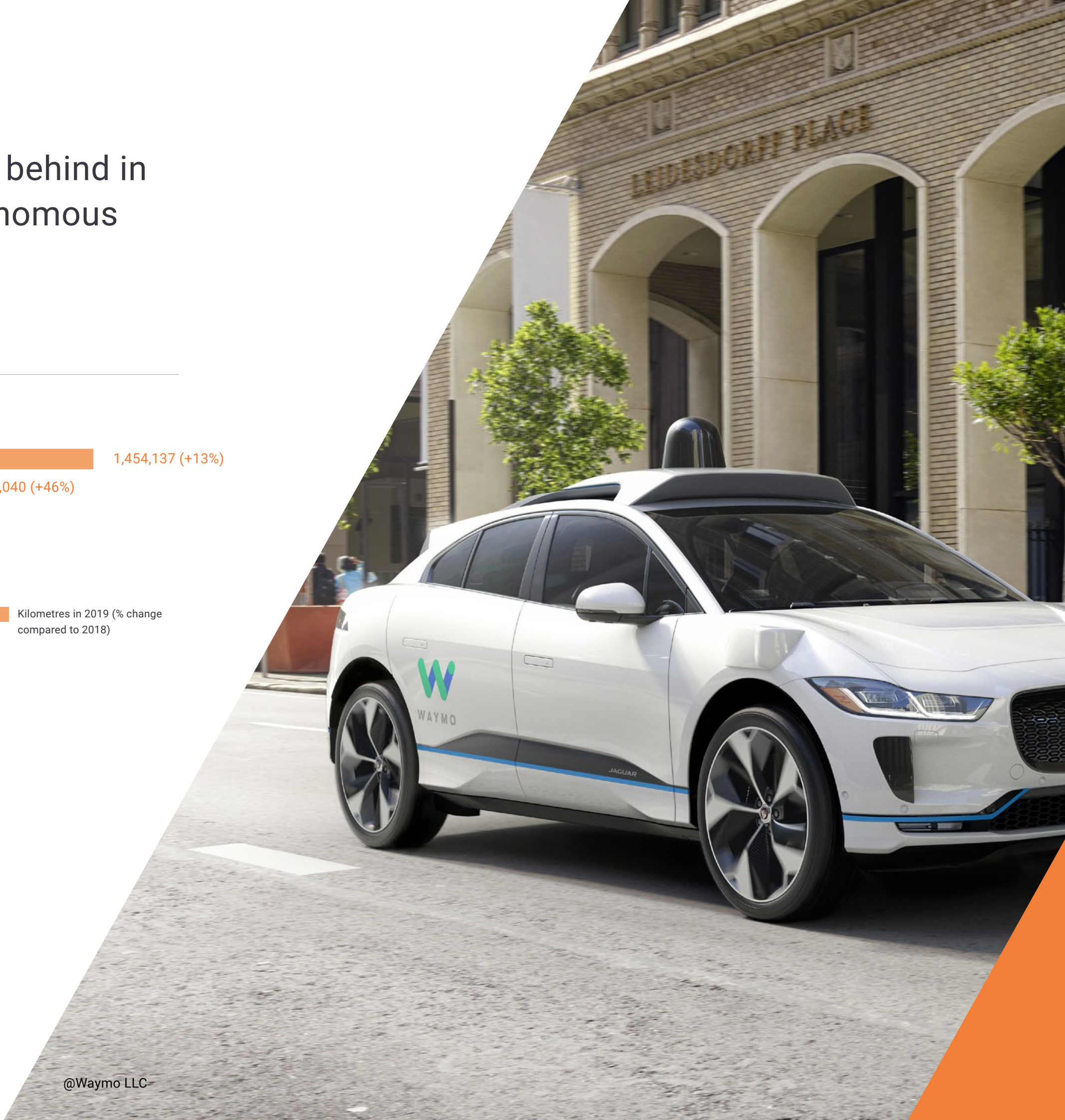


» European companies lag behind in the development of autonomous vehicles



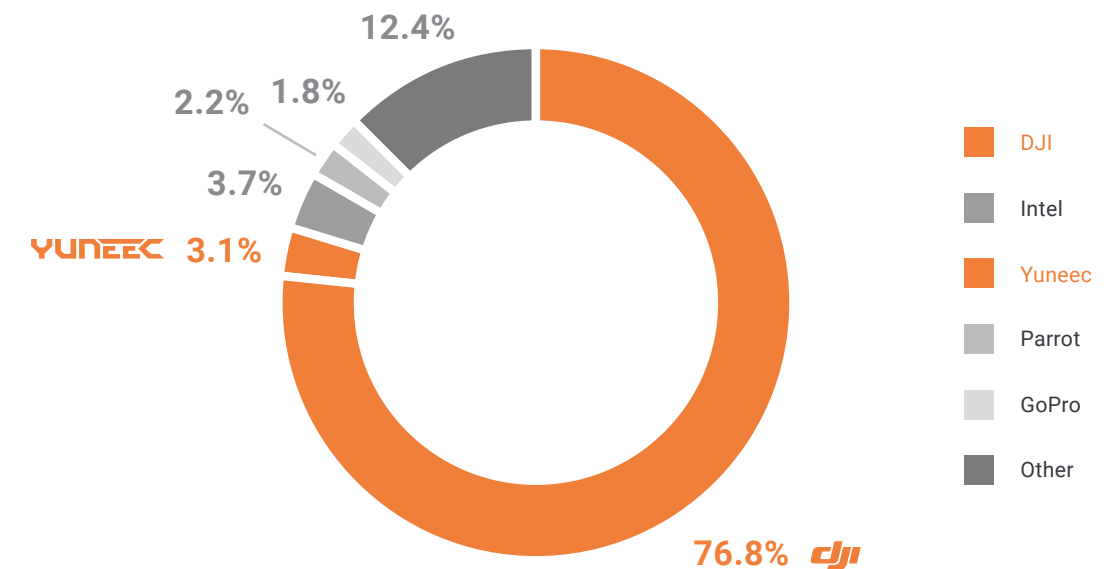
Overview of the test distance covered by autonomous vehicles in California

Source: U.S. Department of Motor Vehicles (2020)





## » Chinese companies are superior when it comes to autonomous drones



Market shares of the top five suppliers of autonomous drones in 2019 in the United States

Source: Drone Industry Insights (2019)

## » Study results



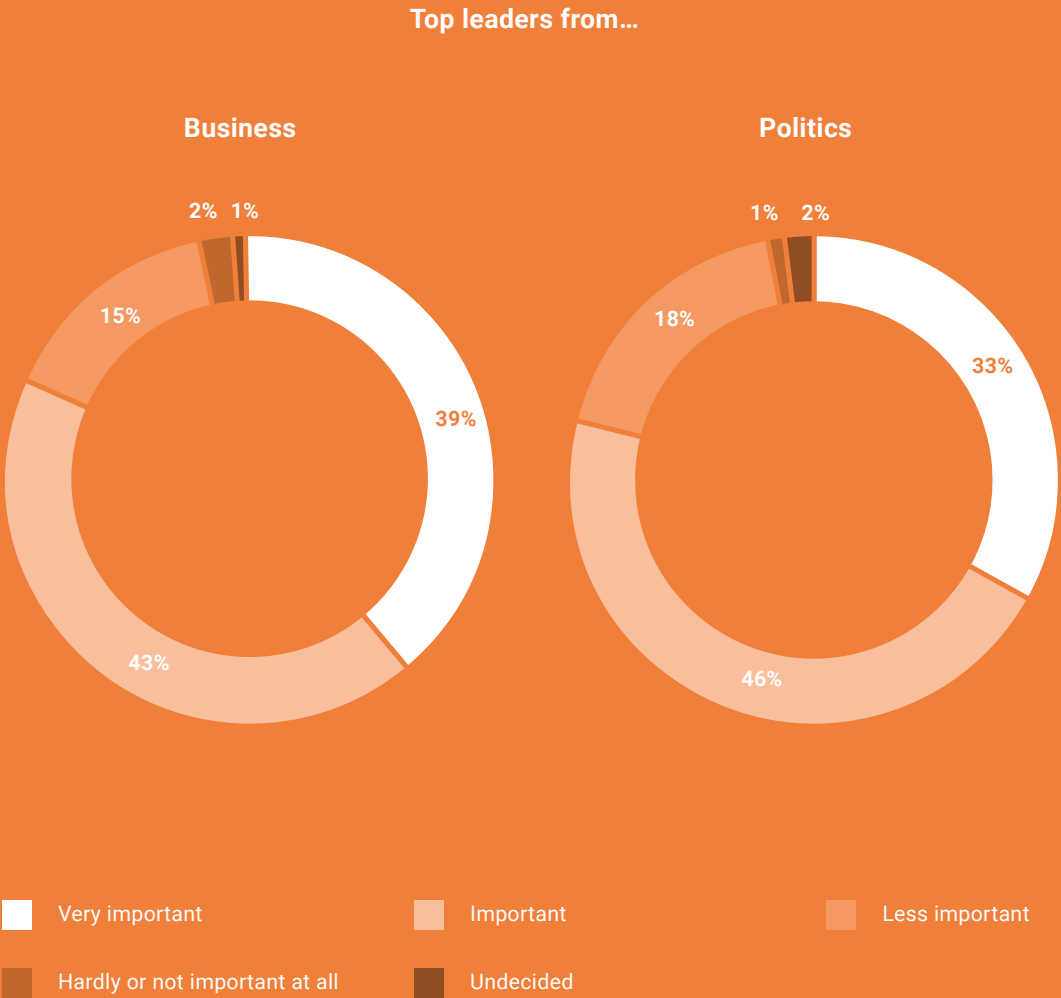


Great importance of autonomous machines

Top business and political leaders attribute exceptionally great importance to autonomous machines. A total of 82 per cent of business representatives are convinced that autonomous machines are of great importance for the future of the German economy; 39 per cent consider this technology to be very important for the future of the economy and a further 43 per cent consider it to be important. Top political leaders have a similar view, in that 79 per cent of them are convinced of the great importance of this technology for the future of the German economy.

GRAPH 1

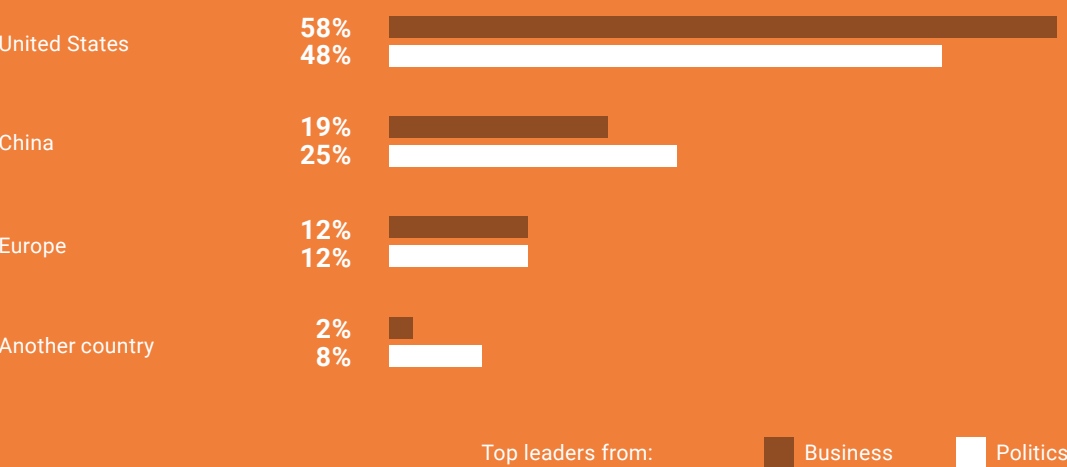
**QUESTION:** “When it comes to autonomous machines (e.g. self-driving cars or self-flying drones): How important do you think autonomous machines are for the German economy? Are they...”



Basis: Federal Republic of Germany, top leaders from business, politics and administration  
Source: CAPITAL-FAZ-Elite-Panel, IfD survey 8254

GRAPH 2

**QUESTION:** “Specifically on the subject of self-driving cars: Who do you think is currently leading in the development of self-driving cars: the United States, China, Europe or someone else?”



Basis: Federal Republic of Germany, top leaders from business, politics and administration  
Source: CAPITAL-FAZ-Elite-Panel, IfD survey 8254

The United States leads in the field of autonomous driving

At the same time, the vast majority is convinced that the big players in the field of autonomous driving are based in the United States and China. In the field of autonomous driving, for example, the United States is primarily rated as the leader, followed by China by a wide margin: 58 per cent of top business leaders consider the United States to be the leader in this field, while 19 per cent name China and only 12 per cent name Europe. Politicians do not see Europe's positioning any differently, but they do so to some extent with regards to the gap between the United States and China. Fewer than 50 per cent of the politicians surveyed are convinced that the United States is the leader in this field, while 25 per cent attribute this accolade to China.

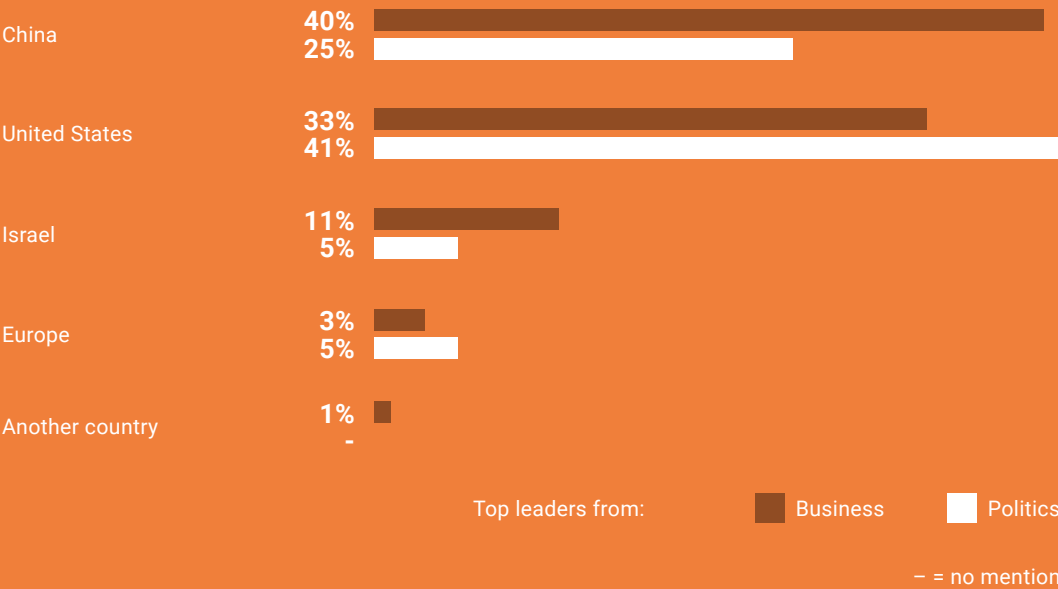


### The United States and China lead in the field of drones

The top leaders’ points of view differ with regards to the development of autonomous drones. Here, the top business leaders see China in the lead, followed by the United States and then Israel by a wide margin. 40 per cent of the top business leaders see China in the lead here, 33 per cent the United States and 11 per cent name Israel. Political leaders, on the other hand, think that the United States is also the leader in this area, followed at some distance by China. Israel, on the other hand, is seen by only a small minority of politicians as a relevant player in this field. It is remarkable how the opinions of business and political leaders diverge here. In general, there is greater agreement between top business and political leaders than there is on this issue. However, business and politics agree on one thing: Europe definitely cannot claim to be a leader in the development of self-controlling drones. Only 3 per cent of top business leaders and 5 per cent of politicians attribute a leading position to Europe in this regard.

GRAPH 3

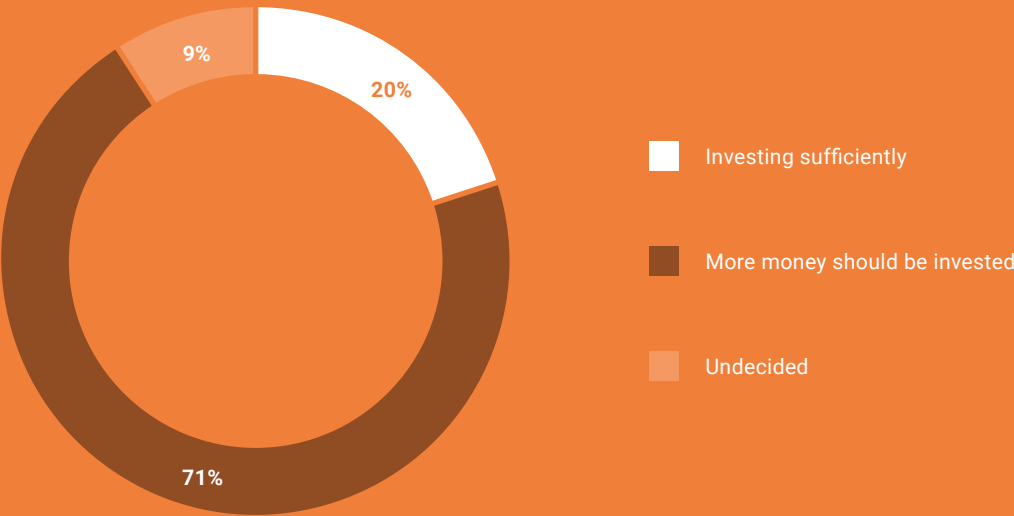
**QUESTION:** “Specifically on the subject of self-flying drones: Who do you think is currently leading in the development of such drones: the United States, China, Europe or someone else?”



Basis: Federal Republic of Germany, top leaders from business, politics and administration  
Source: CAPITAL-FAZ-Elite-Panel, IfD survey 8254

GRAPH 4

**QUESTION:** “What is your opinion: Is Europe investing sufficiently in the research and development of autonomous machines compared to the United States and China, or should more money be invested in this field?”



Basis: Federal Republic of Germany, top leaders from business, politics and administration  
Source: CAPITAL-FAZ-Elite-Panel, IfD survey 8254

More investments necessary

Against this background, it is not surprising that the vast majority of top leaders consider European investments in the field of autonomous machines as inadequate. Only 20 per cent consider the investments sufficient, 71 per cent insufficient. Business and politics are in complete agreement on this issue.

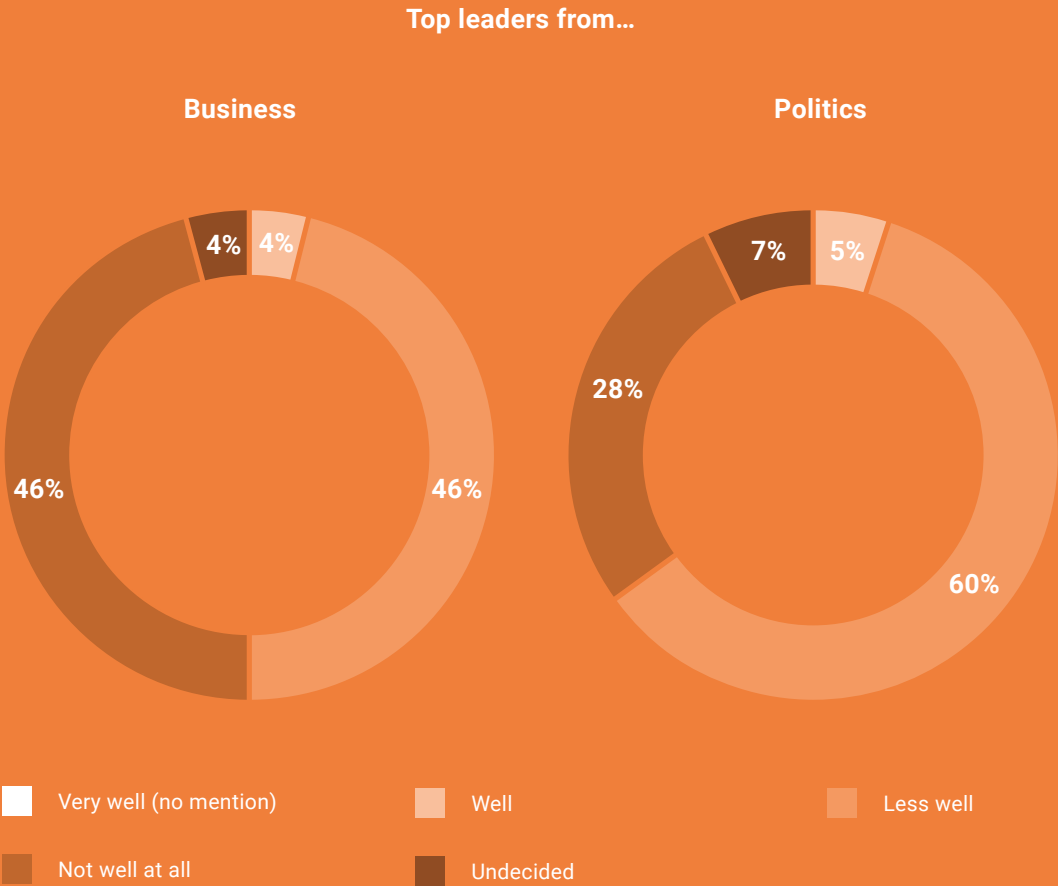


Unsatisfactory Bundeswehr (German army) equipment

There is an even more unanimous request among top leaders for more investment in equipping the Bundeswehr with autonomous machines. In total, 87 per cent of business and political leaders are convinced that more investment is needed in this field. The overwhelming majority consider the Bundeswehr's current equipment in terms of autonomous machines as insufficient. In business, 92 per cent are convinced that the Bundeswehr is less well-equipped or not well-equipped at all with autonomous machines such as reconnaissance drones; in politics, 88 per cent agree with this assessment.

GRAPH 5

**QUESTION:** “Autonomous machines, e.g. reconnaissance drones, also play an increasingly important role in the military sector. If you consider what you know or assume about this subject: How is the Bundeswehr equipped with autonomous machines? Would you say...”



87 per cent call for more investment in equipping the Bundeswehr with autonomous machines.

Basis: Federal Republic of Germany, top leaders from business, politics and administration  
Source: CAPITAL-FAZ-Elite-Panel, IfD survey 8254

GRAPH 6

**QUESTION:** “Communication networks and power grids are part of the so-called ‘critical infrastructure’ of a country. Do you consider autonomous machines to also be part of the critical infrastructure, due to the large amount of data collected, or do you not consider autonomous machines to be part of the critical infrastructure?”

Autonomous machines are part of the critical infrastructure



Top leaders from...



Basis: Federal Republic of Germany, top leaders from business, politics and administration  
Source: CAPITAL-FAZ-Elite-Panel, IfD survey 8254

Autonomous machines are part of the critical infrastructure

The vast majority of top leaders attribute great importance to autonomous machines – and not only for the economy and military operations, as they are also convinced that, like communications and power grids, they are part of the critical infrastructure. In total, 61 per cent of top leaders are convinced of this statement, and leading politicians tend to be even more convinced than top business leaders.

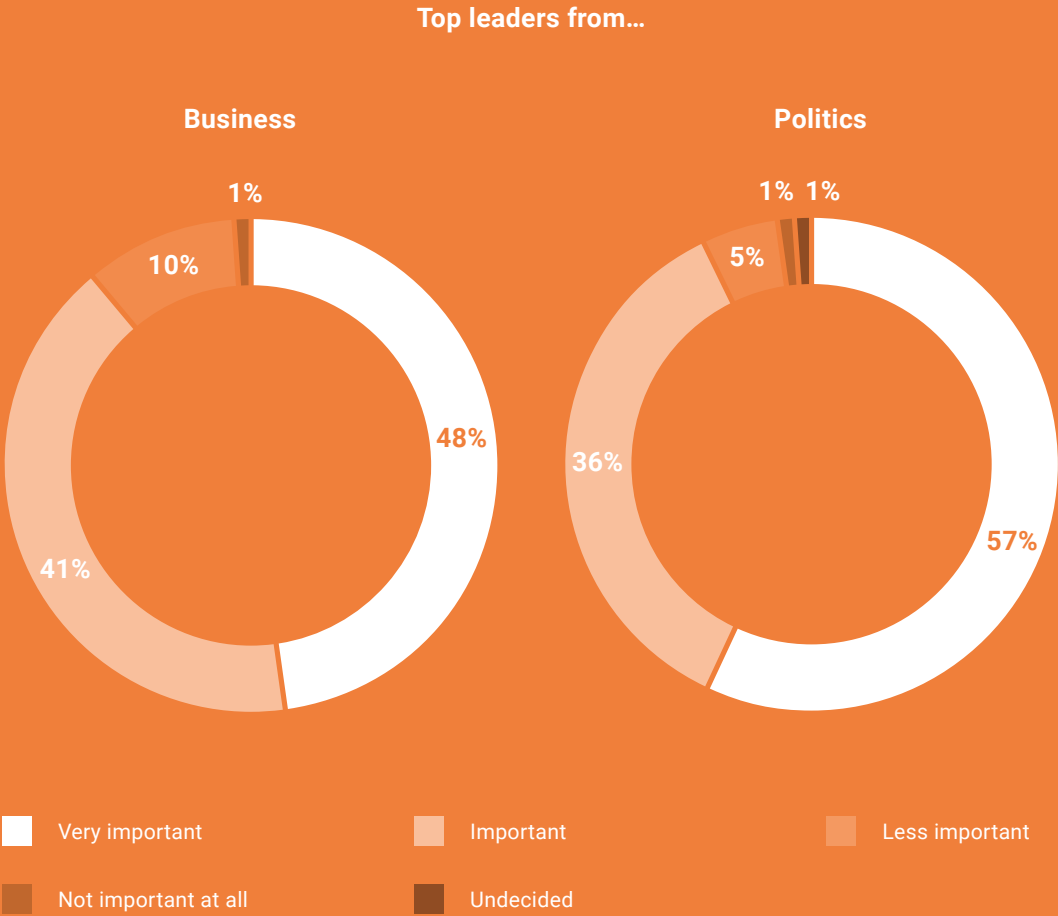


Manufacturing in Europe is important

The vast majority consider it important that autonomous machines, such as self-driving vehicles and self-controlling drones, are also manufactured in Europe and that European data sovereignty is also secured. In total, 89 per cent of business leaders and 93 per cent of the politicians consider it important or very important that autonomous machines are also produced in Europe.

GRAPH 7

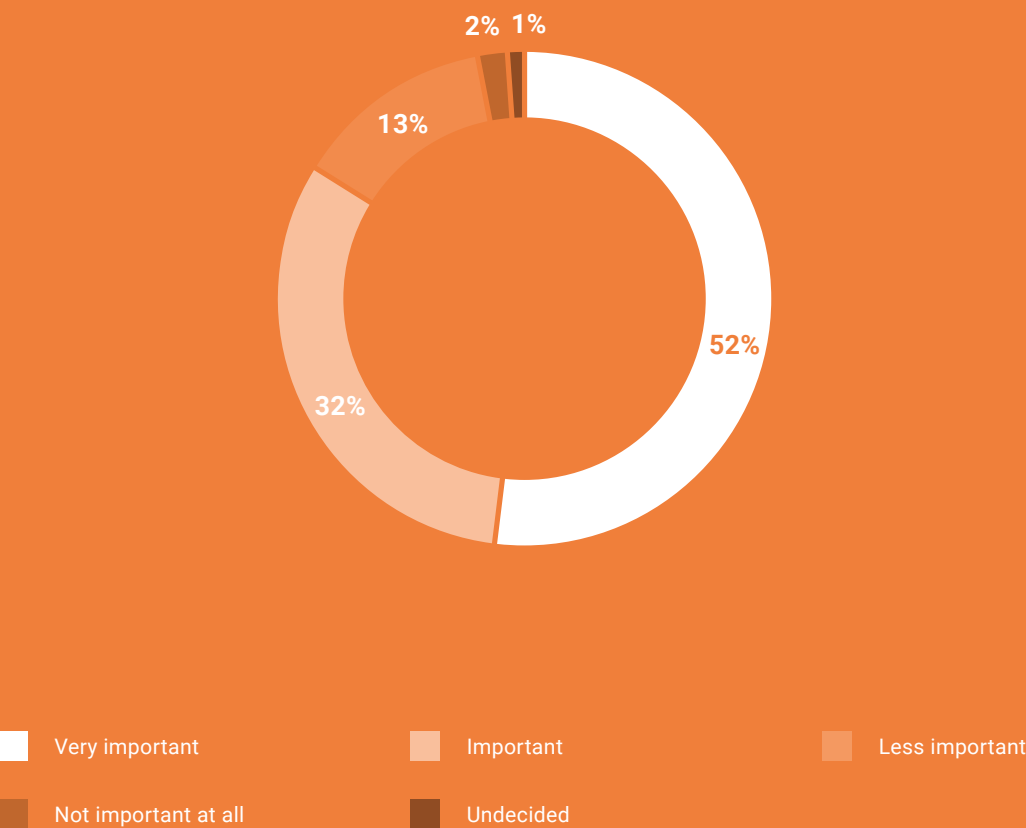
**QUESTION:** “How important do you think it is that autonomous machines such as self-driving vehicles and self-controlling drones are also manufactured in Europe? Do you think it is...”



Basis: Federal Republic of Germany, top leaders from business, politics and administration  
Source: CAPITAL-FAZ-Elite-Panel, IfD survey 8254

GRAPH 8

**QUESTION:** “Autonomous machines, such as self-driving vehicles or self-controlling drones, collect large amounts of data and image information. How important do you think it is that this data, if collected in Europe, can also only be stored and analysed within the EU? Do you think this is...”



Basis: Federal Republic of Germany, top leaders from business, politics and administration  
Source: CAPITAL-FAZ-Elite-Panel, IfD survey 8254

### European data sovereignty?

Since autonomous machines collect large amounts of data and image information, the overwhelming majority of top leaders also consider it important or very important that data collected in Europe can also only be stored and analysed within the EU. A total of 52 per cent of the top leaders consider this to be very important, and another 32 per cent consider it to be important. Only a small minority attribute no importance at all to this aspect. The politicians surveyed attach even greater importance to European data sovereignty than top leaders from business. However, these are gradual differences, rather than a fundamentally different opinion: 88 per cent of the politicians surveyed consider it important or even very important that data collected in Europe are also stored and analysed there; in the business community, 81 per cent agree with this statement.

All in all, this current survey shows that business and political leaders are well aware of the great importance of this technological development. It also shows that leaders are very conscious of the fact that Europe is still insufficiently positioned in the field of autonomous machines, is not investing enough and is still not clarifying its own position to an appropriate extent.



## » Recommendations for action



### LEVER 1 – Recognise and exploit opportunities offered by autonomous machines

Europe must recognise and quickly exploit the opportunities offered by autonomous machines as a key technology for the future

- › Autonomous machines are a key technology for the future, but the sector is still in its infancy. In contrast to markets such as online retail, search engines or social networks, American and Chinese competitors do not yet dominate
- › Therefore, there is still a great potential for Europe to take a leading position in the market of autonomous machines with European products and values – but the market is developing very dynamically, and action is now a matter of great urgency
- › As provided by the U.S. and Chinese governments, strategic support for the field of autonomous machines is also needed in Europe, e.g. through conducive investments and regulations

**Recommendation for action:** Since autonomous machines represent enormous potential as a key technology of the future, in a market that has not yet been dominated, strategic support for this area is needed in Europe

### LEVER 2 – Safeguarding autonomous machines as critical infrastructure

The German government should protect autonomous machines as critical infrastructure to safeguard the nation's digital sovereignty

- › Since autonomous machines have to be classified as critical infrastructure, and as they collect large amounts of sensitive data, the German government must protect them from sabotage and espionage, in order to preserve the nation's digital sovereignty

- › The new IT security law stipulates that both individual components and the political trustworthiness of the manufacturers of critical components must be checked; non-trustworthy manufacturers have to be excluded
- › Similarly, it should be specified for autonomous machines that critical hardware and software components may only be sourced from trusted manufacturers

**Recommendation for action:** In order to protect critical infrastructure from sabotage and espionage, the new IT security law should stipulate that critical hardware and software components for autonomous machines must also be sourced exclusively from trustworthy manufacturers

### LEVER 3 – Open-source solutions and open standards should be included in business models

As in the United States, open-source solutions and open standards in the field of autonomous machines should also receive more attention at the German and European level

- › Open-source solutions and open standards enable innovative suppliers from medium-sized companies to also contribute to the development of individual components, which promotes competition
- › As a result, open-source solutions create a collaboration platform that allows many, not just individual, companies to succeed in the market
- › Following the example of the U.S. government, open-source solutions and open standards in the field of autonomous machines should also be increasingly used in this country

**Recommendation for action:** Open-source solutions and open standards should be used and supported more frequently, in order for Germany and Europe to take a leading global position in the development of autonomous machines



## » European Center for Digital Competitiveness

BY ESCP BUSINESS SCHOOL

The European Center for Digital Competitiveness was founded at ESCP Europe Business School in Berlin with the goal of bringing digital competitiveness to the political and public debate, where it currently only plays a minor role.

Given the digital revolution that our economy and society currently face, digital competitiveness must take center stage in debates to secure our prosperity for the future.

Similarly, in this increasingly dynamic environment we want to support the initiative to position Europe as a global leader for the responsible application of technology for the benefit of society.

## » About ESCP Business School

ESCP Business School was founded in 1819. The School has chosen to teach responsible leadership, open to the world and based on European multiculturalism. Six campuses in Berlin, London, Madrid, Paris, Turin and Warsaw are the stepping stones that allow students to experience this European approach to management.

Several generations of entrepreneurs and managers were thus trained in the firm belief that the business world may feed society in a positive way.

This conviction and ESCP's values - excellence, singularity, creativity and plurality - daily guide our mission and build its pedagogical vision.

Every year, ESCP welcomes 6000 students and 5000 managers from 120 different nationalities. Its strength lies in its many business training programmes, both general and specialised (Bachelor, Master, MBA, Executive MBA, PhD and Executive Education), all of which include a multi-campus experience.

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