

Artificial Intelligence in Europe

Germany

Outlook for 2019 and Beyond

How 307 Major Companies Benefit from AI

REPORT COMMISSIONED BY MICROSOFT AND CONDUCTED BY EY

Contents

Preface

Foreword	06
Executive Summary - 'At a Glance'	08

Setting the Scene

About this Report	10
Rich Data	13
Executive Perspective	14
Participating Companies	16
Bits & Bytes	18
Follow the Money	20
Case Study ProSiebenSat.1	22
Experts	23

Role of AI in European Business

A Strategic Agenda	27
Among Friends	28
Push or Pull	29
Ready, Set...	30
AI Maturity Curve	32
State Your Business.	34
Case Study LEONI	36

Business Benefits and Risks

Another World	38
AI Here, There, Everywhere.	40
Case Study Munich Re.	41
Use it or Lose it	42
Making AI simple	44
Case Study DACHSER	47
Sector Benefits Landscape	48
Risky Business	51

Learn from the Leaders

Capabilities	53
AI Competency Model	54
Advanced Analytics	56
Data Management.	58
AI Leadership	60
Open Culture	62
Emerging Technology.	64
Agile Development	66
External Alliances	68
Emotional Intelligence	70
Case Study Omnibot.	73
AI Landscape in Germany.	74
Case Study Bayer	75

Fast forward

How to Get Started.	76
Who to Contact from Microsoft	78
Contributors from EY	79



We believe every organization, regardless of size, should have access to the benefits of AI technologies to help them grow and compete. Small and medium-sized businesses across Germany can benefit from embracing these new technologies just as much as large organizations. We're focused on helping firms of all sizes succeed by making AI technologies affordable, easy to access, and easy to use.

— Brad Smith, President and Chief Legal Officer for Microsoft

Amplify human ingenuity

In recent years, mobile networks, big data and cloud computing have shaped our economy substantially. Now we can see even more far-reaching developments: Machine learning and artificial intelligence, together with the internet of things, provide the basis for smart cities, efficient energy solutions, new modes of transport and radically different ways of manufacturing.

AI will transform the way we do business, by opening new possibilities to respond to customer requirements and market conditions, enabling companies in all sectors to drive revenue, increase profits and remain competitive. More than this, AI will help us to amplify our human ingenuity, opening exciting new possibilities for an unbeatable man-machine team, and offering the chance to solve major humanitarian challenges – all with tremendous economic potential. Right now, we are just starting to explore the full potential of AI as a driver of transformational change. Many companies still wonder where exactly AI could create value or how to get started. Even among advanced adopters of AI technology many questions remain. How can companies apply AI to empower employees, engage with customers or transform their business? Where do the benefits lie, and what are their blockers?

To provide answers, Microsoft commissioned this study to understand the AI strategy of major companies across 7 sectors and 15 countries in Europe. It examines these companies' readiness to adopt AI, how they rate the impact and benefits from AI implementations, and what they perceive as the risks and keys to success. We also spoke to a range of leading AI experts from business and academia to gain insights into the kind of change which we are on the cusp of, and the role AI is expected to play

as part of a broader transformational wave. This report aims at getting a deeper understanding of how companies currently manage their AI activities, and how AI leaders address opportunities and challenges ahead. To summarise, overcoming challenges appears to be as much about culture and leadership as it is about data, analytics, and technology. As AI helps leaders tackle operational tasks more effectively, they can better shift their focus on empowering their people. This means trusting people to approach challenges in their own way and ensuring they are equipped to be at their best. According to our findings the most 'AI mature' companies expect AI will be beneficial in 'empowering employees', they trust AI to 'engage customers' and they see AI predominately being driven from a combination of technology push and business pull.

Our research confirmed some of the key ingredients necessary for AI in organizations: A combination of domain and technical expertise, the appropriate technology, the right talent, and lots and lots of data. While letting tech-savvy individuals drive innovation is great for building understanding, true transformation will come when business people start suggesting problems for AI to solve - not the other way around.

At Microsoft, our goal is to democratise access to AI for everyone through innovative and powerful platforms. Above all, we're focused on ensuring that our AI tools and technologies are deployed responsibly and ethically, in order to earn people's trust.

We hope you find these insights inspirational for your own journey towards adopting AI and realizing its benefits in order to amplify human ingenuity in your organization.

Sabine Bendiek
Managing Director Microsoft Germany



At a Glance

While the hype of artificial intelligence (AI) and its potential role as a driver of transformational change to businesses and industries is pervasive, there are limited insights into what companies are actually doing to reap its benefits. This report aims at getting a deeper understanding of how companies currently manage their AI activities, and how they address the current challenges and opportunities ahead.

To get to the heart of this agenda, we received input from AI leaders in 307 companies, across 7 sectors and 15 countries in Europe, via surveys and/or interviews. Among the participants are major listed companies, companies held privately by foundations, as well as start-ups. Below is the brief summary of what they had to say.

AI is a “hot topic” - but more so on C-level than in daily operations

72% of the companies respond that AI is considered an important topic on the executive management level. This is significantly higher than on the non-managerial / employee level where AI is only considered an important topic in 30% of the companies. Interestingly, Board of Directors also came out lower with ‘only’ 39% of respondees reporting that AI is important to their board

Most impact expected from ‘optimizing operations’, with ‘engaging customers’ as a close second

89% of the respondents expect AI to generate business benefits by optimizing their companies’ operations in the future. This is followed by 72% that expect AI to be key to engaging customers by enhancing the user experience, tailoring content, increasing response speed, adding sentiment, creating experiences, anticipating needs, etc.

C-suite respondents scored ‘engaging customers’ highest of the AI benefit areas. Noticeably, 100% of the most advanced* companies expect AI will help them engage customers, compared to only 63% of the less mature companies. Using AI to ‘transform products and services’ comes out slightly lower with 66%, and ‘empowering employees’ the lowest with 62% of the companies expecting AI-generated benefits in that area.

AI is expected to impact entirely new business areas in the future

59% of the companies expect AI to have a high impact or a very high impact on business areas that are “entirely unknown to the company today”. This

is almost as much as AI is expected to impact the core of these companies’ current business with 65% expecting AI to have a high or a very high impact on the core business. With AI presumably pushing companies into totally new domains in the future, it is perhaps not surprising that AI is receiving attention as a key topic for executive management.

Very few of the 307 companies consider themselves “advanced” with AI

Despite the apparent sizable impact that companies expect from AI, only a very small proportion of companies, constituting 4% of the total sample, self-report that AI is actively contributing to ‘many processes in the company and enabling quite advanced tasks today’ (referred to as ‘most advanced’ in this report).

Another 27% are in the ‘released’ stage where they have put AI selectively to active use in one or a few processes in the company. The majority, 62% of companies, are still only planning for AI or are in early stage pilots. 7% of companies are self-rated as least mature, indicating that they are not yet thinking about AI at this stage.

only **4%**

of the companies are actively using AI in ‘many processes and to enable advanced tasks’

Percentage of companies that are still only in the planning or piloting stages:

62%

72%
of the companies

respond that AI is considered ‘an important topic’ on the executive management level

Noticeable potential for AI in many corporate functions

The most widely reported adoption of AI (49%) was in the IT/Technology function, followed by R&D with 39%, and customer service with 23%. Interestingly, several functions are hardly using AI at all; most notably, the general management function, where only 3% of the companies currently use AI, followed by procurement with 4% and strategic functions with 6%. This is perhaps surprising, given the many use cases and applicable solutions in these functional areas.

8 key capabilities that are most important 'to get AI right'

When asking the respondents to rank the importance of 8 capabilities to enable AI in their businesses, 'advanced analytics' and 'data management' emerged as the most important. 'AI leadership' and having an 'open culture' followed.

When self-assessing the capabilities where the companies are least competent, they point to emotional intelligence and AI leadership. These are defined as the (lack of) ability to lead an AI transformation by articulating a vision, setting goals and securing broad buy-in across the organization.

To summarize, the challenge ahead appears to be as much about culture and leadership as it is about data, analytics, and technology.

German companies beginning to explore possibilities with AI

When looking across the 35 companies that have participated in the study in Germany, it is clear that there are areas where they are actively exploring and pursuing possibilities with AI. Almost all German companies report they are somewhere in the middle stages of AI maturity. Most German companies state positive emotions about AI. They see Germany's national AI policy (AI made in Germany) as differentiated from other national plans. The expected impact of AI is high: the vast majority of German companies report expecting AI to create a high impact across all business areas, in particular core and new.

What sets the most 'AI mature' companies apart?

They expect AI will help them 'engage customers' (81% of 'more mature' companies vs. 61% of 'less mature' companies).

They see AI predominately being driven from a combination of technology push and business pull (59% of 'more mature' companies vs. 31% of 'less mature' companies).

They expect AI will be beneficial in 'empowering employees' (74% of 'more mature' companies* vs. 49% of 'less mature' companies)*.

They report using a combination of structured and unstructured data for AI (67% of 'more mature' companies vs. 14% of 'less mature' companies), and data from both internal and external sources (67% of 'more mature' companies vs. 17% of 'less mature' companies).

* 'More mature' defined as companies that self-ranked as 4 or 5 on the maturity 5-scale, and 'less mature' defined as companies that self-ranked as 1 or 2."

59%
of the companies

expect AI to have a high impact on 'business areas that are entirely unknown today'

Share of companies that use acquisitions as a way to obtain AI capabilities:

12% only

74%
of the most mature

companies expect that AI will be beneficial by 'empowering employees'

About this Report

What's new?

Artificial Intelligence (AI) is not new. It has existed for decades: processing voice to text or language translation; real-time traffic navigation; dynamically serving targeted advertisements based on personal data and browsing history; predicting trends and guiding investment decisions in financial institutions. The current developments have been fueled by an exponential rise in computing power, increasing accessibility and sophistication of powerful algorithms, and an explosion in the volume and detail of data available to feed AI's capabilities.

Reality vs hype

Only recently have we started to see more widespread, scaled adoption of AI across sectors, value chains and ecosystems. Yet AI technology is quickly approaching a point where it is becoming a critical element in enabling companies across sectors to drive revenue, increase profits and remain competitive.

We hear people in many companies talk about AI. While the hype is pervasive, not a lot of people fully understand its technological potential, where it can create value or how to get started. This report provides a practical understanding of why companies in Europe are investing in AI, what

they are investing in, and how they are managing the complicated process of adopting this new technology and deriving value across business opportunities.

Perspectives, experiences, self-assessment, and benchmarks

From new surveys, interviews and case studies gathered from approximately 307 companies, we provide a snapshot of the current state of AI in European markets. This includes analyzing AI's relative importance on the strategic

agenda, its expected impact and benefit areas, how mature companies are in terms of adoption, and examining self-reported competence levels regarding the capabilities required to succeed when implementing AI. From the aggregate dataset we have been able to determine some benchmarks across the covered markets, which we compare to Germany throughout the report. The report also covers a full spectrum of industry groups which reveals interesting insights.



AI will fundamentally affect the way how we interact and work, how we get information.

— **Munich Re**
Reinsurance company

Straight from the executives

This report and extensive dataset adds new insights primarily into how leading companies are approaching AI on a very practical level. We hear straight from executives how their companies are addressing current challenges, and how they apply AI to unlock new value pockets.

Based on the many interviews conducted, this report reveals some clear excitement and immense potential for using AI to bring new, improved products and services to market, create exceptional experiences for customers and employees, and create ways to operate that enhance performance across the board.

We learned that, regardless of which use cases the companies pursue and the role that AI currently has, taking a strategic outlook to assess the implications for the business and responding accordingly are increasingly seen as crucial for any executive agenda.

Contributions from open-minded and collaborative companies

We are extremely thankful for the time and effort the many executives have put into participating in interviews and providing data for this study. We're particularly appreciative of their willingness to openly share experiences and provide their perspectives on where the future of AI is heading.

While this indicates a general interest in the AI topic, it also speaks to the increasingly collaborative approach many leading companies are taking when entering new technology domains and embarking on journeys into uncharted waters.



AI holds all the traditional challenges of a classic transformation. Key is to focus on generating acceptance towards it by proving the value for the business.

— **ProSiebenSat.1**
Media company



In the financial sector, data is the new oil. If you succeed in merging the skills of data analysis, data security with the clients' trust, you can occupy a very good position in the market regardless of which business model you follow.

— Landesbank Baden-Württemberg Bank



The prerequisite for real added value through AI always has to be well-organized data.

— Lanxess Chemical company

Rich Data

Which sources of information is the study based on?

This report combines multiple sources of data to determine why, where and how AI is currently being used in business. It provides an inside view across markets and sectors, combining local and regional views. The quantitative perspective measures how advanced companies are in terms of AI, and the qualitative perspective indicates how to develop the skills required to succeed with AI initiatives. We have received input from over 330 people from 307 participating companies in the form of interviews and case studies, as well as 299 company responses to our online survey.

Extensive online survey data from business leaders in 299 companies

We have surveyed people with a leading role in managing the AI agenda in all the companies that have contributed to the study. This gives us an aggregate dataset that enables a perspective for each market and each sector, as well as comparative insights for the respective company types, sectors, and countries in Europe

Qualitative in-depth interviews with senior business executives

In addition, we conducted deep-dive interviews to gain deeper, qualitative insights into how AI is affecting the executive agenda. Through conversations with business leaders, we report on where they expect AI will have an impact, how important AI is to their current and future business strategies, what benefits they hope to realize from implementing AI, and which capabilities they believe are key to advance AI maturity in their companies.

We also present case studies of specific companies, both local and international, to provide an understanding of what they are doing with AI and why, drawing on lessons learned and obstacles to be overcome when putting AI to use for specific use cases and to derive value on a strategic level.

Proprietary AI investment data

We have supplemented the primary source input from the companies with acquisition data from numerous sources, to take the pulse of the AI investment market in Europe. These insights help provide a picture of the wider AI ecosystem and its development in the region.

AI expert perspectives

With this wider understanding of AI start-up acquisitions, partnerships, and investment funding, we outline how investments in AI are skyrocketing, where AI investment is taking place geographically, and which sectors are making bets. As we are on the cusp of widespread change driven by AI, we also reached out to AI experts from academia for an outlook on AI technologies going mainstream, and to gain an understanding of the macro scale of business effects that they expect will materialize when looking into a distant future.

Recognizing and mitigating potential survey and interview bias

In terms of methodology, this report follows robust research design and protocol. Doing so minimizes potential bias, but does not eliminate it, as it is inevitable in market research. One potential type is social desirability and conformity bias, as the topic of AI receives lots of media and political attention. Response bias, including extreme responding, cultural bias, and acquiescence bias (“yea-saying”), are potential factors as we ask respondents to self-report on their respective companies’ experience. Therefore, while this report follows best practice, some bias is possible. Nonetheless, with the combination of extensive survey data, interview data, investment data, and expert perspectives, we believe the report provides a solid foundation for an indispensable view of executive experience with – and future plans for – AI in business.

Executive Perspective

Who are the respondents that have contributed to the study?

The data approach used allows us to identify trends across industries and countries based on input from various functional business areas. Consequently, we have captured a range of insights, learnings, and perspectives from both strategic and technical points of view.

Respondents predominantly in senior level positions

To ensure that these insights and perspectives are relevant at the executive level, we surveyed and interviewed high-ranking officers with a responsibility for driving the AI agenda in their respective companies. With 60% of respondents being either part of top management or the executive management team, their input is likely well attuned to the general perspective and overall strategic direction of the companies they represent.

Functional diversity

The respondents cover very different functions, of which the most common are designated IT/technology/digital department, followed by R&D/product development, and general management functions. This functional diversity increases the breadth of the report, with insights and perspectives covering widely different aspects of AI.

Surveyed companies span multiple sectors

The participating companies are spread fairly evenly across seven sectors, with the majority of companies belonging to Industrial Products & Manufacturing, followed by Financial Services. Services and Life Science are represented to a lesser extent.

A combined annual revenue of \$2.7 trillion

Participants come from both major listed companies, companies privately held by foundations as well as start-ups. In totality, they represent a combined revenue of approximately \$2.7 trillion. Despite covering a significant part of total European business, our selection criteria have also included a number of successful startups with extensive AI experience and capabilities.

Mix of companies represented in German data

The respondents in Germany are major listed companies or companies privately held by foundations as well as start-ups. They had a combined total annual revenue of over \$625 billion in 2017.

More than 300 participants

Number of participants interviewed and/or online surveyed in the study

35 of 300+

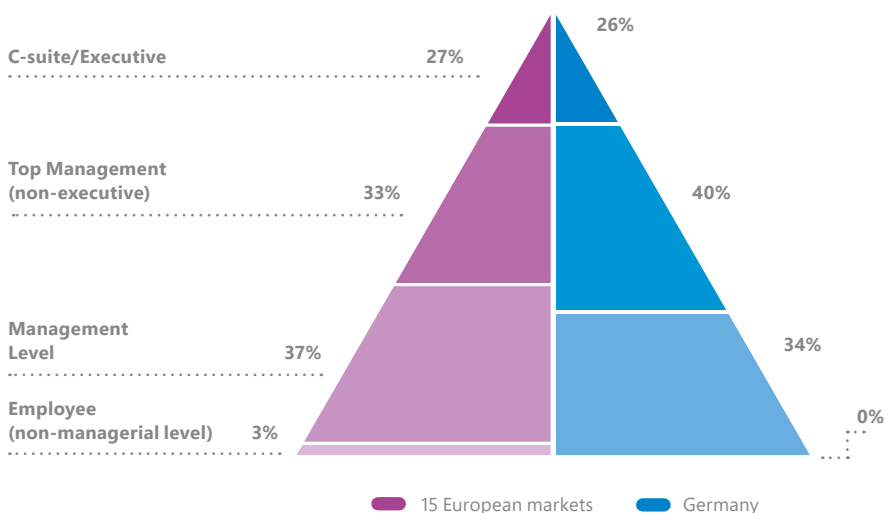
are German participants



15 European markets Germany

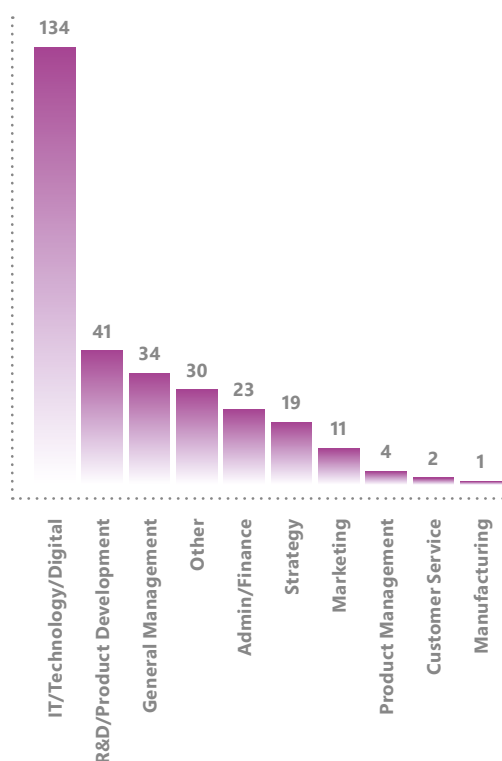
Majority hold a top management or executive position

Organizational level of person participating in the study



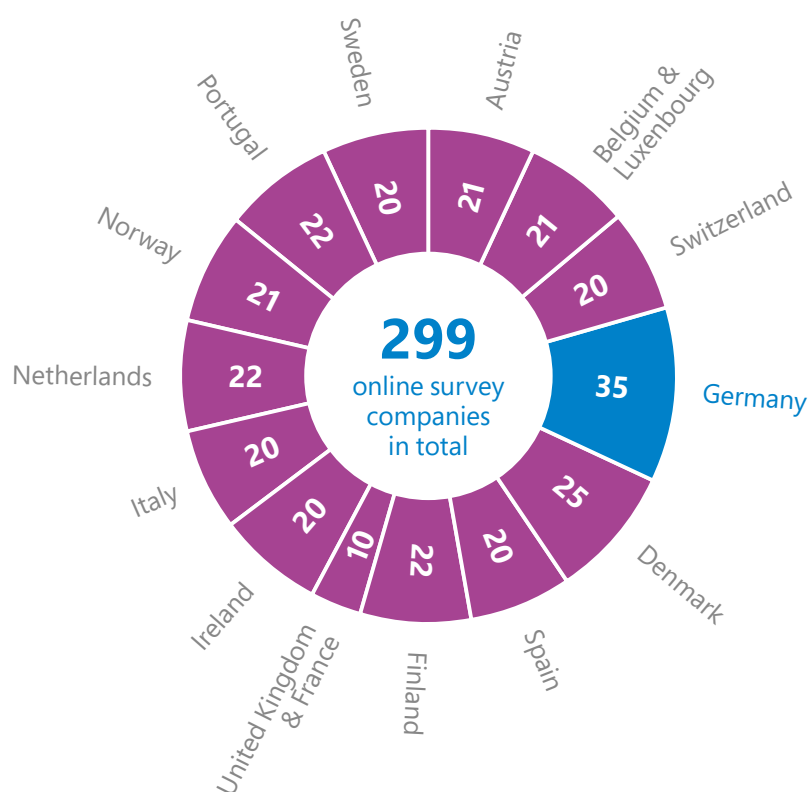
Large group of respondents with a specific IT/tech/digital role

Organizational function of respondents in the online survey



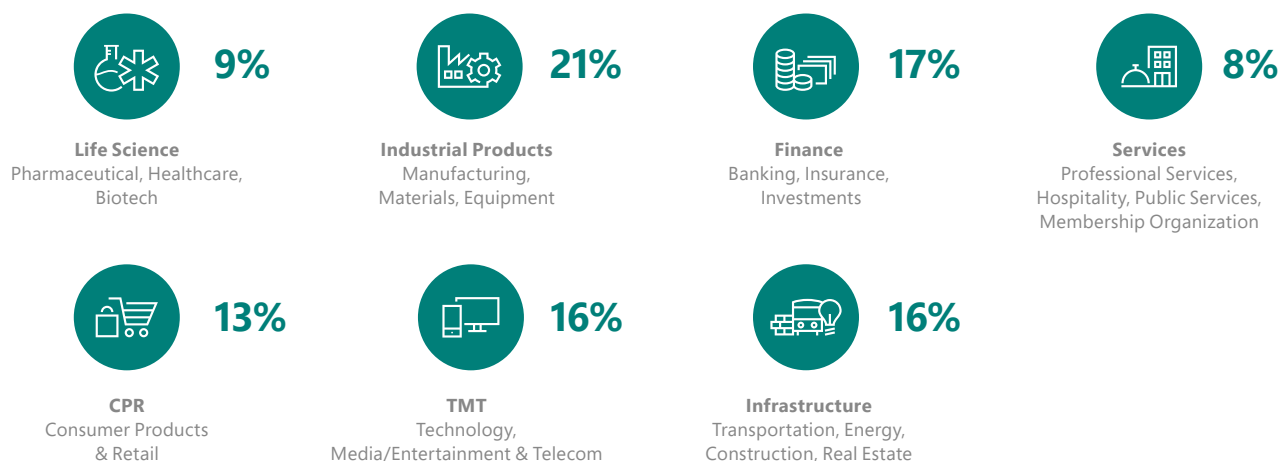
Surveyed companies are well represented across each of the 15 European markets

Number of online surveyed companies per country



Seven major sectors covered in the study

Representation of participating companies per sector category



307 Companies

A.P. Moller - Maersk, Acciona, Adamant-Namiki of Europe, Aegon, Aena, Ageas, Agfa-Gevaert, Agrifirm Group, Ahlstrom-Munksjö, AIB, **Akademie Deutscher Genossenschaften**, AkzoNobel, Almirall, Alpro, ALSA, Amadeus, AMAG, Ambea, APM Terminals, Aprila Bank, Arcelor Mittal, Ardagh Group, Arval BNP Paribas Group, Asiakastiето Group, Assa Abloy, Assicurazioni Generali, Atea, **Audi**, Austrian Airlines, Austrian Federal Computing Centre, Autogrill, **Bahlsen**, BAM Group, Barco, **BASF**, BAWAG P.S.K, Baxter, **Bayer**, BBVA, Besix, **Bilfinger**, **BLG Logistics**, **Böhringer**, Bolloré, **Botswatch**, BTG, BUWOG, C&C Group, Campbells International, Capio, Carmeuse, Carnival UK, CEiiA, Cermaq, Chr. Hansen, Cirsia, City of Amsterdam, Colruyt Group, Com Hem, Combient, Comifar Distribuzione, Constitutional Court of Austria, Coolblue, COOP Nederland, Cosentino Group, Costa Crociere, Credit Suisse, Crédito Agrícola, **Dachser**, DAF Trucks, Danfoss, Danske Bank, Dawn Meats, DFDS, DNA, DNB, DSM, DSV, Dümmer Orange, Dynamic ID, DAA, Edison, EDP - Energias de Portugal, Egmont, EQT, Ericsson, Erste Group Bank, ESB, ESIM Chemicals, Esprinet, Europac, **Evonik Industries**, Fazer, FDJ, Federal Office of Meteorology and Climatology MeteoSwiss, Ferrovial, **FEV Group**, Fexco, Finnair, **FlixBus**, Fortum, Galp, **GEA Group**, Geberit, **GEMA**, Genalica, Generali Versicherung, GetVisibility, Gjensidige Forsikring, Glen Dimplex Group, Globalia, GN Store Nord, **Gothaer**, GrandVision, Grupo Antolin, Grupo Ascendum, Grupo Codere Cablecom, Grupo Juliá, Grupo Nabeiro – Delta Cafés, Grupo Pestana, Grupo Visabeira, GSK, GAA, H. Lundbeck, Hafslund, Handelsbanken, **Henkel**, Hera, **Heraeus Group**, **Hermes**, Hostelworld, Husqvarna, IKEA Group, Ilmarinen Mutual Pension Insurance Company, Implenla, Impresa, Indie Campers, Intesa Sanpaolo, ISDIN, ISS, Jansen AG,

Julius Baer, Katoen Natie, KBC Group, Kemira, Kingspan Group, KLP Banken, Komplett, Kongsberg Gruppen, LafargeHolcim, **Landesbank Baden-Württemberg**, LanguageWire, **Lanxess**, LEGO, LEO Pharma, **Leoni**, Lerøy Seafood, Liga Portugal, L'Occitane, Lonza, L'Oreal, Lusíadas Saúde, Luz Saúde, Länsförsäkringar, MAPFRE, **Merck**, Merkur Versicherung, Metall Zug, **Metro**, Metso, M-Files, Millicom, Mota-Engil, **Munich Re**, Mutua Madrileña Automovilista, Møller Mobility Group, Neste, NH Hotel Group, Nilfisk, Nokia Corporation, NorgesGruppen, Norstat, Novabase, Novartis, Novo Nordisk, Novozymes, Now TV, **OBI**, Oesterreichische Nationalbank, **Omnibot**, OP Financial Group, Opportunity Network, Orion, Paddy Power Betfair, Peltarion, Pernod Ricard, PFA, Philips, Planeta DeAgostini, Poste Italiane, Posti, PostNord, **ProSiebenSat.1**, **Provinzial**, Proximus, Pöyry, Rabobank, Raiffeisen Software, Raiffeisen Switzerland, Ramada Investimentos SA, Randstad, **Ratiodata**, Rexel, ROCKWOOL Group, Room Mate Hotels, Royal College of Surgeons in Ireland, S Group, Saipem, Saint Gobain, Sakthi Portugal, Salsa, Saxo Bank, Sbanken, SBB Swiss Federal Railways, **Schaeffler**, Schindler, SEB, SGS, Siemens Mobility, SimCorp, Skandia, Solvay, Sonae, Sonae Arauco, SpareBank 1 SMN, SpareBank 1 Østlandet, Sportmaster, **Stadtwerke Lübeck**, Statkraft, Stedin, Steyr Mannlicher, Stora Enso, Styria Marketing Services, Suomen Terveystalo, Swedbank, Swisscom, **Talentwunder**, Taylor Wimpey, TDC, Teamwork, Telefónica, Telekom Austria, Telenor Global Shared Services, Telia, Tesco, Tetra Pak, The Navigator Company, **Thüga**, TIM, Tine, Tokmanni, TomTom, Tryg, TTS Group, TVH, Ubimet, UDG Healthcare, UniCredit, Unilin, UPM, Vaisala, Valmet, Valora Group, Van Lanschot, Vattenfall, Version 1, Visana, Vodafone Automotive, VodafoneZiggo, Voestalpine High Performance Metals, WABCO, WALTER GROUP, **Werkzeugmaschinenlabor WZL der RWTH Aachen University**, Western Bulk, William Demant, Wind Tre, WIT Software, Wolters Kluwer, Zurich Airport, Zurich Insurance, Öhman, Ørsted, Österreichische Post.

Note: Of all contributing companies, 14 chose to be anonymous, 0 of them being from Germany

Bits and Bytes

What technologies and data solutions are within the scope of the study?

AI can be defined as the ability of a machine to perform cognitive functions which are normally associated with humans. This includes reasoning, learning, problem solving, and in some cases even exercising human behavior such as creativity.

Advanced AI applications are not yet widespread

AI holds the potential to transform business in a radical way given its wide variety of use. Quite simply, business leaders need to understand AI in order to grasp the opportunities and threats the technologies pose.

While companies acknowledge the significant potential of broader, more advanced AI technologies such as computer vision, speech recognition, and virtual agents, they are currently

not in common use by companies in Europe. Companies surveyed are currently focused on narrower and more specific use-cases that support existing business. These efforts will undoubtedly help companies build capabilities that are necessary to deploy more advanced AI solutions in the future.

Machine Learning

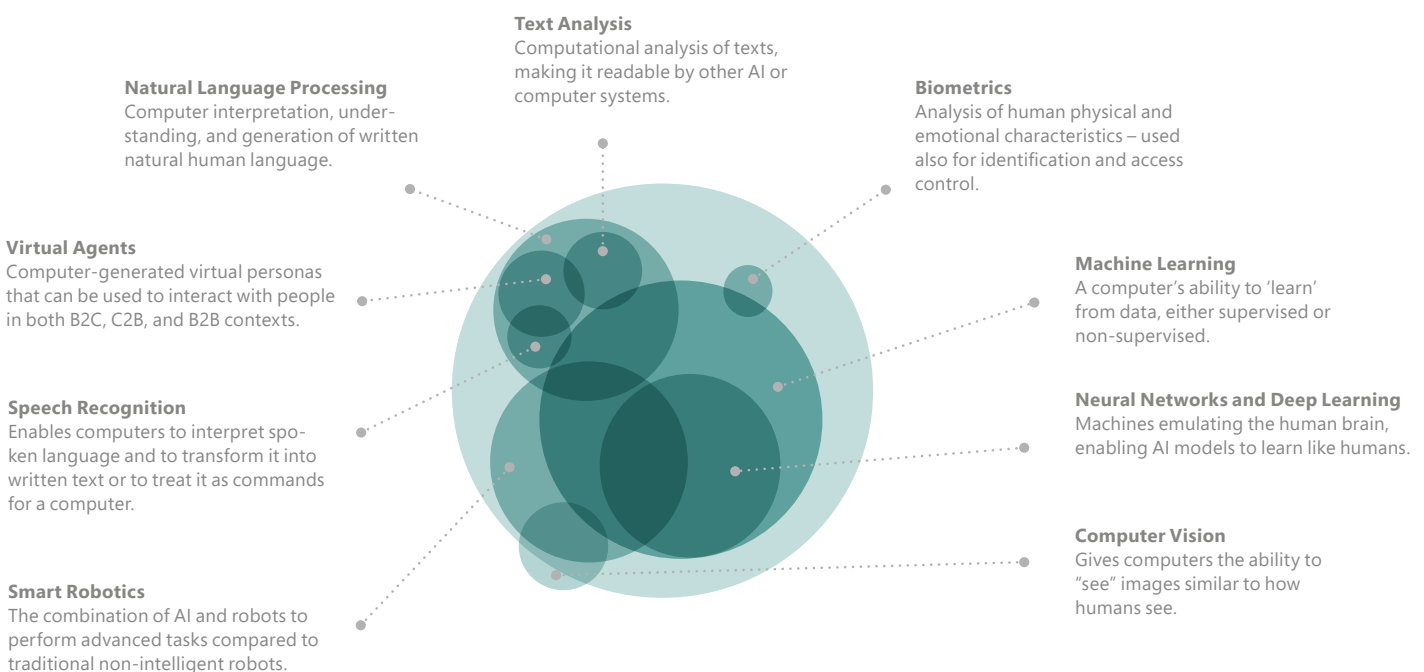
The most commonly used AI technology among the surveyed companies is Machine Learning. This is inarguably due to its wide-ranging applicability, making it relevant for a variety of use-cases across the value chain. Of the different types of Machine Learning, the most common is supervised Machine Learning, where software is fed structured data and finds patterns that can be used to understand and interpret new observations.

While companies historically have primarily have used internal data for supervised Machine Learning, many have begun exploring the possibility of combining internal and external data-sets in order to produce even deeper insights.

Machine Learning and Smart Robotics were found to be the most useful. It is not clear from the study if this is because they are simply the most common starting points before deploying more advanced technologies, or if they also longer term hold the most wide and significant application potential.

A broad definition of technologies are included in this AI definition

Which technologies are included in the definition of AI used in this study?



Companies are using a combination of on-premise and cloud solutions

Companies are increasingly using cloud-based AI solutions for both storage and on-demand computing power – 83% of companies reporting using Cloud technology to some extent to enable their AI capabilities. Key benefits of cloud solutions mentioned by many respondents are the flexibility to swiftly scale systems up and down to accommodate changing demand, a variable cost structure, and access to larger data sets. However, many companies are still relying on on-premise solutions, not least due to existing data infrastructure.

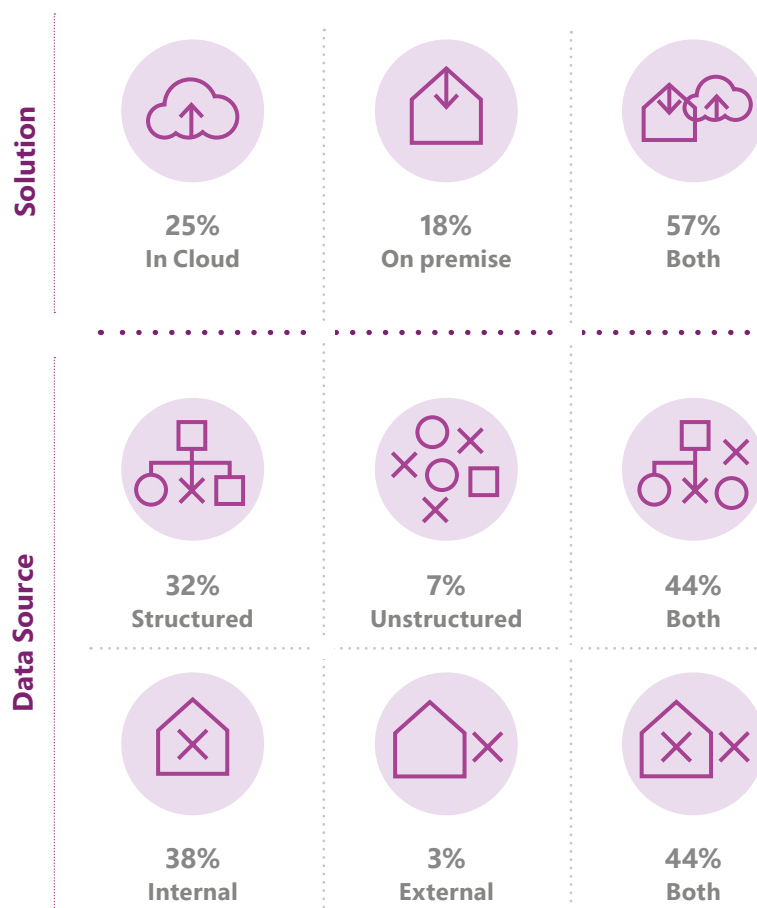
Machine learning, smart robotics, neural networks and text analysis most useful for German companies

On average, the technologies that are most useful for German companies are concentrated in three areas: machine learning (86%), smart robotics (57%), neural networks (57%) and text analysis (57%). Additionally, 90% of German companies selected more than one type of AI technology.

Companies are using a mix of Data Sources and Storage

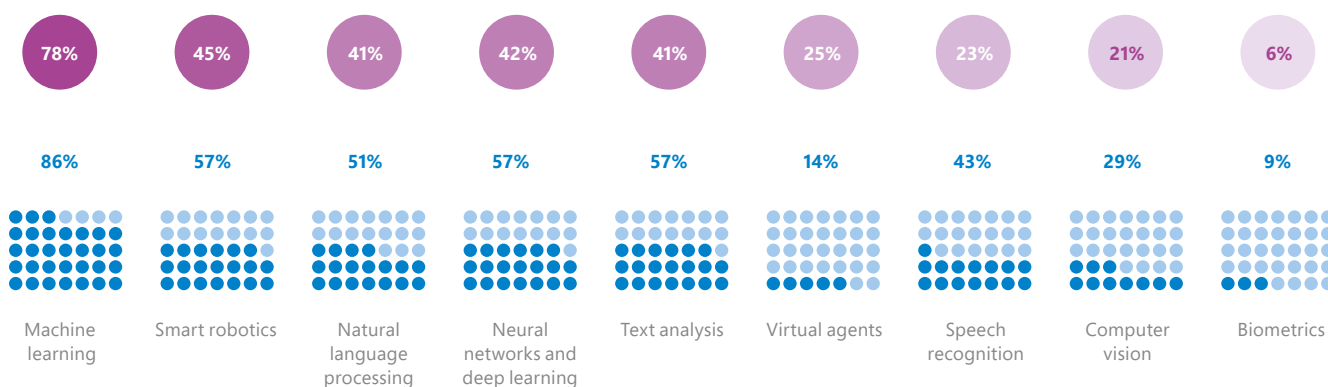
Solution: How are you primarily dealing with the computing demands needed for AI?

Data Source: 1.Are you currently using unstructured or structured data types in your AI process? 2.Are you currently using internal or external data sources in your AI process?



Machine Learning and Smart Robotics found to be the most useful

Which of the following technologies have you found to be most useful in your company's deployment of AI?



 Affirmative responses, 15 European markets

 Affirmative responses, Germany

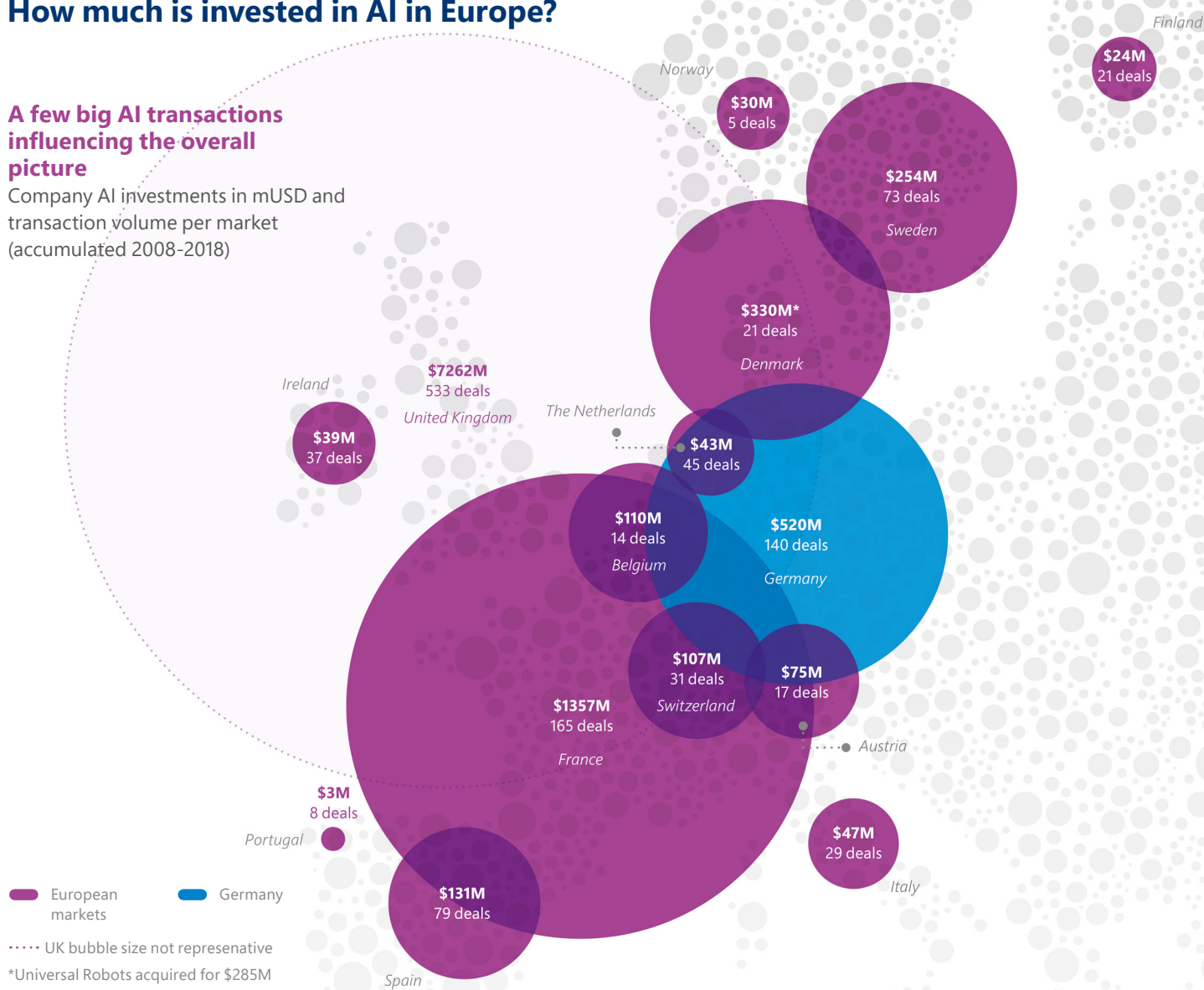
Note: Remaining percent 'Don't know' responses

Follow the Money

How much is invested in AI in Europe?

A few big AI transactions influencing the overall picture

Company AI investments in mUSD and transaction volume per market (accumulated 2008-2018)



The acquisition data from numerous sources enabled us to explore the European AI ecosystem and gain insights into investment activity.

An exponential increase in AI investment over the past decade

Looking at AI transaction activity across Europe, there has been a steep consistent growth trend over the past 10 years, totaling 1,334 transactions involving AI by 2017 – with a six-fold increase in activity in the last 5 years

alone. This trend is on track to continue, with an exponential increase in interest in AI driving more large companies to invest in AI or acquire AI capabilities from innovative start-ups. Of the 15 markets surveyed, some include one or two transactions that are significantly large deals.

Majority of investments in AI from private equity and venture capital

Private equity (PE) and venture capital (VC) firms are significantly more active

investors and acquirers of AI than corporates, accounting for 75% of deal volume in the last 10 years. This is an indication that AI companies are in the early stages of high risk/high growth dynamics. It also indicates that, for large corporates, acquiring or investing in external AI businesses in order to obtain AI capabilities is relatively limited. This is confirmed by our survey results where only 10% of companies are seeking to obtain needed AI capabilities through external investment or

Note: Several transactions in the dataset did not have publically disclosed deal values, suggesting that actual total values are higher than what's shown above

acquisitions, and is also much in line with what we're seeing when comparing with the US and Asia.

Investment activity concentrated in major European markets

It comes as no surprise that a lot of investment activity is in the UK, France, and Germany, having attracted 87% of investment in AI companies over the past decade. The UK leads significantly in this regard, with 533 of the total 1,362 AI transactions in Europe. From an investment perspective, it is also worth noting that in April 2018, the EU committed to a 70% increase in investment in European AI by 2020, suggesting further growth and potential in the region.

Over \$520 million invested in AI start-ups in Germany in the past decade

In Germany, there were 140 transactions over the past decade involving companies working with AI. Of these, 76 reported deal value totaling \$520 million. A large portion of this amount was the \$150 million investment in Definiens AG in 2014. Of the AI companies in Germany that received investments or were acquired, 48% focus primarily on Machine Learning technology, likely due to its wide applicability across a range of business problems and sectors.

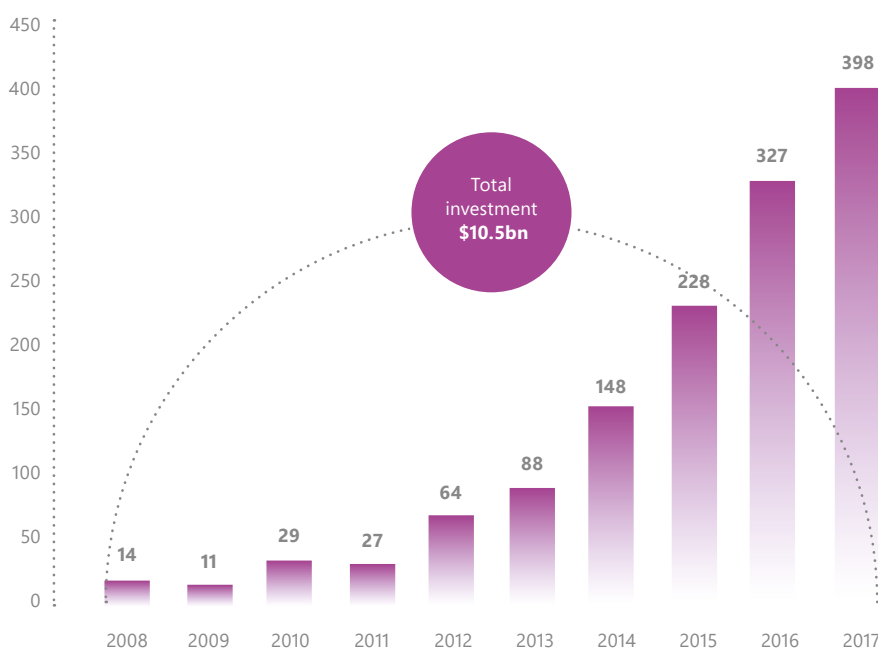
TMT (Technology, Media & Telecommunications) most active, behind private equity and venture capital

Investments into AI companies per sector, mUSD (accumulated 2008-2018)*

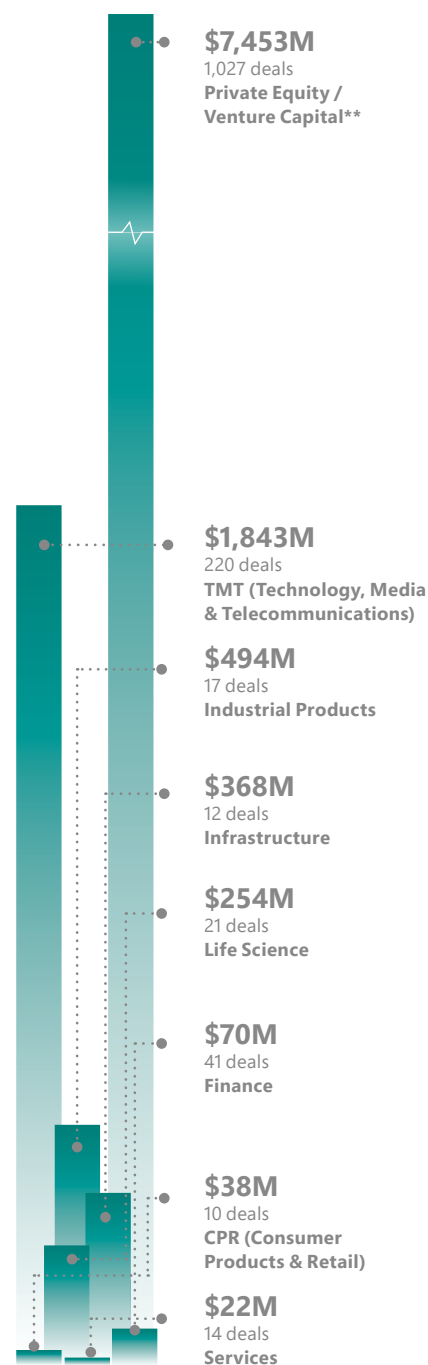
Steady increase in European AI investments

How much did AI companies invest in transaction volume in Europe (from 2008-2018)**?

Number of transactions



Europe



* For all of Europe, 34 countries (not just the 15 markets focused on in this report)

** Including governmental investment

ProSiebenSat.1

NUCOM GROUP is a majority-owned subsidiary of ProSiebenSat.1 Media SE, one of Europe's leading media companies and Germany's biggest TV network. ProSiebenSat.1's media power and expertise accelerates the strong growth path of NUCOM's portfolio companies. This portfolio combines multiple market leading consumer services and lifestyle brands which highly rely on effective TV advertising.

ROI of TV advertising is determined by TV spot properties and various contextual factors such as weather conditions, context of the TV program and the target audience. ProSiebenSat.1 tracks and

stores a vast amount of such factors. Additionally, ProSiebenSat.1's proprietary attribution model measures the effect of every TV Spot.

ProSiebenSat.1 considers AI as a meta-concept: strongly focused on the implementation of new, but more importantly meaningful AI methods and technologies.

This allows human driven manual hypotheses testing: TV spots with bright colors might work better in bad weather conditions in the afternoon and romantic comedies potentially

increase consumers desire for a dating platform membership late at night. But due to the underlying complexity (e.g. media budget constraints, an enormous number of possible influencing factors) manual optimization falls short of producing scalable, timely and constantly effective growth of ROI.

To fully capitalize on this potential, ProSiebenSat.1 moves from manual to an assisted optimization. Through leveraging state of the art A.I. and optimization tools like contextual enriched Deep Reinforcement Learning, TV spots are assigned to the available advertising slot with the maximal predicted ROI.



ProSiebenSat.1 Group is the leading German entertainment player with a strong e-commerce business. With 6,500 passionate creators they deliver daily entertainment to 45 million households in GSA and generate more than one billion video views online per month.

ProSiebenSat.1 uses the reach of its TV stations to push into digital business areas. Their growth is based on three segments: a wide-reaching entertainment portfolio with leading TV and digital brands, international program production and sales subsidiary, and a large commerce portfolio.

What next?

The tool will be continuously improved to include further variable such as audio & sentiments and to provide input for advertising spot production. In addition, the tool can be further refined to also optimize the Group's general advertising allowing advertisers and agencies to benefit from ProSiebenSat.1's expertise in a machine-learning driven end-to-end optimization of TV advertising – a unique differentiator in the market for above-the-line advertising.



AI provides us with a powerful tool set to both identify as well as personally address our customers.



Looking at AI within our strategic scope, it is one of the key competences for the coming years. That means we are building the foundations today to benefit from them in the next few years.

Expert Perspective

What does the future look like according to AI analysts?

We also spoke to a range of leading AI experts from business and academia to gain insights into the kind of change which we are on the cusp, and the role AI is expected to play as part of a broader transformational wave.

AI is entering the mainstream and here to stay

One thing was clear from the experts we spoke to: as far as the peaks and troughs of hype and technological leaps surrounding AI go, there is no doubt that we are living through a particularly prominent peak, with no indication that the buzz nor the potential will fade away any time soon. In a world increasingly dominated, disrupted and driven by innovative tech powerhouses, large and small, it is no understatement to suggest that AI will be a chief protagonist in the change transcending all elements of business in what has been labelled the Fourth Industrial Revolution.

Business-minded people will drive the transformation

The AI experts confirmed some of the key ingredients necessary for AI in organizations: a combination of domain and technical expertise, the appropriate technology, the right talent, and lots and lots of data. While letting tech-savvy individuals drive innovation is great for building understanding, true transformation will not come until business people start suggesting problems for AI to solve - not the other way round.

Agile culture enables AI

Culture was a recurring theme as well. It can either stifle forward momentum in organizations, or be the silver bullet that enables the potential of AI to be realized from top to bottom.

Some of the experts even argue that it's not only technical skills that hold up AI projects, it's also the need for a culture of experimentation.

Companies that are more natively digital or have gone down that road understand the value of experimenting and iterating. They don't think in traditional terms of committing to year-long projects that need to produce specific outputs, but rather to explore and test ideas before scaling.

When it comes to AI, knowledge is power

Expert opinion also seemed unanimous in that most people not directly involved with AI must still have quite a basic understanding of what AI is and what it can actually do. Therefore, the

task is to educate and improve understanding, from C-suite leadership teams to employees at the coal face. This also ties in with the importance of partnering to get started and access the expertise needed to use AI. While partnering and collaborating solves the perennial AI challenge concerning the scarcity of talent, the significant cost and substantial benefit that can be gained from AI means that organizations also need to be cognizant of building capabilities in-house for the long-term.

Finally, as AI develops, we are also going to see innovation and expertise spreading outside of the dominant clusters of the likes of Silicon Valley, as governments, businesses and universities increasingly invest in building knowledge, resources and capabilities.



If we do not manage to show a measurable improvement to the economy, AI as a concept is in risk of being swept under the rug like any other trend, any other hype.

**— Werkzeugmaschinenlabor WZL
of RWTH Aachen University**

From the Horse's Mouth*

***From the highest authority**

“

The full extent of the AI story remains in its early stages. What we do know is that big data, computing power and connectivity are changing the industrial landscape. The opportunity rests in accelerating the digitization of businesses, making them more data driven by building applications that deliver machine-assisted insights.

— Mona Vernon, CTO, Thomson Reuters Labs

“

In some cases, there is too much hype, but paradoxically, the potential opportunities and benefits of AI are still, if anything, under-hyped. Often, the impact of new technologies is overestimated in the short term and underestimated in the long term, and while there is a lot of noise regarding AI, there's been a lack of in-depth discussion and analysis of how it's actually going to transform businesses.

— Nigel Duffy, Global AI Innovation Leader, EY



We believe that every organization is going to have to write their own AI manifesto: what they believe about AI, how they're going to use or not use data, how they're going to publish data, and make the consumers of their products and services aware of that. The creation of those manifestos is going to become a gateway to the success of AI.

— Norm Judah, Chief Technology Officer of Worldwide Services at Microsoft



If you have a ton of data, and your problem is one of classifying patterns (like speech recognition or object identification), AI may well be able to help. But let's be realistic, too: AI is still nowhere near as flexible and versatile as human beings; if you need a machine to read, or react dynamically, on the fly, to some kind of ever changing problem, the technology you seek may not yet exist. Intelligence is a really hard problem.

— Gary Marcus, Founder & CEO, Geometric Intelligence [acquired by Uber] professor, NYU, contributor to The New Yorker and The New York Times



AI is a general purpose technology, so will eventually affect all industries. However, this impact can be slowed by the lack of data in particular industries. There's also more innovative cultures inside different organizations, that can either drive adoption or prevent it.

— Marc Warner, CEO, ASI Data Science

Role of AI in European Business

There is a lot of hype surrounding AI at the moment, and few doubt its potential. We examine how important AI is compared to other digital priorities and where AI fits on the strategic agenda.

We look at the impact of AI on the company's core business, as well as on adjacent and new areas of business.

We also examine the current AI maturity levels across sectors and markets, the potential drivers for deploying AI, and where AI is applied within organizations, across customer-facing functions, operations, product development, and internal business support.

A Strategic Agenda

Where is the AI conversation currently taking place?

A good starting point to understand how large European companies are handling AI is to look at who in the organization is driving the AI agenda, whether it be the Board, the C-suite, managers, or employees.

AI is particularly relevant at higher organizational levels

From driving strategic considerations at the Board level to being a topic of interest or concern at the employee level, the results are clear: AI is important and resides across all levels at many of the organizations we interviewed. Only a few companies stated that AI is not currently an important topic at any level of the organization - while the vast majority of companies view AI as generally important regardless of how advanced they are, or how much AI is being considered for deployment in the near future.

Active C-suite and Board of Directors involvement

In 72% of the companies surveyed, AI is already an important topic on the C-suite agenda and across various roles - from cost-focused CFOs looking for efficiency through automation, to CDOs with customer-oriented ambitions as part of wider digitalization efforts, to the CTOs who is often still responsible for a type of AI Center of Excellence.

Companies more advanced in AI tend to have stronger involvement of the C-suite and the Boards of Directors than the rest. They focus less on the technology itself and more on the business problems that AI can address. Relatively speaking, the AI topic seems to not yet have reached the same level of importance at the non-managerial level (employees) than at the top. Speculating about the reason, it could

both pertain to job insecurity and to the fact that AI is still a highly abstract topic for many when it comes to proving day-to-day business value.

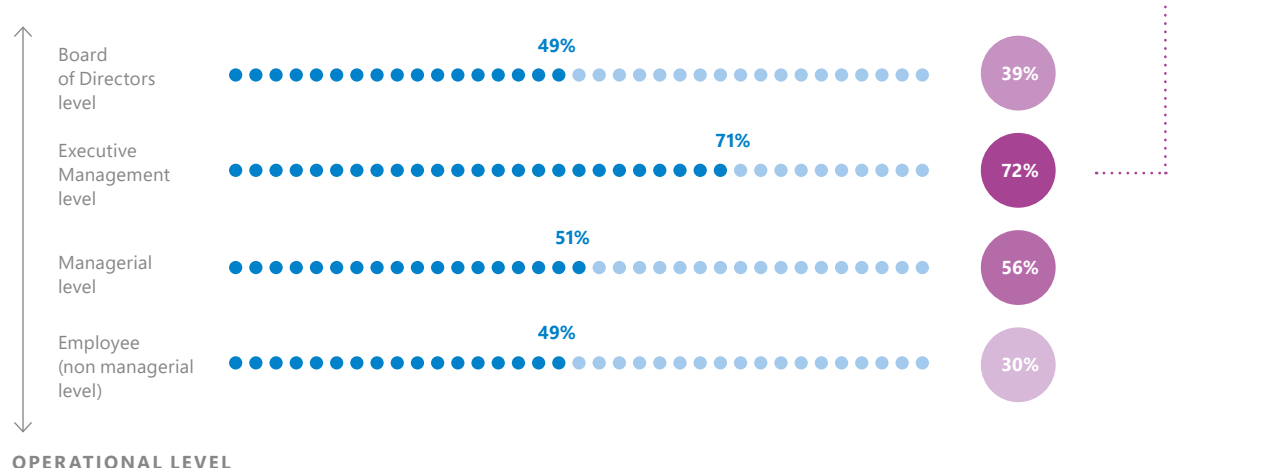
AI an important topic among executives and board of directors in Germany

In Germany, AI is an important topic across most levels of the organization. This is particularly the case at the C-suite level, where 71% of the German companies surveyed report that AI is an important item on their agenda. At 49%, companies in Germany are among the highest in Europe in terms of considering AI to be an important topic at the Board of Directors level.

AI is an important topic on the C-suite level in particular

On what hierarchical levels in your company is AI an important topic?

STRATEGIC LEVEL



● Affirmative responses, 15 European markets

● Affirmative responses, Germany

Among Friends

What is the importance of AI against other digital priorities?

In a business era driven by innovation and tech-led disruption, AI is obviously not the sole priority.

AI as a digital priority

When asked on a scale of 1 to 5 how important AI is to the business relative to other digital priorities, the majority of respondents told us that it is about equal. Very few organizations said it was their most important digital priority, or not formalized as a digital priority at all, with the spread of responses leaning slightly towards the upper end of the importance spectrum.

This slant is likely to increase as many companies expect AI to become more important, as the technology develops and use-cases become more clear to companies.

The participating companies are generally in the process of understanding the potential of existing data, including to what extent it can be used, what it can be used for, and how to capture and leverage it.

Furthermore, many of the companies are focused on building the appropriate data infrastructures or modernizing legacy systems as a top digital priority, both being prerequisites for introducing AI into the company. Considering that AI is heavily reliant on data as its fuel, this development suggests that the foundations are being laid for further AI integration in the years to come.

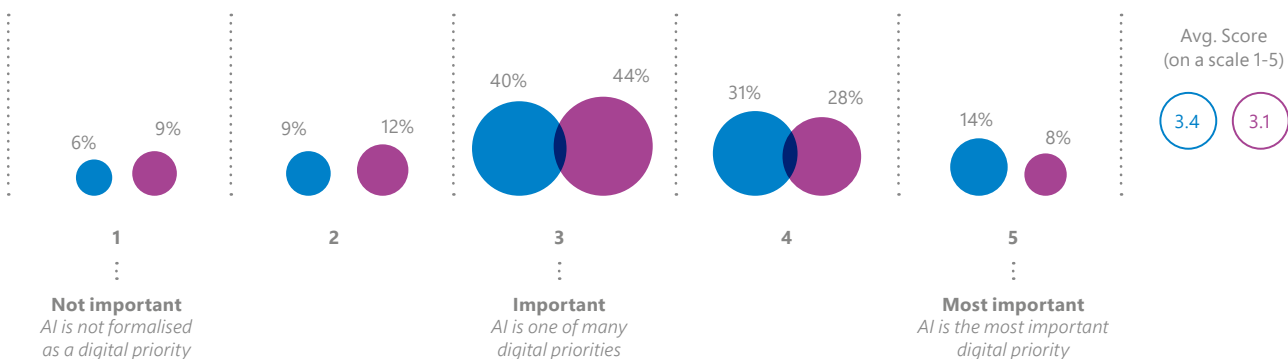
AI seen as relatively important vs. other digital priorities in Germany

Most surveyed companies in Germany are engaging in pilot projects and Proofs of Concept, or have AI initiatives that are released into production. When it comes to their prioritization, on average, German respondents consider AI to be one of many digital priorities. Even though they have more important digital priorities, German companies interviewed are starting to allocate more time towards AI and thus moving their AI initiatives forward.

AI is seen as one of many digital priorities - but rarely the most important

How important is AI relative to your company's other digital priorities?

The majority consider AI to be important



Note: Remaining percent 'Don't know' responses

Push or Pull

How is AI predominately deployed into the organizations?

To understand the drivers behind the adoption and deployment of AI in the companies, we took a closer look at how AI is approached in a top down-bottom up management context, and from a functional tech- vs. business driven dynamic.

AI driven from a combination of technology push and business pull

The contributing companies are quite evenly split across deploying AI as a top down process, as a bottom up, or as a combination of the two. However, when looking at the self-reported most advanced companies, they are more top down than bottom up in their approach. It was clear from speaking with them, that this is partly a result of AI being increasingly important enabler in the company, and playing an increasingly significant role in the overall strategy.

AI driven from a combination of technology push and business pull

According to a large part of the companies. and despite still being a technically complex thing that requires many specially skilled employees, AI is most often deployed as a combination of business pull and technology push.

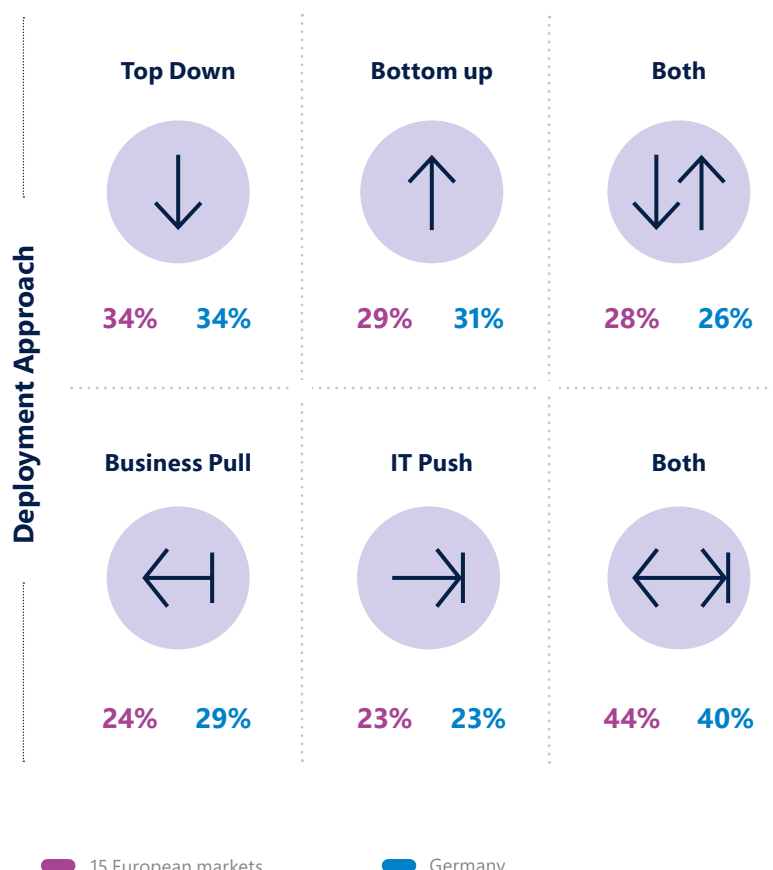
This resonates well with one of the most consistent inputs from the executives on the most sought after AI profiles which centered in on the hybrid profile that understand the business needs *and* the ability to match them to the technological possibilities.

AI managed top-down in German companies

Among German companies surveyed, AI deployment is driven slightly more frequent by business needs as opposed to IT capabilities and innovation. In addition, 34% of German companies report AI is managed via a top-down approach as opposed to a bottom-up approach (31%). This outcome is coherent with the results showing AI is considered a more important topic among executives (71%) than managers (51%) for German companies.

AI deployed and managed in a balanced way

How would you characterize the way AI is being managed in your company? How would you characterize the way AI is being deployed in your company?



Note: Remaining percent 'Don't know' responses

Ready, Set...

What is the maturity of AI in different sectors?

While working with AI should be considered a continuous journey, the AI maturity of surveyed companies (as defined on page 32) provides a tangible indication of the level of advancement of current initiatives.

Multiple use cases, limited scalability and advanced use

The majority of companies have begun exploring use-cases, while some companies have made early investments with the intention of taking a leading position in AI. The levels of advancement also vary in that some companies are focusing on narrow use-cases to support their existing business, while others are taking an explorative approach. Among the small group of companies with no or only little AI activity to date, several respond that they are planning to drastically ramp up efforts soon.

Technology immaturity and internal data quality are key obstacles

Many companies that have already implemented AI initiatives in their businesses are seeing tangible benefits. Consequently, many of them are exploring more use-cases and structuring their learnings from previous AI projects into a modus operandi that can speed up new initiatives.

Meanwhile, a substantial number of companies have intentionally chosen to take a 'follower' position, reporting the perceived immaturity of AI technologies as a key reason. Another reported obstacle to rolling out broader AI

initiatives are rooted in data and data infrastructure, where companies have separate projects aimed at improving the structure of existing data, collection of new data, and data access in general. However, the trend is clear: AI maturity is on the rise as adoption of key technologies accelerates and internal capabilities grow.

The vast majority of European businesses are currently either conducting pilot projects to test selected use-cases, or have commenced implementing AI in the business. When talking with executives, it is evident that many companies are struggling with how to integrate pilot projects into daily operations.

Clear sector patterns, with TMT, Services, and Finance on top

Companies currently leading the way in terms of AI maturity are in TMT (Technology, Media & Telecommunications), Services & Hospitality, and Financial Services. Companies in those sectors gravitate towards grading their AI maturity as 'Released' (AI in active use, though selectively or not with very advanced tasks), or 'Advanced' (AI actively contributing to many processes and enabling advanced tasks). A logical explanation for the maturity in TMT and Finance is their tendency to be digitally advanced and more savvy with analytics, favoring these companies to progress beyond piloting by having data science capabilities in place to evolve towards more advanced AI stages.

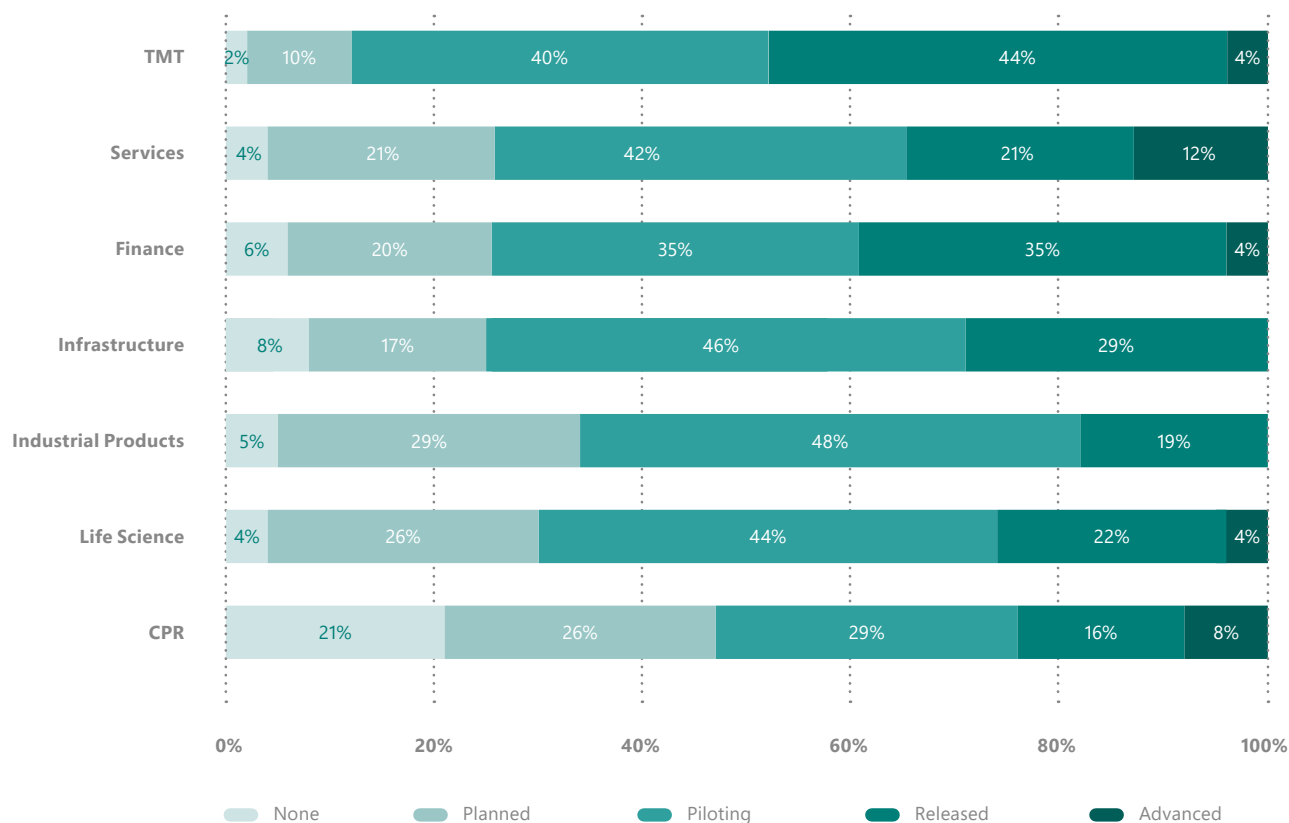


The use of AI always needs a definite, business-driven use case. AI should not be developed for just the sake of it.

— **FlixBus**
Transportation provider

TMT sector with largest percentage of companies that are either released or advanced

How would you describe your company's general AI maturity? Sectors arranged by maturity based on Advanced and Released



Infrastructure and IP with relatively many projects in 'piloting' phase

The Infrastructure and Industrial Products (Industrial Products) sectors both stand out as having no companies responding that they are 'Advanced' in AI at this stage.

This indicates slower technology adoption lead times in these two sectors. Yet, with 75% of companies being in the 'Piloting' or 'Released' phases, the Infrastructure sector also seems to be evolving onto more advanced AI maturity.

Life science and CPR have fewest released projects

CPR (Consumer Products & Retail) companies have a broad spread in terms of AI maturity, where 21% state they have no plans at present for how and when to use AI – much higher than other sectors – while others in the same sector are already at the 'Released' or 'Advanced' stage of AI maturity. Several companies in both Consumer Products & Retail and Services & Hospitality cite the challenges of knowing what relevant AI technologies are available, utilizing unstructured data, as well as affording the payback period where there may be large upfront costs and undetermined returns on investment.

AI Maturity Curve

Majority of companies are in the 'Piloting' or 'Released' stage

We asked companies to self-report their current AI maturity level, grading themselves at None, Planned, Piloting, Released, or Advanced - as defined below.

LEVEL OF MATURITY

Advanced

AI is actively contributing to many processes in the company and is enabling quite advanced tasks

Released

AI is put to active use in one or a few processes in the company, but still quite selectively, and/or not enabling very advanced tasks

Piloting

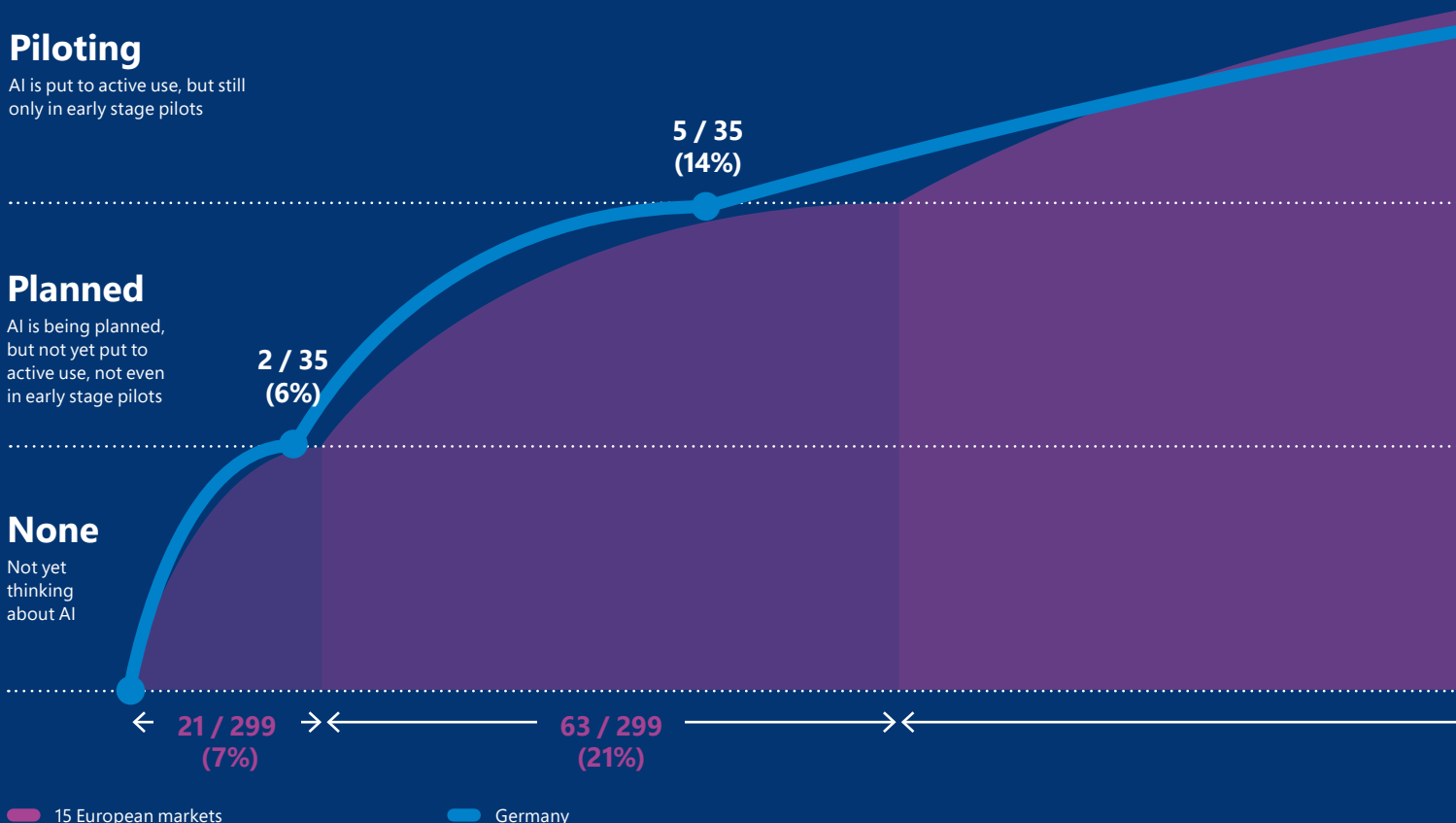
AI is put to active use, but still only in early stage pilots

Planned

AI is being planned, but not yet put to active use, not even in early stage pilots

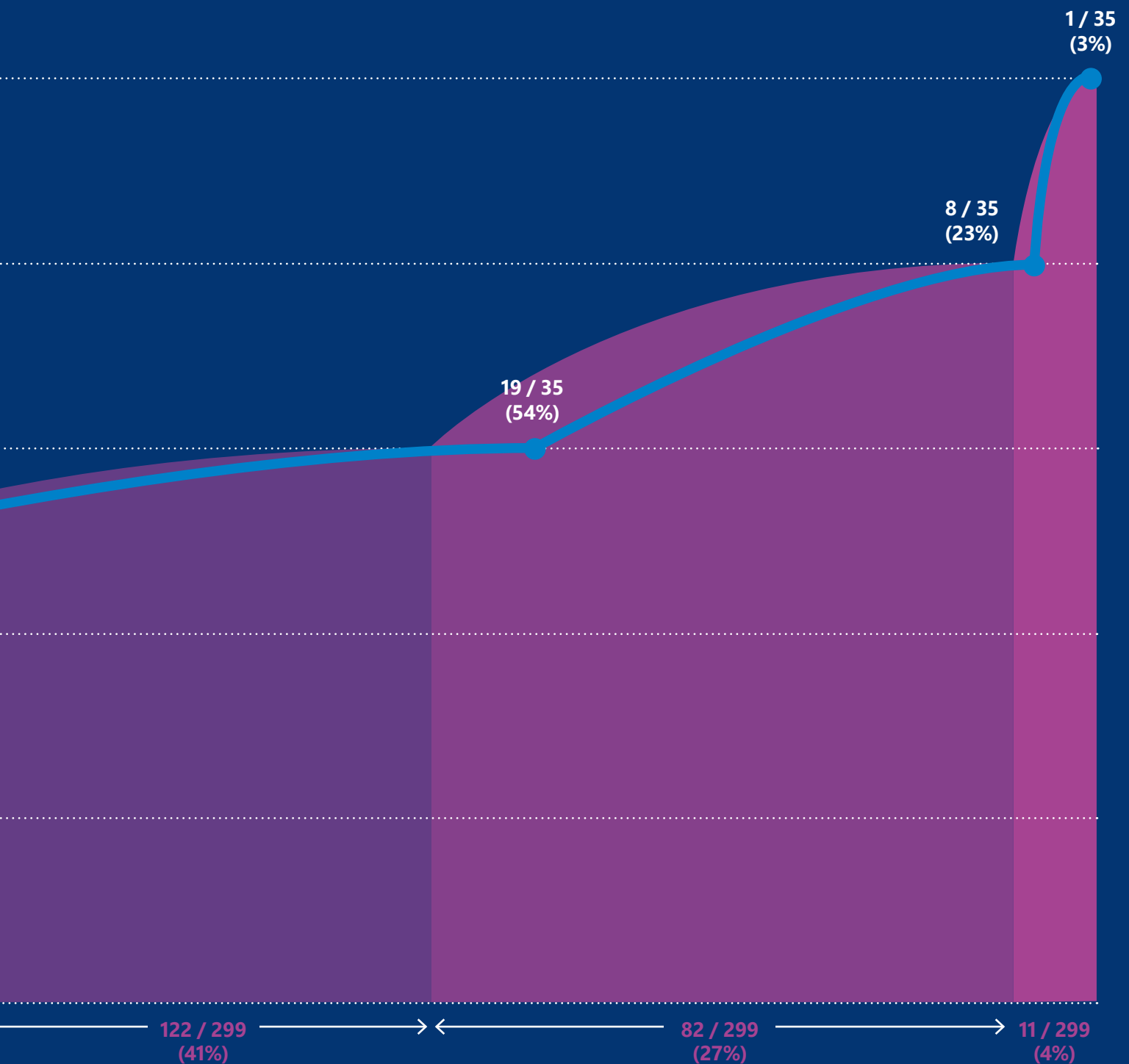
None

Not yet thinking about AI



Companies in Germany are advancing their AI journey

In terms of AI maturity, all companies surveyed in Germany report being either conducting pilot projects (54%), or have begun releasing AI applications for use in their daily operations (23%). Consequently, most companies surveyed are working with AI and even some report having reached an advanced stage (3%). The interviews confirm that most German companies are conducting Pilots, gathering field data, and building use cases to be applied in future expansions.



State your Business

Where is AI currently deployed across the companies' value chains?

Looking at the business functions that most commonly use AI provides a good indication of where companies are placing their bets. These functions are driving the company AI agenda, influencing the future direction of the company's AI efforts.

Much AI in R&D and IT/Digital functions

On top of an expected high prevalence of AI within IT departments, AI is also commonly used within R&D functions. This primarily comes down to three factors: employees in R&D are often engineers who tend to have a good understanding and appreciation of AI; the R&D function is often already wired

towards taking an experimental, agile approach which is key to AI; and the R&D function often sits on significant amounts of useful data leading to high potential use-cases.

Online customer interactions generating front to end data

Customer-facing, commercial functions such as Marketing, Sales and Customer Service are also heavier users of AI, partly driven by their digitization levels. Although AI is generally adopted more slowly in customer facing interactions than in back-end functions, the abundance of data from increased use of online channels is expected to make these functions obvious candidates for

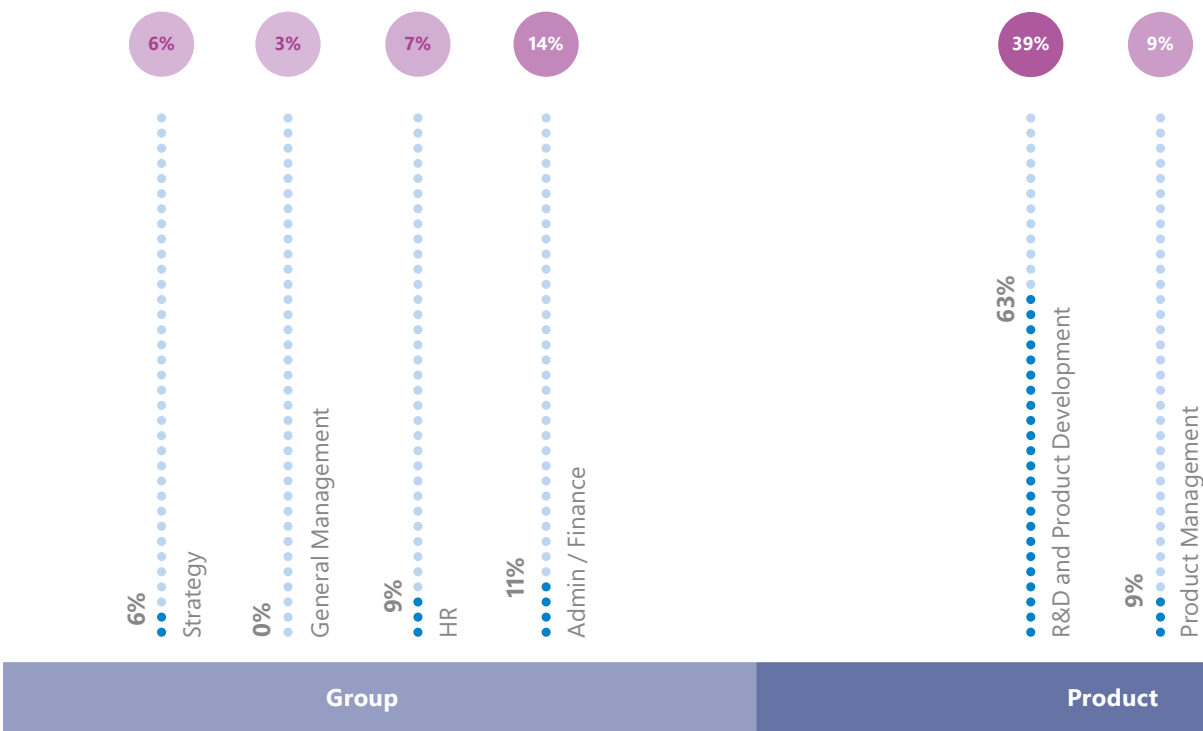
AI technologies in the future. Operations and back-end functions use AI to increase efficiency by automating processes and informing decision-making. The key enabler is data infrastructure, and many companies – currently limited by legacy systems and processes that impede capture and retrieval of data – need to upgrade their infrastructure.

Limited use in HR and Procurement

There are several functions where AI is hardly in use among the participating companies. This includes people-‘intensive’ functions such as HR and Procurement. This is not due to lack of potentially valuable AI use-cases,

AI most commonly applied in IT & R&D functions

Which of your company's business functions currently use AI?



■ Affirmative responses, 15 European markets ■ Affirmative responses, Germany

which in the case of HR include talent acquisition (avoiding human bias), onboarding (Q&A), performance evaluation (analyzing data), etc. but rather seems to be a result of prioritizing other functions first.

AI mostly applied in R&D and Product Development and IT, Technology & Digital in Germany

Among companies surveyed in Germany, usage spans 12 out of 13 business functions and follows a similar trend to the European distribution. Some companies interviewed in Germany also mention their efforts to introduce AI-related technologies and ways of working across various functions. The distribution of AI usage is concentrated in two areas, with highest usage in R&D and Product Development (63%), followed by IT, Technology & Digital (60%).



We use artificial intelligence to create a smooth process that helps our clients to identify the right talent from over 1 billion profiles very easily so that even hard to find tech positions can be filled quickly.

— **Talentwunder**
Talent search engine



Operations

Commercial

LEONI

Intelligent high power charging

The LEONI portfolio for electrically driven vehicles (EVs) comprises a permanently growing range of high-voltage products. Its established EV cable solutions cover all aspects of power transmission inside electric vehicles and addresses EV-charging on the basis of AC for private and public sectors as well as DC at quick-charging stations with power loads of 350kW and beyond. LEONI has developed cooled charging cable solutions with a focus on high power DC charging. The resulting cables can carry higher current loads and drastically shorten charging times for EVs and hybrid vehicles. New digital cable technology "LEONiQ"

transforms charging cables into an intelligent solution, providing continuous monitoring and also optimization of the charging process. This is especially relevant for the high-power

the charging process is operated at peak performance levels at all times. LEONiQ is a digital data-driven technology platform that makes energy and data flows more efficient, secure, and reliable.

LEONiQ can record and evaluate temperature, media intrusion (e.g. water penetrating a cable), and pressure along almost any given cable system. This technology facilitates drawing conclusions concerning the condition of the overall cable system, controlling it, and giving recommendations for future development cycles.

Cable systems transform into an intelligent system for energy and data transmission, monitored by a digital twin and AI in the cloud.

"Intelligent energy and data solutions powered by AI will transform the cable system business into a software and service business."

loads in DC-charging cycles. LEONiQ integrates sensor data from the charging column and charge plug with the "live" cable temperature to ensure that

LEONI

LEONI is a global provider of products, solutions, and services for energy and data management in the automotive sector and other industries. The group of companies, listed on the German SDAX index, employs more than 90,000 people in 31 countries and generated consolidated sales of EUR 5.1 billion in 2018. LEONI's largest customer group comprises the global car, commercial vehicle, and component supply industry in addition to serving the following markets: data communication & networks, healthcare, process industry, transportation, energy & infrastructure, factory automation, machinery & sensors as well as marine.

What next?

LEONI is enhancing its portfolio with more skills and competencies in digital solutions, e.g. data analytics, AI, software, and digital twins. The goal is to offer industry-leading energy and data solutions to customers. In the future, LEONI will be leveraging its domain expertise and technical product knowledge to enhance solutions like integrated sensor technology, active micro-electronics, embedded software, data analytics, AI, and digital functional simulations.



Our vision is: Passion for intelligent energy and data solutions!



The lack of transparency of a cable system's behavior over lifetime will be solved by condition monitoring, analytics and machine learning. The product transforms from a black box component to an intelligent system.

Business Benefits and Risks

As a number of industries are beginning to reap the benefits of AI, we investigate what AI is actually doing for businesses today and what is expected in the future.

We look at how big an impact executives expect AI will have in terms of driving growth or causing disruption in their industry, and examine AI's basic and more advanced uses - highlighting examples of these functionalities in operational mode.

We also present a strategic approach to understanding AI's four benefit domains from a business perspective, summarizing the value executives expect to generate by using AI, and touching on what business leaders see as the most prevalent business risks.

Another World

What is the expected impact from AI within the next 5 years?

Of the surveyed companies, 77% believe that AI will have a high or significant impact on their industry within the next five years. Digging deeper into the data, many of these companies expect AI to fundamentally change their competitive landscape, driven by increasing risk of competition, including from new types of start-ups and companies from adjacent industries. The majority of companies also believe that AI will play a key role in their efforts to continuously cut costs to stay competitive.

Strongholds and premiums to change as AI gains ground

Many companies expect competition to intensify due to the 'winner takes all' dynamic often associated with the massive scale that AI and digital can create. They also expect significant impact on their products, increasingly in the form of new services, and they believe the speed of developing new products and taking them to market will drastically decrease - making current competitive strongholds less viable in the long-term. This is particularly clear in R&D intensive sectors such as Pharma, where big datasets and intelligent algorithms to speed up the drug discovery process (10x mentioned as realistic) can impact the dynamics towards existing peers, while new AI based entrants (e.g., intelligent devices) can influence how premiums are distributed in future value chains.

Across sectors, executives expect significant impact

Services comes out on top in the 'High Impact' category, but all sectors expect a significant degree of impact from AI. An overwhelming share also anticipate that AI will result in entirely new products, services, and business models. Companies from Industrial Products and CPR expect relatively least 'high' impact from AI, but even in these

sectors, more than 30% expect the industry to be disrupted.

Limited sync of maturity and expected impact

The biggest disparity is within Finance, specifically Pension and Insurance, where ambitious companies are making significant investments in building data infrastructure and AI capabilities, while others are taking a waiting stance, and will jump on the AI train when the technology is more mature.

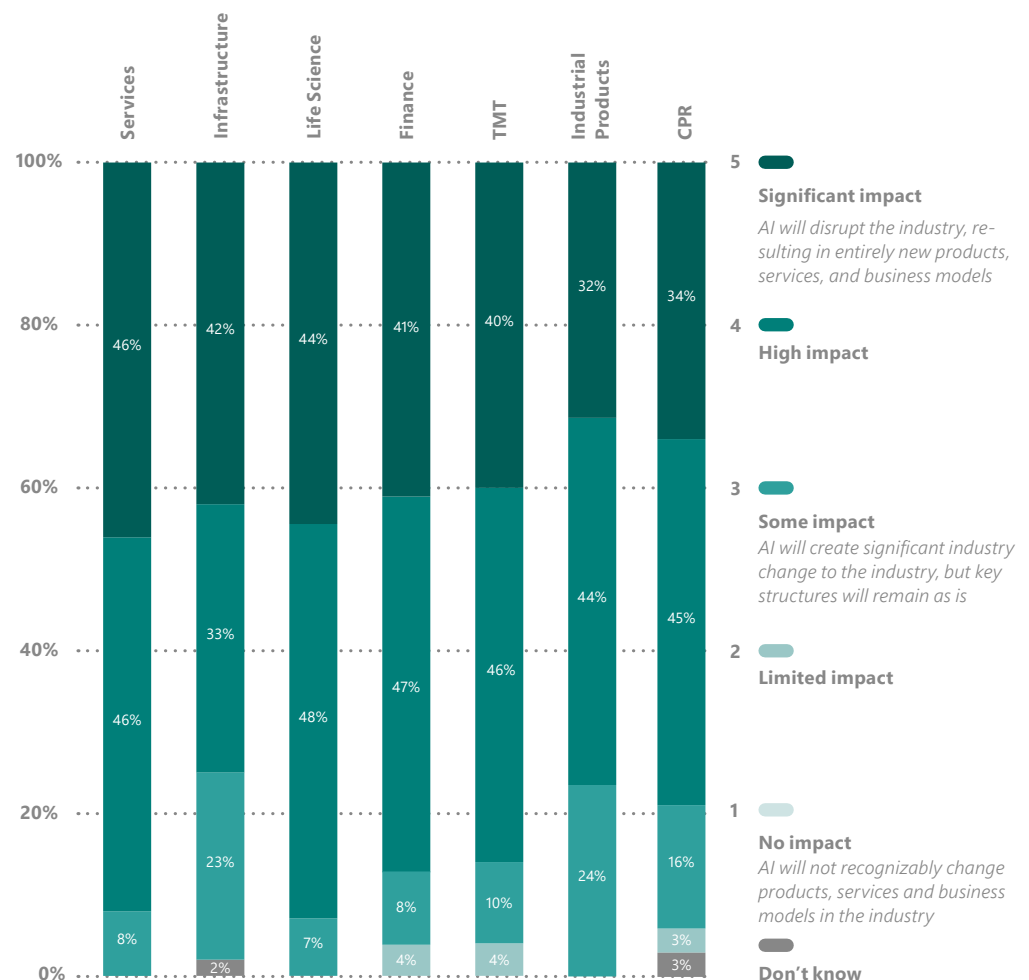
Countries expect different impact from AI

When approaching impact from a country perspective, the tendency remains; very high expectations across the board. Portugal stands out with most 'high' impact responses.

In the opposite end of the expected impact scale, Ireland, Austria, and Spain, in that order, are the countries where most companies expect only 'some' impact from AI or less.

Services the sector with the highest expected impact from AI

How much impact do you expect AI will have on your industry within the next 5 years?



Germany expects high impact of AI in the future

At 37%, companies in Germany are among the lower midfield across Europe when it comes to expecting AI to have a significant impact on their industry in the future. However, when including companies that reported a 4 on a scale of 1 to 5, 86% of German companies report that AI will have a high or significant impact on their industry. These results suggest that German executives might feel a little insecure when assessing AI's impact and gravitate towards not choosing the extreme options on the scale. According to the executives, some of the ways in which AI will disrupt industries relate to providing completely new digital capabilities, reduction of fail costs or automation of large amounts of business processes.

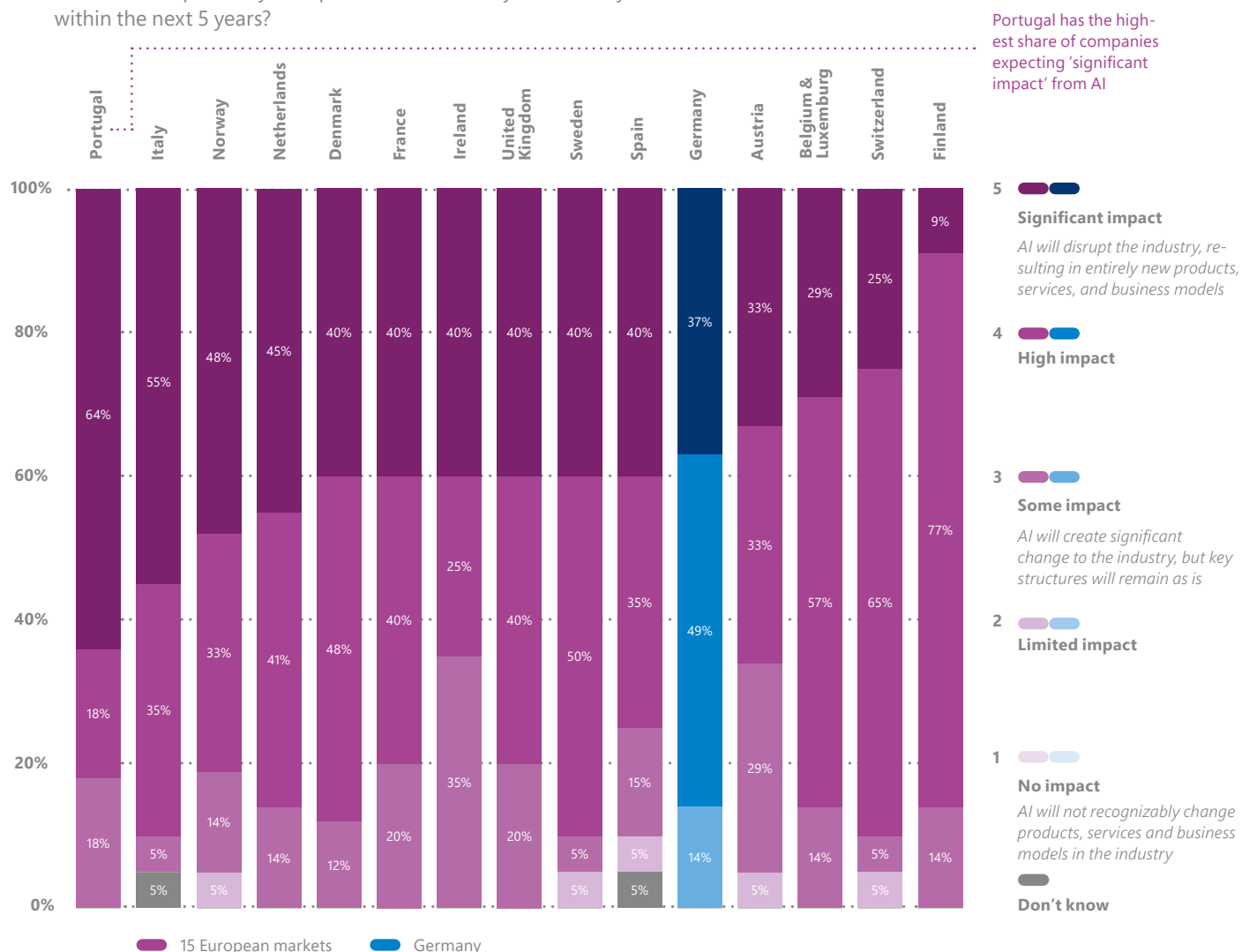


If AI manages to significantly reduce production costs or to accelerate R&D speed, it has the potential to strategically change the chemical industry even without the yet undiscovered new business opportunities.

— **Lanxess AG**
Chemical company

High expected impact from AI consistently across countries

How much impact do you expect AI will have on your industry within the next 5 years?

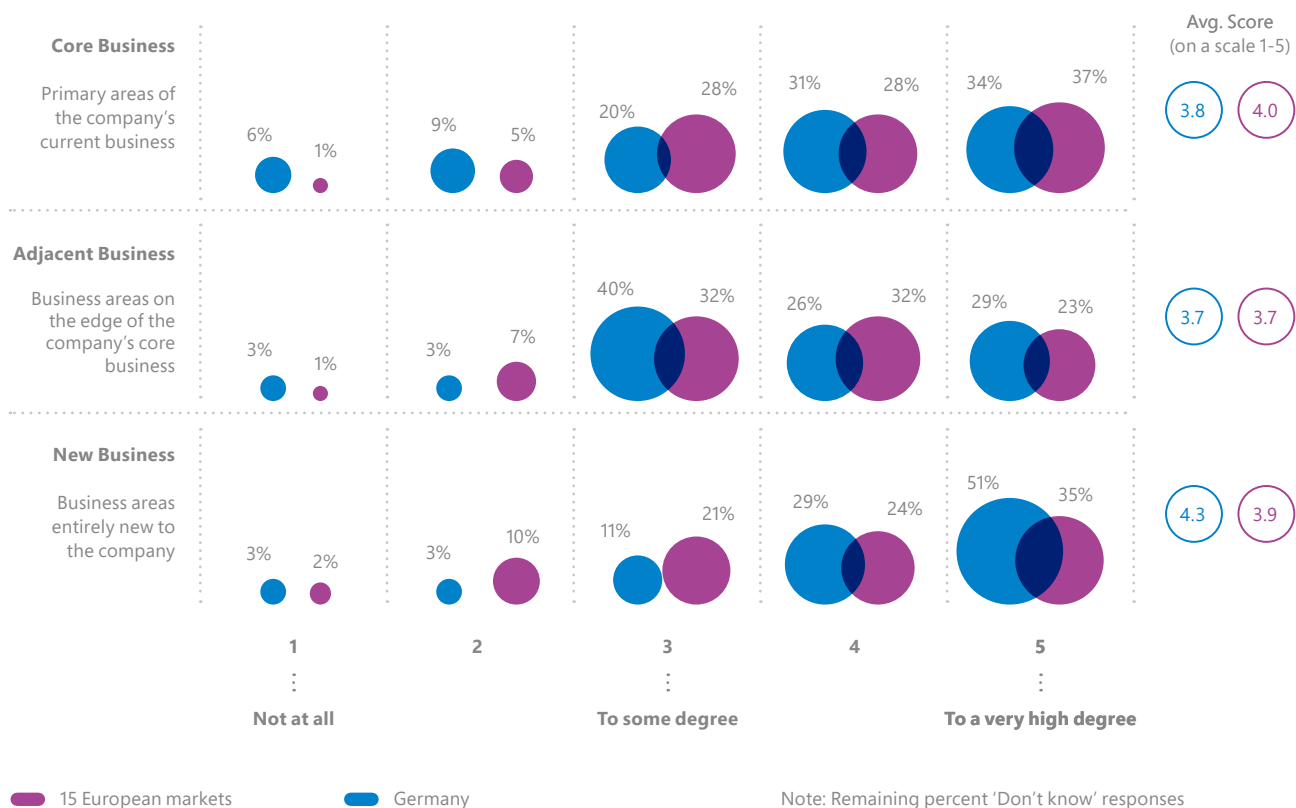


AI Here, There, Everywhere

What is the proximity of AI's future impact to core business?

Companies expect impact across all horizons

To what degree do you expect AI will create impact for your company within each of the following areas?



Many of the participating companies are expansive, with diversified business units offering a range of products and services. We questioned *where* they expect AI to have an impact - in their core, adjacent and/or new business.

AI will impact across the board, but less consensus on timelines

Companies expect AI to have a relatively equal impact on core, adjacent and new areas of their business. In interviews, they say impact depends on the timeline, for instance AI impacting the core business now, but adjacent and new business later on. The range of answers for "Adjacent" and "New" across

Europe are more split and contain more "Don't Know" responses than for "Core" - perhaps because there is an inherent challenge in making predictions about AI's impact on new business areas where business results are not yet realized, and where the role of current and upcoming AI technology is not clear.

Yet, interestingly 32% feel confident AI will impact areas that are "entirely new to the company." This is not far behind the 37% of respondents who expect a very high degree of impact on the core areas of the current business.

German companies expect AI to create impact across all business areas, on new business in particular

At least 55% of companies in Germany expect AI to have a high or very high impact across core and adjacent business areas. As an exception it should be noted that new business areas enjoy a significantly higher level of trust as this is where German companies expect AI to have a big impact, ranking far above the European aggregate.

Munich Re

Munich Re argues that AI will profoundly affect the future of the entire insurance industry. Application of AI is considered a strategic imperative and plays a key role in Munich Re's digital transformation strategy. The Board of Management, a dedicated AI organization as well as several interdisciplinary teams throughout the firm are strongly committed to bring the company's way of decision making to the next, digital level. One of the firm's strategic fields of play are the improvements AI can bring to text mining. Traditionally, the work of insurance companies involves dealing with long, complex texts such as damage reports that come in different shapes and formats, but typically contain a lot of highly relevant information. Accordingly, Munich Re has devel-

oped numerous AI-based Text Mining pilot projects and merged them into a single 'Text Mining Platform' providing features like document management, deep learning based entity and relat-

At Munich Re the Board of Management, a dedicated AI organization as well as several interdisciplinary teams throughout the firm are strongly committed to bring the company's way of decision making to the next, digital level.

ing extractors and knowledge graphs. The platform is serving as a central repository for all text mining projects and incorporates commercial as well as open source components and is designed to be open to both internal and external users.

One of the various use cases realized with this platform addresses supply chain risks area. A broad range of reports containing risk-relevant information about suppliers and customers are automatically analyzed by the Text Mining Platform. Companies and relations can be extracted, using trained deep learning models, and the full supply chain network can be provided to the respective experts in charge for review. Deep neural networks, are able to increase the accuracy by a significant amount, compared to rule based methods. This approach allows for much broader monitoring and has opened new perspectives in risk assessment, such as finding bottle necks in the supply chain.

Munich RE

Munich Re stands for exceptional solution-based expertise, consistent risk management, financial stability and client proximity. It operates in all lines of insurance, with more than 42,000 employees throughout the world. Munich Re is one of the world's leading players in the reinsurance industry with premium income of €31.6bn from reinsurance alone. Company offers a full range of products, from traditional reinsurance to innovative solutions for risk assumption. Especially when clients require solutions for complex risks, Munich Re is a much sought-after business partner. Company has roughly 12,000 staff in reinsurance and possess unique global and local knowledge. Munich Re attaches great importance to its client service, which regularly receives top ratings.

What next?

Munich Re is excited about the possibilities AI holds for the insurance sector and will continue to develop new AI-powered solutions to strengthen their existing services and extend their service portfolio. Upcoming pilot projects will focus on intelligent automation of standardized tasks and supporting staff with extracting complex information from large, textual repositories and images. Munich Re believes that now is the right time to ramp up AI capabilities at large and sees a significant potential in leveraging cognitive services for insurance specific use cases. Munich Re believes that AI will continue to affect the way people work and interact with each other in the future. The vision is to augment and empower all clients and employees to get a better understanding of data and the new challenges in a time of increasing and fast changing risks.



What is really challenging is not the prototyping, but the industrialization of our AI capabilities.



What we are looking for is delivering new functionalities to our customers. Our purpose is to provide AI-powered services that are insurance-specific, and that do not exist to date.

Use It or Lose It

How is AI put to use in companies today?

AI enables a wide range of uses, broadly split into personalizing, automating, predicting, prescribing and generating insights. We asked companies how relevant each was to their business and found a significant degree of variance in terms of what executives expect to use AI technologies for.

Prediction is the top use

With 74% of companies seeing prediction as a relevant use of AI, this functionality, which includes churn analysis, predictive analysis, and predictive maintenance, comes out as the top use. Companies with a large customer base use churn analysis to identify and proactively engage customers with exit potential. Sales teams use predictive analysis to identify leads with the highest likelihood of conversion. Companies that sell or use advanced costly machinery use predictive maintenance to save money through decreased downtime.

Intelligent automation for effectively dealing with routine tasks

Smart automation is seen as widely applicable by 73% of companies surveyed. With estimates that 20-30% of current

tasks can be done without human intervention, a substantial number of companies are currently in the process of training chatbots to transform the way information is acquired.

Generating insights to make informed decisions

Focusing on generating insights based on internal and external data, 59% of companies view AI as a way to make better decisions. This requires a sophisticated data infrastructure. Companies reliant on R&D are using AI to speed up the process of analyzing data for new product development and to inform future research.

Personalization is becoming a common feature

Among the surveyed companies, 42% are using AI to personalize the user experience, for instance by tailoring content to individual interactions as an effective way of driving mass-personalization. Next steps in personalization include chatbots and virtual assistants, where some companies already have fully automated customer front-end solutions in place.

Prescriptions' potential is big

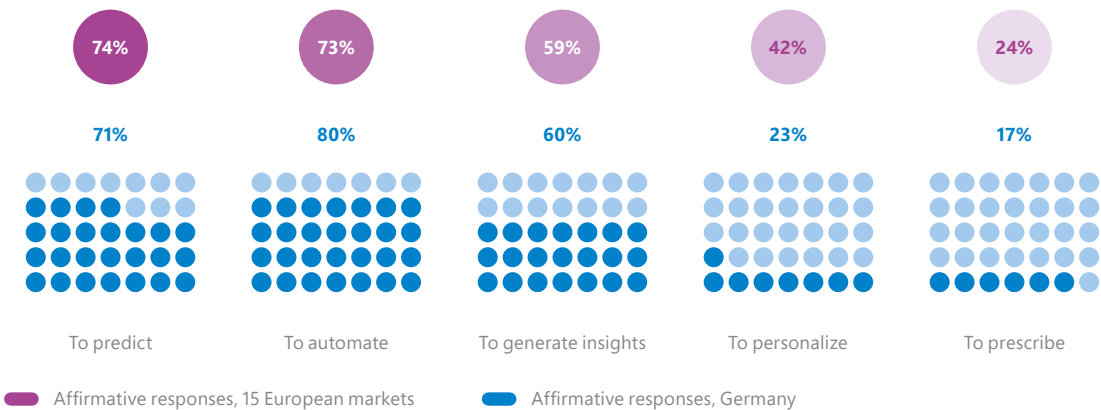
Prescription is the laggard among the five AI uses (24%), with current use-cases typically being early stage, such as suggestion engines and decision recommendations for salespeople and advisors. AI for advanced prescription such as complex decision making lies in the future, as it requires collecting large amounts of data and understanding which variables are significant, including some that are difficult to digitize.

Automation, prediction and generation of insights most relevant in Germany

At least 60% of respondents in Germany consider three of the five main uses of AI relevant for their company. The most common uses of AI are to automate (80%), predict (71%) and generate insights (60%), leaving far behind the opportunities of service personalization and prescriptive recommendations. Current use-cases highlighted by respondents include automation of routine back-office tasks and operations, and the standardization of tasks in customer support.

Prediction and automation relevant to most companies

What are the relevant uses of AI in your company?



Predict

Anticipate events
and outcomes



With the help of artificial intelligence, we have created a search assistant that enables companies to find people with the right skills for a given position. Our system identifies not only which people match the needed requirements, but also predicts their willingness to switch jobs.

— **Talentwunder** Talent search engine

Automate

Handle tasks without
human intervention



Internal processes are made more efficient and are automated in cases where no personal contact is needed. Complex use cases are simplified by receiving training from the machine or software, which in turn allows employees to focus more on tasks where personal contact is required.

— **Omnibot** AI platform provider

Insights

Identify and understand
patterns and trends



With AI, we can build systems that are able to learn new patterns of behavior and draw new conclusions from data that are too complex to spot by a single person.

— **Munich Re** Reinsurance company

Personalize

Tailor content and
user-experience



When it comes to AI, we primarily focus on the possibilities of analyzing our clients' preferences, building better next-best-offer algorithms and understanding the capital market at a granular level. Basically, our approach here is more experimental.

— **Landesbank Baden-Württemberg** Bank

Prescribe

Suggest solutions to
defined problems



AI is important to us, because we want to understand our audience, stay in contact with them through different channels, and produce content that is directly relevant to them not only now, but also tomorrow.

— **ProSiebenSat.1** Media company

Making AI Simple

What is a good framework to map the potential benefits from AI?

The contributing companies generally expect to benefit in all four key domains as outlined in **Microsoft's Digital Transformation framework**: *optimizing operations*; *engaging customers*; *transforming products and services*; and *enabling employees*. Each domain draws on underlying AI functionalities – 'reasoning' through learning and forming conclusions with imperfect data; 'understanding' through interpreting the meaning of data including

text, voice, and images; and 'interacting' with employees, customers and other stakeholders in natural ways.

Applying AI to these domains can be transformational to a business, ultimately changing the landscape of the business itself and the industries and eco-systems in which it operates.

Let's look in more detail at what that entails.

Artificial Intelligence impacts business in four benefit domains

Companies must consider how they approach the benefit domains in their AI strategy formulation

Engage your customers

E.g., provide customers advice, shorten conversion cycles, and reduce time to resolution



Artificial Intelligence benefit domains

Transform your products & services

E.g., speed up product innovation cycles, enable new value add services, and provide real time support



Enable employees

E.g., increase employee efficiency through predictions, enabled support, and automation of repetitive tasks



Optimize your operations

E.g., improve planning and reduce costs through intelligent prediction, operational efficiency, and deep insights, predictive maintenance



Improved production and efficiency through optimized operations

While digital transformation in general is based on customer engagement, optimizing operations is what companies first look to when putting AI to use. It draws on multiple levers such as:

- **intelligent prediction**, e.g., identifying chronic diseases, anticipating non-performing products, or adaptive modelling to flag corrective actions;
- **operational efficiency**, e.g., optimizing forecasting and order-to-fulfilment flows across the value chain, or processing huge sets of documents in a fraction of the time;
- **deep insights**, e.g., detecting anomalies to surface irregularities such as fraud, or identifying new pockets of opportunity before competitors do.

Engaging customers more effectively through AI

After optimized operations, companies look to customer engagement as the domain in which to seek most business benefits. Early examples of AI applications in the customer engagement space involve levers such as:

- **conversational agents**, e.g., bots providing personal recommendations and transactional advice;
- **personal assistants**, e.g., guiding decision-making, shortening conversion cycles;
- **self-service**, e.g., options to help customers reduce time to resolution.

Staying ahead of the competition by transforming products and services

Transforming products and services, and enabling employees, came out on the same level, slightly below the two other domains when it comes to where companies expect to generate future business benefits. Transforming products and services, ultimately giving rise to entirely new business models, is mostly favored in **R&D-heavy sectors** where companies consider AI and advanced analytics as levers to speed

up the product innovation and discovery process. In **B2C-oriented sectors**, AI enables provision of new services via multilingual cognitive tools, geo-location suites, sentiment analysis, cognitive robotic advisory capabilities, personalized service agents and more, to transcend the sectors to a new level of value-add -with significantly increased scale and reach in real time.

Enabling employees to be more efficient and capable

Across sectors, numerous AI use-cases focus on increasing employee productivity or serve to enhance the human ingenuity and the ability to fulfil a given function. AI helps employees in B2C companies expand organizational knowledge by analyzing vast customer behavior datasets in order to adapt online and offline store layouts, driving conversion and sales. **Customer personalization** is used at scale, powered by AI solutions that reveal real-time customer insights, identifying the best next actions for up-sell and cross-sell opportunities, as well as predictive models that obtain a 360-degree view of the customer by integrating customer data and sentiment to generate targeted offers.



In areas where artificial intelligence is irrelevant the risk to employment is constantly overestimated and in areas where it can contribute significant value it is largely neglected.

— **Talentwunder**
Talent search engine

Where Value Hides

What benefits do business leaders particularly expect from AI?

Respondents were asked to assess the potential of AI within each of the four benefit domains.

Optimizing operations and engaging customers to deliver most value

Among all companies surveyed, 89% expect AI to prove beneficial in optimizing operations, with use-cases most highlighted by executives being monitoring results, predicting trends, and prescribing future solutions. A lot of focus is given to intelligent automation. This includes for example making compliance cheaper and more robust, improving risk analysis, optimizing supply chains, providing predictive maintenance capabilities, and more.

Not surprisingly, the ability to structure repeatable processes and reduce human error and bottlenecks is something most executives can get behind from a cost-saving perspective. 72% of companies surveyed expect AI to help them engage customers and enhance the user experience, including tailoring content, increasing response speed, adding sentiment, creating experiences, and anticipating needs.

Fewer companies expect AI to generate value in products/ services and employee engagement

Although executives speak of the potential in making sense of existing and new sources of data to introduce higher margin services to product portfolios, expedite new product development, and introduce innovative new offerings, only 66% expect AI to help transform products and services.

Even fewer (62%) expect AI to provide benefit from empowering employees to improve productivity, enable innovation, support problem solving, etc.

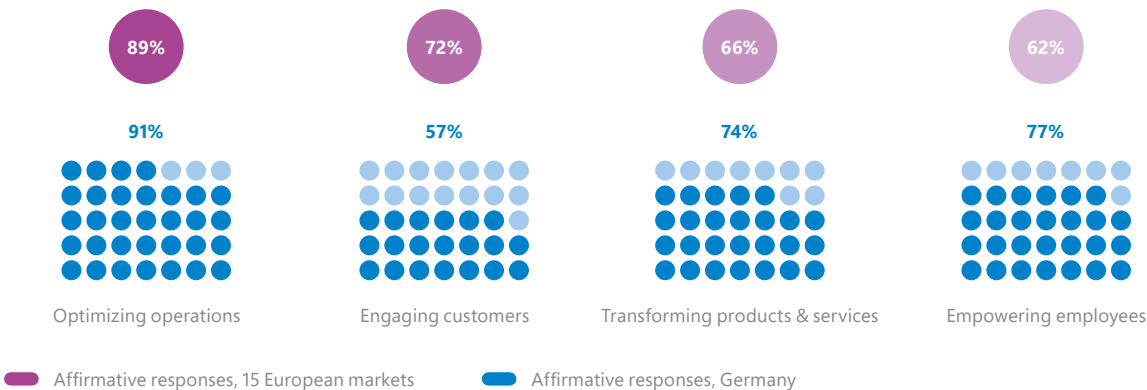
What we did hear overwhelmingly, however, was the importance of bringing all employees along on the company's AI journey. This involves getting internal buy-in that AI will be a force for good, generating excitement about working with intelligent technologies, and making existing jobs easier and more engaging.

Companies in Germany expect AI to transform products and services, as well as to empower employees

Among German companies surveyed, 91% expect AI to help optimize operations in ways such as automating processes and predicting capacities - following a similar trend as the European aggregate; 77% expect AI to empower employees by taking informed decisions and exploring new capabilities; and 74% expect AI to transform products and services, for instance by virtualizing offerings and increasing the precision of offerings. Lastly, 57% expect AI to help engage customers in ways such as tailoring insights and personalizing products.

Most companies expect to benefit from optimizing operations

What business benefit do you expect AI to generate?



DACHSER

DACHSER has implemented its digital activities in the general strategy, at the organizational level and AI is seen as one of the digital core initiatives. The main focus lies in the prediction of quantities in the area of network as well in Robotic Process Automation (RPA). DACHSER has established a core team of dedicated experts that drive the development of RPA solutions. Thereby DACHSER identifies processes with great leverage opportunities and rebuilds them using bots. One of the currently implemented RPA bots focuses on country specific compliance requirements. Issued invoices that are put on a page of the country's tax authority

have to be tracked simultaneously. The recipients (one of them is DACHSER) have to look in every day, download the invoice into a particular directory,

DACHSER uses digitization and AI to improve its asset driven business model and to streamline processes in complex supply chains. A customer centric approach is key.

save it on a drive and then move it to an electronic workflow and check if the invoice is correct before its release. For this standard procedure DACHSER has built a RPA bot, that automatically

logs into the system on the tax page, works 24/7 and repeatedly looks if there are new documents available. If needed, the bot pulls out these papers and places them accordingly so that the electronic workflow can be approved in the system. This is a very simple example; however, it represents the application of RPA in case of a real urgency where typically a simple human interaction would be required. DACHSER strongly believes that this shift to the automation of simple activities helps to set the focus of workforce on more important or complex tasks that involve a higher degree of business value.

DACHSER

DACHSER combines the ethical culture of a traditional family business with a passion for top-quality logistics services. This unique constellation explains the development of the forwarding company founded in 1930 by Thomas Dachser in Kempten / Allgäu to become one of today's most successful logistics companies. The history of DACHSER shows how a company can dynamically develop in line with technological progress and the impact of globalization on the logistics industry. Today DACHSER stands for highly modern, efficient and IT-driven logistics solutions. Its core business is based on the close integration of the company's global transport and warehouse networks, long-term partnerships and consistent digital networking worldwide. In 2018 DACHSER had 30,600 employees and an annual net revenue of 5.6 billion euros.

What next?

DACHSER is striving to apply new technologies in a daily business. The future goal for DACHSER is to illustrate within the company and for the customers its technological potential. The awareness of potential AI benefits across all departments within DACHSER is currently being raised in order to initiate the development of further use cases. Simultaneously, DACHSER is extending its competence team, which is able to technically deal with AI topics. The goal is to build up an agile framework, where teams with diverse business and technical qualifications collaborate and create an organizational setup that deals with the topic of AI & Analytics throughout the entire organization.



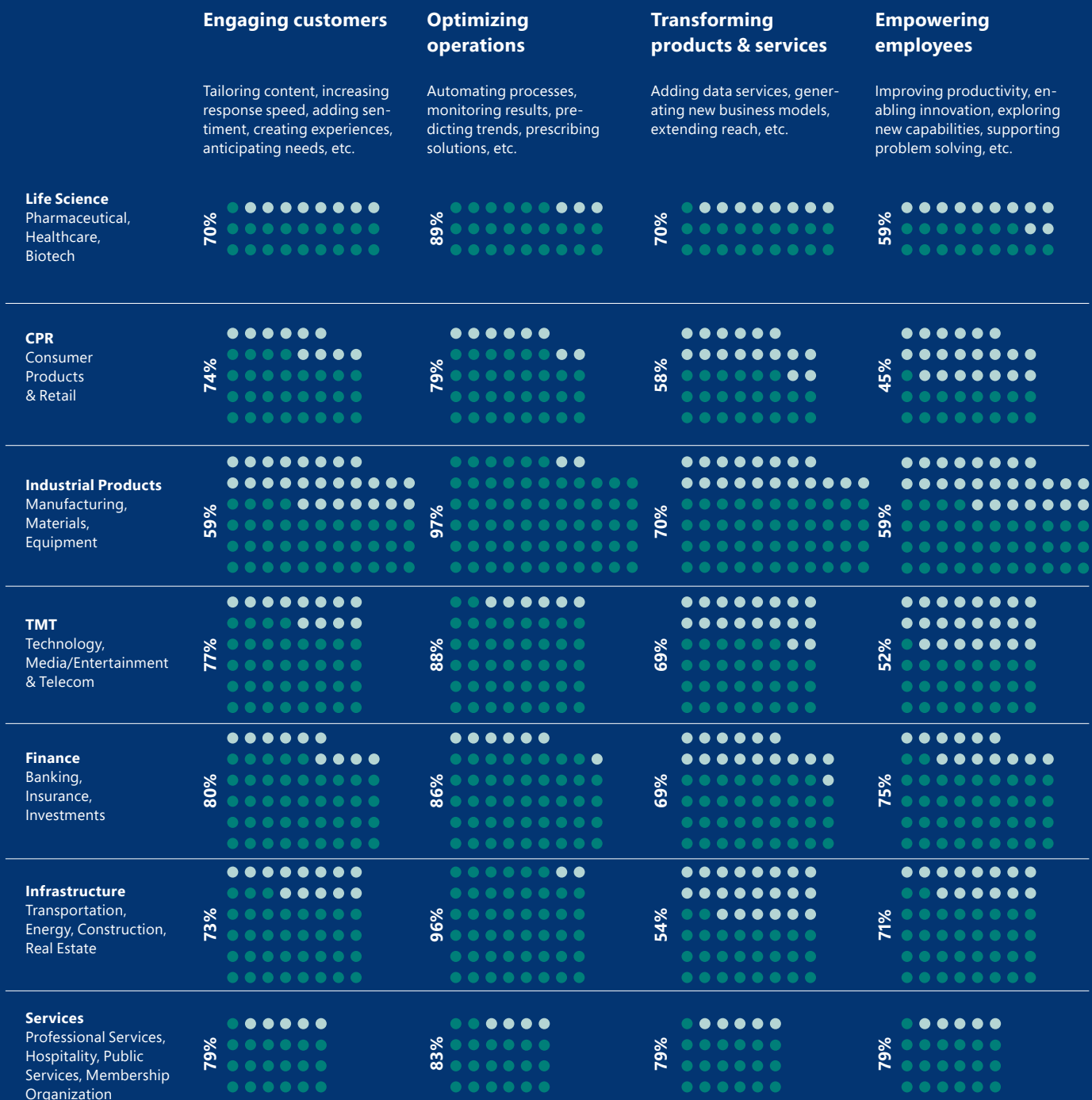
Today one of the essential keys to success in AI implementation is changing the collaboration style from line to matrix and bringing the AI topic together. Teams should be able to handle multiple disciplines and bring both technical and business expertise.



The success for us would be when we saved one hour of our working time per day to enable employees to do more valuable work. Digital initiatives and AI are being discussed on executive level.

Sector Benefits Landscape

We asked companies across sectors what business benefit they expect AI to generate across Engaging customers, Optimizing operations, Empowering employees, and Transforming products & services



 Affirmative responses by sector

Front to Back

What are the expected benefits by sector?

Executives surveyed and interviewed in the various sectors recognize the distinct benefits of AI, speaking about the myriad of ways they see AI transforming their businesses and industries. Although there are clear patterns to discern, executives from different sectors often speak to different benefit areas from which they particularly hope to capitalize from.

Services companies expect the most benefits from AI

Services companies reported the highest expected benefits across all four domains, expecting significant value from AI through engaging customers and empowering employees, for example via improving resource and skills allocation across their large human capital pools. (Note: the Services sample is the smallest of all sectors.)

Expedited drug discovery and disease prediction in Life Science

Executives in Life Science are among those most excited about benefits pertaining to transforming products and services. Many see AI leveraging existing internal and external datasets to speed up the drug discovery process and enable the transition towards precision medicine.

Deep learning with huge datasets is also expected to assist with disease prediction. Customers can be engaged using new health-oriented IoT-related

wearables, paving the way to valuable data collection and even entirely new business models.

Engaging customers in new ways in Consumer Products and Retail

The Consumer Products and Retail companies we spoke to rank lowest in terms of expecting benefits from AI, pulled down by only 45% expecting benefits from AI to empower employees. However, with multilingual cognitive tools and being able to bring targeted, tailored offerings to customers, many spoke of the potential to engage customers, and of using AI for crucial activities such as understanding brand performance and sentiment analysis.

Virtually all Industrial Products and Infrastructure companies look to optimize operations

Companies from the Infrastructure and Industrial Products & Manufacturing sectors top the list at 97% respectively in terms of expecting efficiency gains through AI optimized operations. The heavy focus on equipment, complex supply chains and materials means there is ample scope for intelligent optimization. Yet, there is a relatively small focus on engaging customers and empowering employees. This is likely due to the frequent B2B nature of these businesses, and the potential for automated machinery to play an ever-growing role in the industrial sector.

TMT expects AI to increase engagement, insights, and connectivity

The focus in many Telecom, Media and Technology companies seem to be on using AI to reduce costs of retaining and growing customer bases. AI is projected to help build seamless experiences across devices, predicting churn, and automating customer service capabilities to solve some of the sector's longstanding challenges while bringing down costs.

AI to revolutionize Financial Services firms

Finance companies reported some of the highest expectations for AI benefits across the four domains, which can explain the sector's current frontrunner when it comes to current AI maturity. From using machine learning to detect fraud and automation to streamlining KYC (Know Your Customer) efforts in the back office, and to reducing compliance and regulatory costs via technologies that digest vast quantities of legal documents, banks and other financial institutions are looking to provide higher quality service at faster speeds and lower costs. Similarly, mortgage applications can be approved in a matter of minutes, and investment decisions can be guided by robo-traders to transform products and engage customers in the front office.



Our AI solutions are geared to the problems of our customers. Therefore, it is our goal to increase the added value of our customers with the help of AI. Technology should always lead to a better support of our clients.

— **Landesbank Baden-Württemberg**
Bank



So setting ethical and moral boundaries in AI is actually a challenge that is not so distant in the future. Doing what is right and what is good with the data that we have, is instrumental.

— Bayer Pharmaceutical company



There is a need for people in the departments, who do not only work on their digital tasks as an additional mile, but who act as assignment-based resources on specific projects with dedicated space during their work time to create valuable results. Dedicated resources from different departments working on one solution is the setup that speeds up the development of digital products.

— DACHSER Logistics company

Risky Business?

What do business leaders need to pay attention to when implementing AI?

There are inevitable concerns about the business risks associated with AI, as many of the applications of the relatively new technology are still in their early development while receiving significant media and political attention. However, from what business leaders tell us, they are balancing their excitement about AI's potential with some healthy reflections on key business risks, not at least the risk of investing in a technology that may not prove its commercial value if not done correctly.

Broad concern with regulatory landscape

Over half of all companies surveyed expressed concern regarding regulatory requirements. This concern can broadly be split into compliance with existing requirements and navigating the nascent, often ill-defined regulatory landscape for AI. For the former, companies

need to take advantage of solutions in accordance with everything from GDPR to cybersecurity concerns. For the latter, the lack of clarity around AI regulation can slow down scaled implementation as business leaders worry about investing in solutions when the rulebook is still being written. Many first movers within our AI report feel they need to write the rules themselves and hope for the best.

Concern with the human in the new machine age

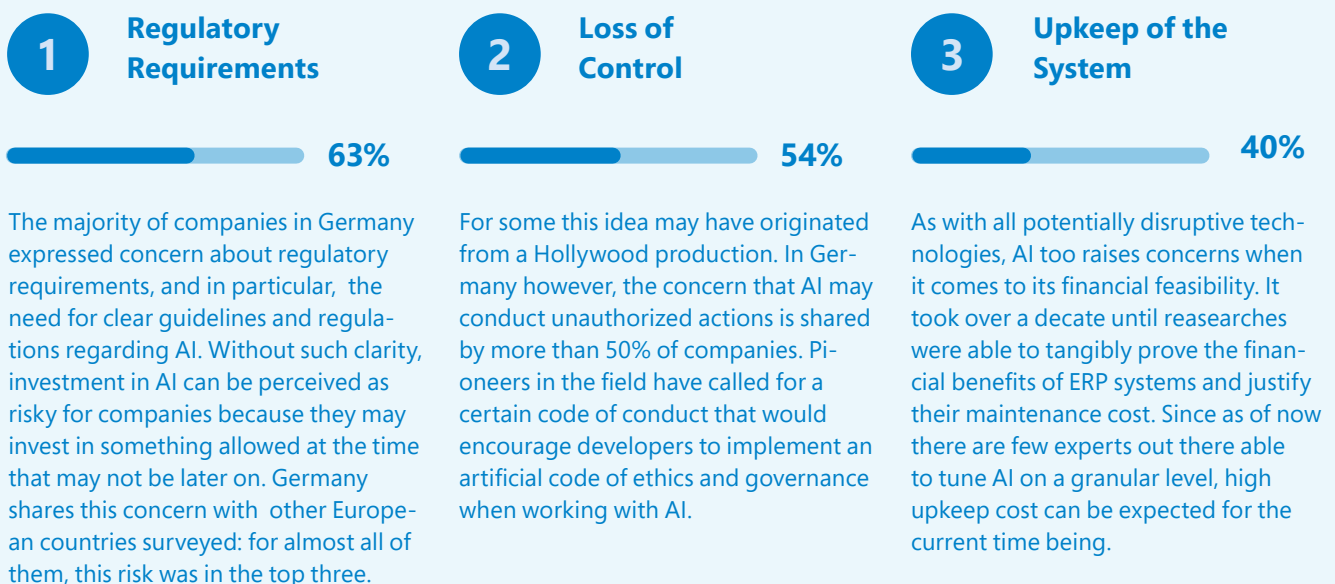
A prevailing risk many companies were also concerned with was impact on personnel. The need for employees across the organization to buy in and adapt to working with AI touches on all industries and markets. The instinctual fear of job losses among personnel is one that needs to be managed as AI will often transform the daily tasks of

employees, rather than replace them altogether, allowing for more people-oriented or creative work. There is also a larger task in training employees to work together with AI, usually a challenge and risk in itself.

Seeing the wood for trees

A further dominant risk articulated by several surveyed business leaders is about feeling information overload. AI can help make sense of huge quantities of data, but setting up AI and learning to use it effectively requires feeding the technology the right data and working out what is useful versus what is noise. A further element in the risk of overload is understanding the different AI technologies and solutions available and making sense of technological as well as market developments to know where to make strategic use of AI.

Top 3 business risks in Germany



Learn from the Leaders

The promise of AI lies in creating business value.

We have identified the eight most recognized capabilities needed to successfully create value from AI, and assessed how competent the companies are within each capability.

Perhaps more importantly, the executives we spoke with highlighted the importance of these 8 competencies as those needed to successfully create value from AI.

Capabilities. How?

What competencies are required to get AI right?

This section explores the necessary eight capabilities to develop AI maturity, realize tangible business benefits, and minimize risk. As exhibited in the chart on the following page, we asked the companies to rank the importance of these capabilities in terms of incorporating AI into their business, as well as to self-assess how competent their companies are with regards to each AI enabling capability.

The human element and technology

Some of the eight capabilities center around human elements: AI Leadership; Open Culture; Agile Development; Emotional Intelligence. Others are more technology oriented: Advanced Analytics; Data Management; Emerging Tech; External Alliances.

Ranking of key capabilities for realizing AI potential

Advanced Analytics comes out on top as the most important AI enabling capability among the companies surveyed. *Data Management* is second. AI Leadership is perceived as the third most important capability. *Open Culture* refers to collaboration and the ability to embrace change and uncertainty.

Understanding how to deploy the right *Emerging Technologies* in a future proven way is ranked fifth, followed by *Agile Development*, where self-organized teams are characterized by shorter project cycles, the ability to work with constantly evolving technology, and transparency regarding success and failure that leads to wider buy-in and scaling.

Entering into *External Partnerships* ranks second to last in terms of importance, perhaps because it's the area that resonates most with existing capabilities and where business leaders perceive themselves most in control. As the majority of companies we spoke

to are looking to supplement their in-house skills with external partners when building their AI solutions, particularly for pilot projects, it is not due to a general lack of relevance.

Bringing behavioral science into play via *Emotional Intelligence* to build solutions that understand and mimic human behavior, and make it easier for humans to interact with the technology, is seen as the relatively least important AI enabling capability. An explanation for this could be that the technical skills are still so relatively complex for companies to grasp and establish, that more advanced human emotional skills become less of a priority at this stage.

Noticeable sector deviation

As exhibited in the following chart where business leaders are asked how competent their company is in relation to the most important AI enabling capabilities, the sector aggregate scores land at or just above the median, with a fairly close spread. Sectors that are more mature in using AI are those that report higher competency in Advanced Analytics - particularly TMT (Telecom, Media/Entertainment & Technology), as well as Finance (including Banking, Investment & Insurance), and Life Sciences (including Healthcare & Pharma) all report lower competency in AI Leadership. A possibility is that in the pharmaceutical industry, AI chiefly resides in R&D, and has yet to affect the broader organization on the wider strategic level. Companies intend to use various levers to obtain these AI capabilities.

Companies are relatively evenly split between using recruitment (62%), training (55%), partnering (58%). Only 12% of the companies use acquisition of teams or businesses as a way to fast track building much needed AI capabilities.

8 capabilities

1. Advanced Analytics

Obtaining and deploying specialized data science skills to work with AI by attracting talent and working with external parties

2. Data Management

Capturing, storing, structuring, labeling, accessing and understanding data to build the foundation and infrastructure to work with AI technologies

3. AI Leadership

The ability to lead a transformation that leverages AI technology to set defined goals, capture business value and achieve broadly based internal and external buy-in by the organization

4. Open Culture

Creating an open culture in which people embrace change, work to break down silos, and collaborate across the organization and with external parties

5. Emerging Tech

The organizational-wide capability to continuously discover, explore and materialize value from new solutions, applications, and data platforms

6. Agile Development

An experimental approach in which collaborative, cross-functional teams work in short project cycles and iterative processes to effectively advance AI solutions

7. External Alliances

Entering into partnerships and alliances with third party solution providers, technical specialists, and business advisors to access technical capabilities, best practices - and talent

8. Emotional Intelligence

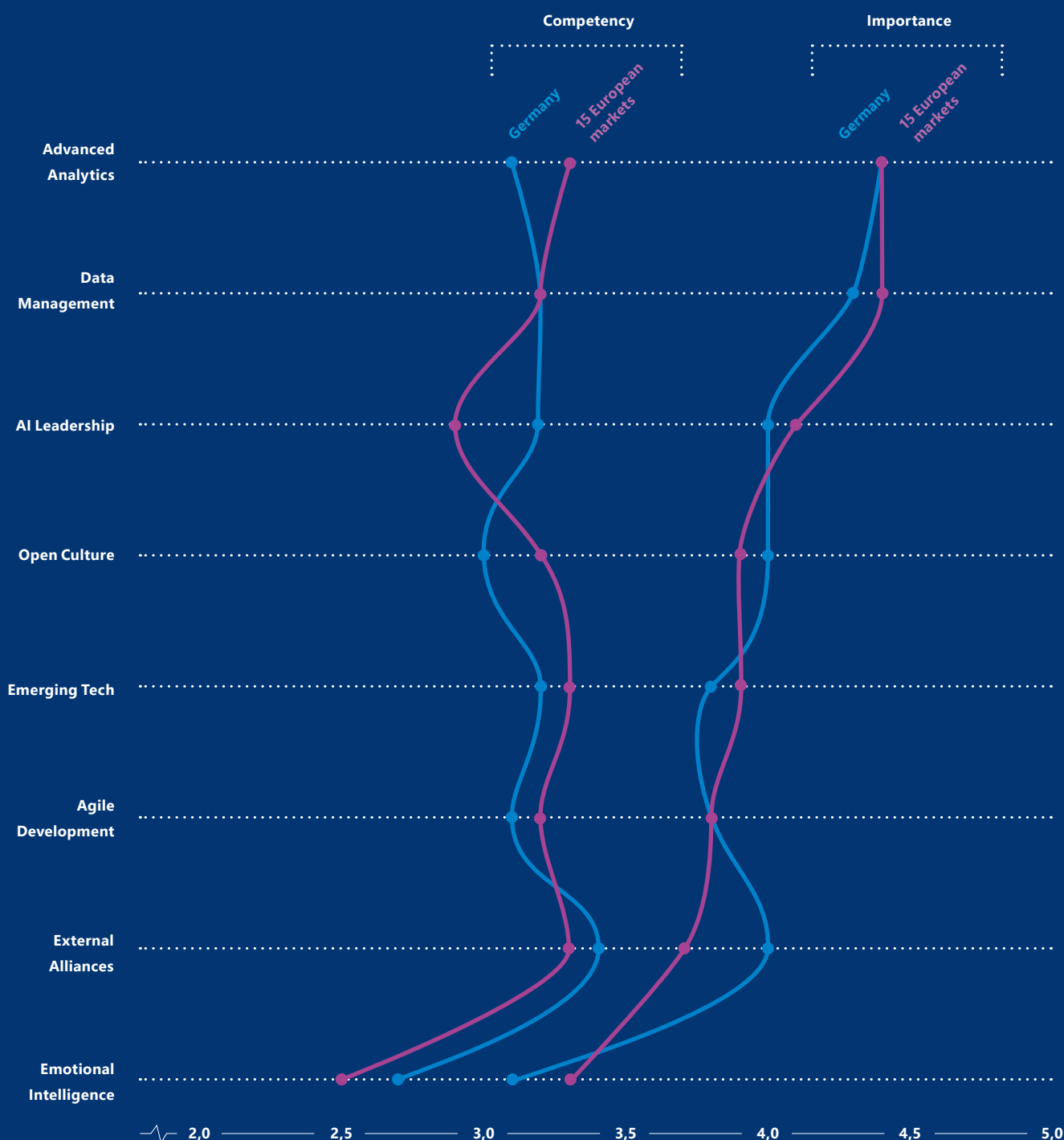
Applying behavioral science capabilities to understand and mimic human behavior, address human needs, and enable ways to interact with technology and develop more human-like applications

AI Competency Model

Advanced Analytics and Data management considered most important AI capability

How competent is your company within these organizational capabilities?

How important is each of the organizational capabilities for your success with AI?



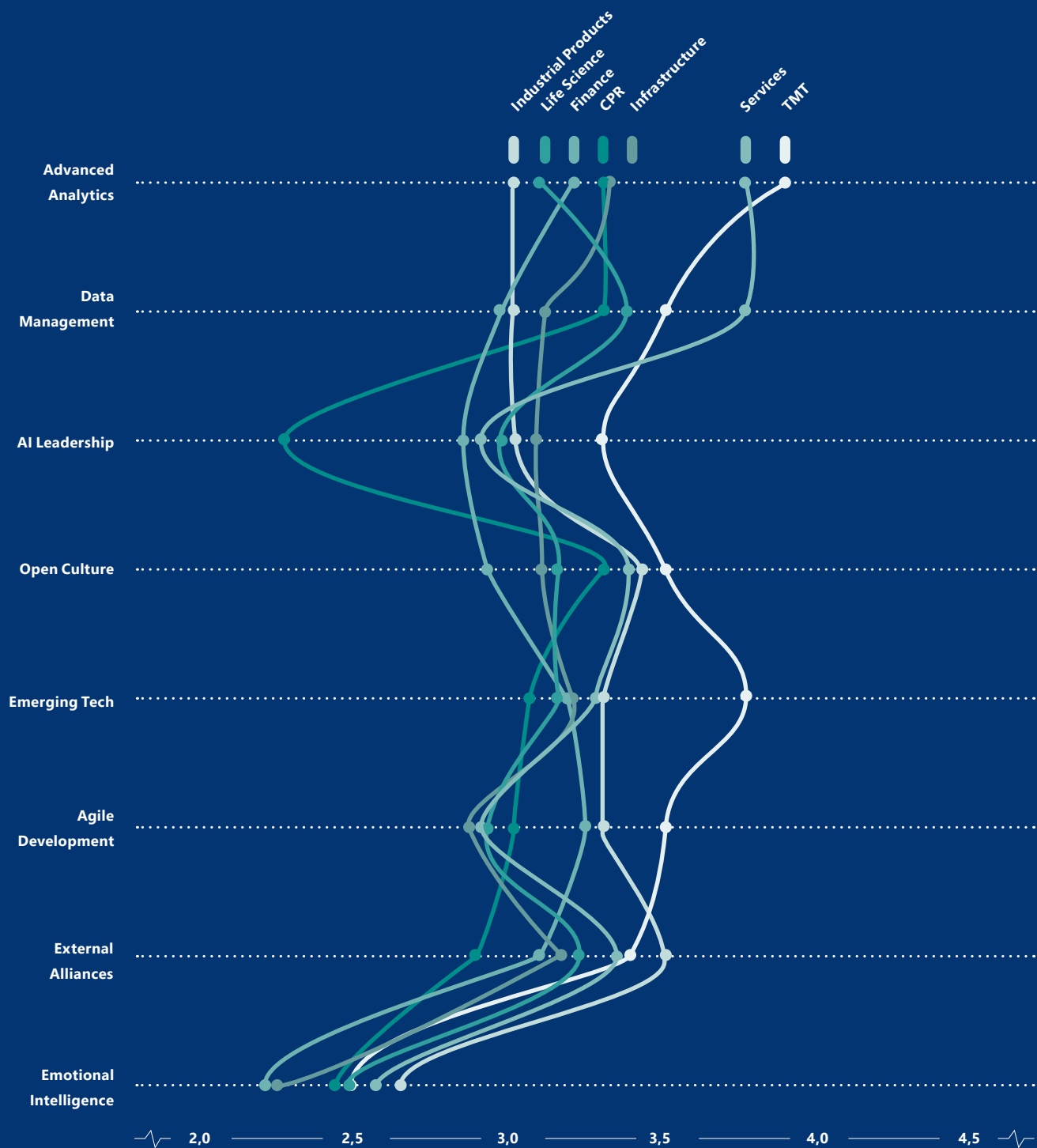
Note: 'Don't know' answers not included in average score.

Average competency and importance for Germany and 15 European markets (1: lowest – 5: highest).

Capabilities ranked according to highest importance in 15 European markets.

TMT is ahead of other sectors regarding AI competency

How competent is your company within these organizational capabilities?



Note: 'Don't know' answers not included in average score.
Average competency by sector (1: lowest – 5: highest).

1. Advanced Analytics

To obtain and deploy specialized data science, data engineering, data architecture and data visualization skills by training employees, attracting talent and co-creating with external partners



Educational institutions should try to motivate students by introducing state-of-the-art research and use cases already at introductory lectures. At the same time, companies should get an understanding that it will probably take one or two student generations to perfectionate the skill sets needed for the implementation of complex algorithms.

— Werkzeugmaschinenlabor WZL of RWTH Aachen University

The backbone of AI is made up of skilled, intelligent minds who are capable of understanding business problems at the granular level, and deploying AI to effectively solve or support others in solving these problems. This requires technical data science and mathematical engineering skills, to hybrid profiles with sufficient business acumen to decode problems and ability to tackle them using quantitative methods.

A self-fulfilling talent prophecy

It is evident from the study that there is a major lack of technical data skills to meet the drastically rising demand for AI. As a result, the hunt for AI experts has become extremely competitive, and it is far from uncommon that functional AI experts are paid higher salaries than their superiors are - in some cases leading to new HR policies to reflect evolving requirements.

Several business leaders state that the lack of AI talent is the greatest barrier to implementation within business operations. Interestingly, companies that have chosen an early adopter strategy for AI have been successful in attracting senior professionals who again have been able to build out sizeable AI teams in their companies – based on the premise that talents seek talent – making AI recruitment a self-fulfilling prophecy for these pioneering companies.

In other words, the longer you wait, the harder it can be to get the right people. Consequently, a 'wait-and-see' strategy can be risky for companies that are AI followers due to the scarcity of talent, which may prove impossible to attract once the company is ready to make a more ambitious move into AI.

While many companies struggle with acquiring AI talent, we also experienced companies - even in traditional industries such as Transportation and Industrial Products - with AI teams of +25 experienced data scientists holding Ph.D's in mathematics, astrophysics, etc., from high profile universities. Most often, these companies have been first movers on AI and attracted senior practitioners tasked with building out sizeable AI communities to work on the most strategic business agendas.

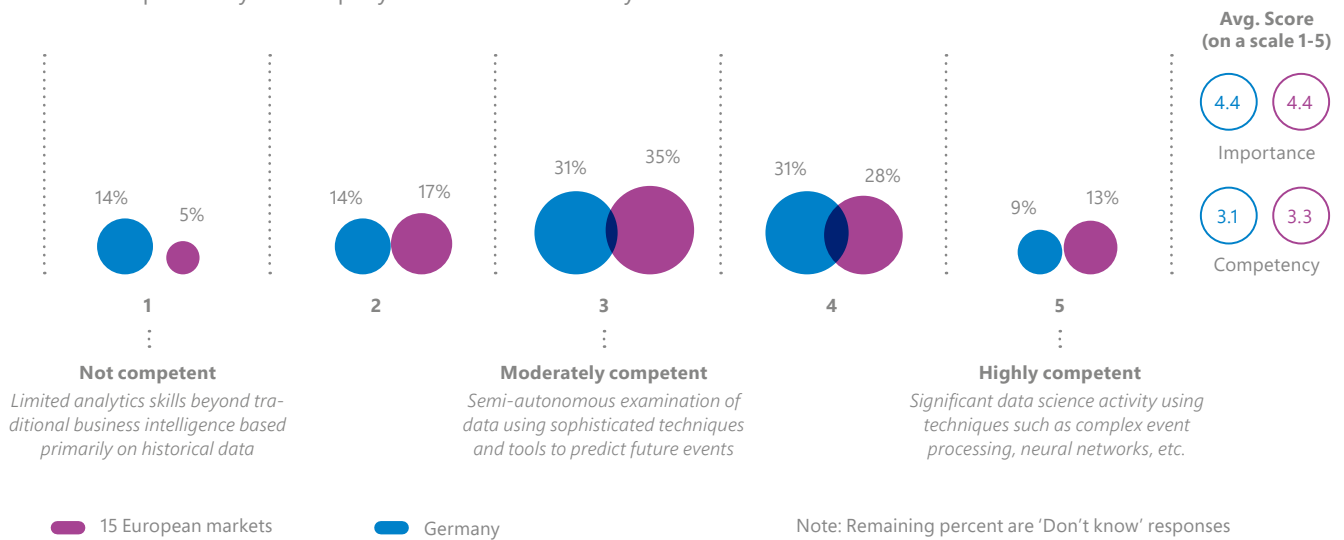
Hybrid profiles becoming the hardest currency

One of the most consistent inputs from the executives was the need for people with deep domain knowledge combined with strong technology proficiency. This hybrid profile is essential to identify relevant use-cases in the business with possible AI solutions.

Contrary to data scientists, software engineers, and even data architects that can be recruited externally, the hybrid profile is often nurtured by training existing employees from the line of business and adding AI skills. To succeed however, a fundamental appreciation for technology is required.

Companies consider themselves moderately competent within Advanced Analytics

How competent is your company within Advanced Analytics?



Co-creating to compensate for blind spots - while avoiding the black box

The scarcity of available talent has led companies to increasingly co-create solutions with external partners who bring with them specialized know-how. However, executives very clearly point to the need for internal AI capabilities in the receiving end to understand the real problems and evaluate the performance of external partners.

Companies find that AI solutions implemented by external parties become black boxes unless the organization is capable of contributing and taking over the solutions after delivery. Avoiding black boxes is a general concern among executives. Consequently, internal data scientists must be able to decode and dissect AI applications to explain the underlying rationales.

Such rationales are important in making AI driven solutions creditable, and greatly reduce the risk that an AI application draws wrong conclusions based on false assumptions.

Advanced Analytics is one of the most important capabilities in Germany

Across all markets surveyed, Advanced Analytics is considered the most important of the eight capabilities necessary for success with AI - on a scale of 1 to 5, the average importance score in Germany (4.4) coincides with the European average. In terms of their competency, 9% of German companies consider themselves highly competent in Advanced Analytics. (3.1 average). The companies talk about their efforts to increase their competency in this area, and in particular, mention challenges around finding the needed skills and personnel, as well as the appropriate applications of advanced analytics.

What to learn from AI leaders:

1. Providing interesting problems, good data, and a freedom to thrive in a non-corporate environment is key to attracting talent.
2. A wait-and-see follower strategy can prove risky and put companies in a talent scarcity trap.
3. Training existing staff with deep business intrinsics is key to make AI work - and effective when access to talent is challenged.



The successful introduction of AI requires not only technical experts, but also human capabilities of empathy and profound change management.

— **FlixBus**
Transportation provider

2. Data Management

Capturing, storing, structuring, labeling, accessing and governing data to build the foundation and infrastructure to work with AI technologies

Companies tend to focus their AI efforts in areas where they already have relevant data. We found that the amount of available data varies significantly by sector but regardless, a significant proportion of the time companies dedicate to AI is spent on data management related tasks.

Data governance is no trivial task

One of the major hurdles companies face regarding data is governance, particularly who 'owns' it, how data is stored, how to access it, and who may access it are all essential questions when working with AI. Questions that used to be about efficiency suddenly become highly strategic and complex to respond to without rethinking governance structure and policy. Governance aside, the most common obstacles to using data are organizational silos or legacy systems built for specific purposes, resulting in decentralized storage that limits access.

Companies reported that they typically spend 2-3 years building the appropriate data infrastructure for AI, and many respondents with the most ambitious AI visions are still spending the majority of their time fine-tuning their infrastructure.

Data privacy regulations

Data infrastructure is not only a prerequisite for effectively working with AI, but is increasingly needed to comply with data privacy regulations, which respondents see as a key risk. The recent implementation of GDPR in the EU has highlighted the need to govern what data is being used for. AI-specific regulation is in many ways still immature, and AI leaders find that a lack of clear guidelines can limit their progress.

Advanced companies (also) appreciate external and unstructured data

To build precise and useful AI solutions, companies not only need a lot of data, but also accurate data that is appropriately structured and labeled. Data is often reported to be in a state that it is simply unusable, as it could lead to undesirable or unreliable outcomes.

While most companies are preoccupied with cleaning, structuring and migrating historical data, some have chosen to build new data structures from scratch to collect the correct data going forward. Interestingly, we found that while companies that are less mature in AI tend to

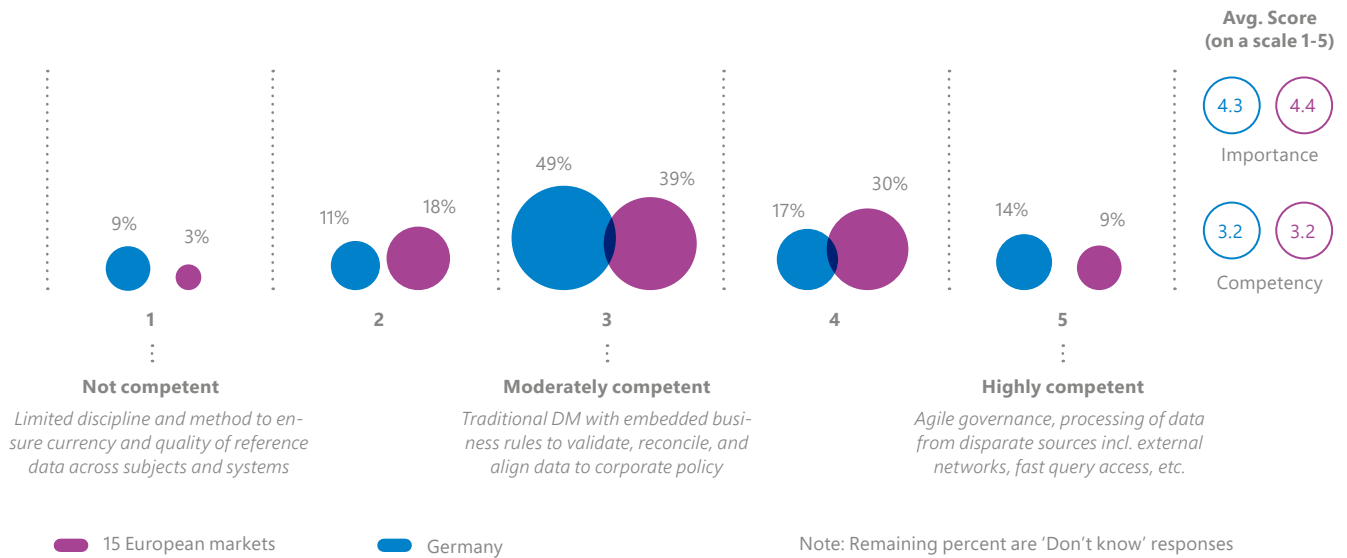


Owning and retrieving a lot of data is good in itself, but it is not sufficient to create great outcomes with AI. There are several process steps in between receiving data and using the data for AI in an organization.

— **Talentwunder**
Talent search engine

A significant share of companies consider themselves moderately to highly competent within Data Management

How competent is your company within Data Management?



use mostly structured data from internal data sources, a significant 80% of the most advanced companies also use both structured and unstructured data, and an equivalent 80% use data from both internal and external sources.

Similarly, 60% of these self-rated most advanced companies report use of hybrid architectures of on-premise and cloud based storage, while the less advanced predominately rely on on-premise platforms.

Data Management is one of the most important capabilities in Germany

German companies rate Data Management as the second most important of the eight capabilities necessary to succeed with AI (4.3 average on a scale of 1 to 5) – slightly below the European average (4.4). In terms of the level of competency, 80% of companies surveyed in Germany consider themselves moderately competent or above in Data Management. However, the average score is only slightly above moderately competent (3.2). This suggests that some companies have developed a Data Management foundation but are still midway before achieving the capability level that will fully back their AI systems. Finding the right quantity and quality of data is an essential according to many of the companies interviewed.

What to learn from AI leaders:

1. Make sure that the value of data is understood and prioritized throughout the organization.
2. Engage the C-suite in defining data governance and strategy - it is key to getting AI right.
3. Build your data structure to embrace unstructured data, also from external sources - advanced companies indicate that you may soon need it.



The biggest challenges are certainly gathering all relevant data, generating insights that really add business value, and then raising awareness to make users embrace the long-term changes.

— **ProSiebenSat.1**
Media company

3. AI Leadership

The ability to lead an AI transformation from top to bottom by articulating a vision, setting goals and securing broad buy-in across the organization

As with any corporate transformation, the foundation for successful deployment of AI is executive leadership buy-in and sponsorship. The C-suite must be aligned in what they want to achieve, and AI must be placed on the strategic agenda to ensure that AI efforts are an integrated part of the company's overall strategic goals, that capital is allocated, and employee time is dedicated.

AI Leadership among the lowest competency of all capabilities

Given the relative importance of AI Leadership (avg. 4.1 across all sectors), it is interesting to see that business leaders self-assess their level of competency as among the lowest of all eight AI enabling capabilities, with an avg. competency of only 2.9; 66% of respondents state that their companies have moderate, little or no AI Leadership competency. Many executives are realizing that business acumen is not

enough in itself for understanding how AI is impacting the business. As AI technologies become increasingly complex, leaders must be able to launch, support and, where necessary, challenge relevant AI initiatives against strategic business imperatives. The disruptive potential that companies believe AI will have also means that leaders should anticipate and prepare for a broader change management exercise aimed at embracing the change from AI on multiple levels.

Significant variation in AI conversations from top to bottom

Interestingly, data revealed that AI is considered an "important topic" on the C-suite level among 73% of the companies surveyed. However, less so on the Board of Director level where it is only considered an important topic in 38% of companies, and even less so on the operational employee level with 28%.

We observed in the interviews that companies very rarely have AI capable leaders across the Board of Directors, Executive Management, and Functional Management layers. Senior AI leaders can sometimes be found on one of the levels, but rarely with any speaking leadership colleagues to challenge ideas. This leadership vacuum was often pointed to as an issue from lower level AI experts.

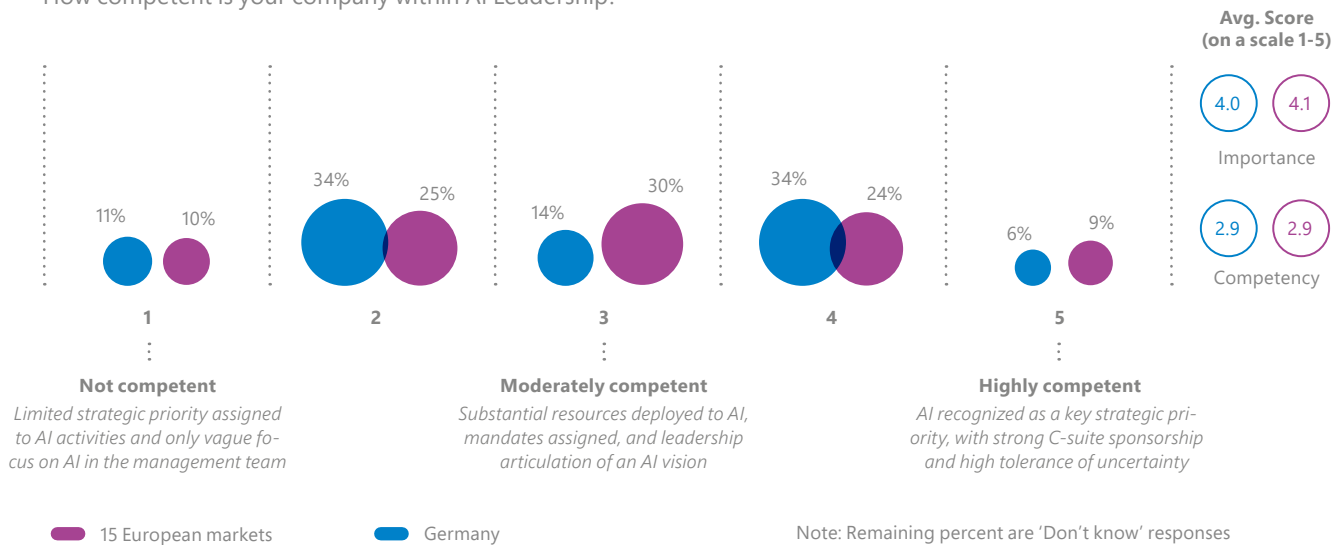


In our daily business we are supposed to deliver goods from A to B. In the past we faxed, called, etc. Today you can go to our digital portal, where you can place your order and then book the delivery accordingly. So that's a new form of starting the business, but simultaneously we still keep our business model as it is.

— **Dachser**
Logistics company

A large proportion of companies consider themselves to have limited or no AI Leadership competency

How competent is your company within AI Leadership?



Accepting loss of control

As new technological opportunities foster innovative, dynamic business models, organizations will need to tear down silos to become more agile and collaborative. To achieve this change, it is paramount for leaders to create and convincingly articulate a vision so stakeholders understand the bigger picture.

A general characteristic of this challenge is that leadership needs to accept that it will lose some control. Projects will increasingly be explorative, bottom-up and have less certain outcomes, requiring leaders to be ready to adjust the overall direction of the company more frequently. Increasingly, AI projects will rely on open source code and off-site cloud solutions, building on collaborative capabilities outside the company.



Companies that recognize and use the advantages of AI across company levels at an early stage will be more successful in the long run.

— **Lanxess AG**
Chemical company

AI Leadership the second lowest competency in Germany

Leadership is the second lowest ranking capability in terms of competency in Germany, where 59% of companies report to be moderately competent or below and none say to be highly competent (2.9 average). However, German companies consider AI Leadership to be the third most important capability to succeed with AI (4.0 average) – although still slightly below the European average (4.1). This likely reflects that many of the companies surveyed have gone through an initial digital transformation and are now starting to develop their AI leadership competencies. Furthermore, many of the participants referred to major tech companies when assessing their AI position; with those reference points, many companies considered themselves to be behind.

What to learn from AI leaders:

1. The organizational transformation driven by AI will be continuous - this requires seeing AI as a process, not a project.
2. Leadership must be accustomed to AI technologies to understand how it will affect the company.
3. Articulating a clear AI vision is key to achieving buy-in and motivating exploration of use-cases with uncertain outcomes.

4. Open Culture

Creating an open culture in which people embrace change from AI, navigate confidently in uncertainty and ambiguity, work to break down silos, and collaborate seamlessly across the organization

New technologies have often disrupted how work is conducted. AI is no different. Establishing an open, collaborative culture to minimize resistance and enable human performance can prove efficient to prepare the organization for transition. However, this may be difficult, as the magnitude of impact driven by AI can imply a fear of uncertainty, ambiguity, and a general resistance to change.

Job risk to employees less of a concern among most advanced companies

Companies reported that employees generally have a positive attitude towards AI. Yet, one thing is having a positive attitude in general, another is to retain an open attitude once new technologies start impacting the way work is done.

To achieve buy-in, business leaders must make the changes due to AI tangible to reduce organizational uncertainty. However, companies expect

a significant impact from AI which will drive a fundamental transformation and increasingly assist in tasks previously performed by humans.

Interestingly, the companies that self-rated as most advanced see a lower risk to personnel than the less advanced (only 20% of advanced reported this risk as a concern vs. 43% for the companies still in the “planning” phase).

Relatively small competency gap

With a relatively small gap between importance (avg. 3.9) and competency (avg. 3.2), creating an Open Culture is one of the capabilities where business leaders feel most comfortable.

An obstacle mentioned by many respondents is the ability to work collaboratively across the organization despite AI most often being put to use towards quite narrow use-cases. With benefit areas being limited to specific domains or functions, it is often not seen as relevant to involve the organization in a broad and collaborative approach on AI.

Furthermore, many companies have had difficulties in carrying out effective AI programs, which are closely modelled on the lean processes of startups. The primary purpose of such programs is to enable brief, agile projects to gauge the applicability of AI use-cases, requiring a substantial change to company culture. Silos between departments in the company have to be bro-

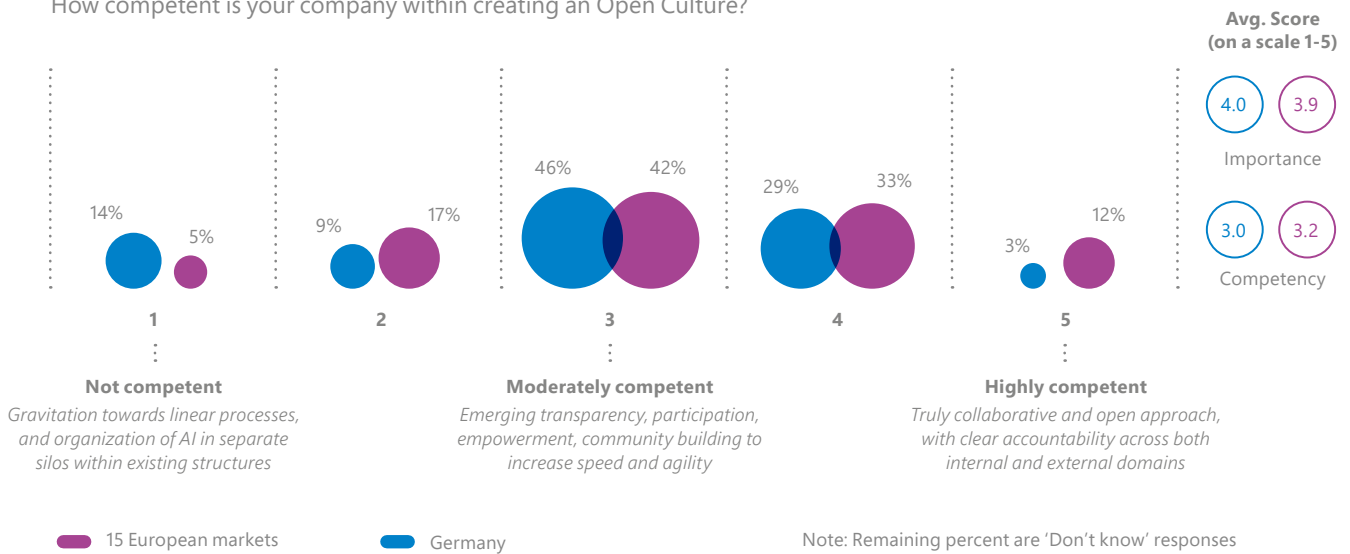


Collaboration between humans and AI in different areas is certainly one of the most rational ways of development for some more years. Machines still need human presence, where one can assess the machine again and again or even complete it. This collaboration is an important factor to ensure sustainable success and build up trusted AI framework.

— **DACHSER**
Logistics company

Most companies rate themselves moderately competent in Open Culture

How competent is your company within creating an Open Culture?



ken down in order to promote a culture where AI-teams work in conjunction with the rest of the company to create value, circumventing needless complexity and time-consuming processes.

Another issue relates to the concept of sharing data openly, when the value of the data largely remains unknown until it has been treated, processed or combined with other datasets.

Cooperation across the organization

Many of the most advanced companies that have been able to produce several AI projects have also managed to establish links and cooperation across the organization. These cases indicate that the benefits of an open work culture far exceed the difficulties and associated risks.

A potential obstacle to an open culture is the fear of job losses with the introduction of AI. According to respondents, the fear of workforce redundancy has some merit, but the concern should not overshadow the significant benefit potential of AI. A pivotal task for company leaders is to proactively articulate a tangible vision for AI initiatives. This will make it easier for employees to understand the AI opportunities on a personal level, and thereby embrace the change ahead.

Germany is moderately competent in Open Culture

German companies consider themselves to be moderately competent in Open Culture (3.0 average). This capability is considered somewhat above moderately important (4.0), indicating that German companies on average do not believe this is one of the key capabilities for their success with AI. Yet, some companies highlight their efforts to establish a type of culture and leadership that embraces AI and is willing to take on the challenges that come with it.

What to learn from AI leaders:

1. Establish cross-organizational projects to foster collaboration and learning across functions.
2. Ensure employee buy-in by being open and clear about on-going projects and desired outcomes.
3. Ensure that governance structures support collaboration through projects co-owned by AI experts and business leaders.



Employees must be maximal supported by the management to be open minded, curious, educated and result-oriented to ensure the success of AI.

— **Omnibot**
AI platform provider

5. Emerging Technology

The organization-wide ability to continuously discover, deploy, and create value from intelligent solutions, applications, and data platforms

Evidence of the rapid pace of technological change are plentiful in today's digital world. What we have seen is that there is a definite correlation between companies that are ahead of the pack with AI and with the wider technological adoption. That AI benefits from being able to identify and implement emerging technology may seem intuitive and obvious, yet finding the right formula is no trivial exercise.

A strong tech radar

With an average score of 3.3, the ability to explore and implement emerging technology is an area where business leaders perceive their companies to be most competent across the eight AI enabling capability areas.

One factor in working with emerging and rapidly developing technology to build a stack fit for AI is a well-calibrated 'radar' by which large companies pick up on the trends outside of their own walls. Many companies mention

that being unable to quickly integrate innovative trends and cutting edge technology due to the burden of legacy systems, siloed business units, and complex governance processes is proving a real challenge for their AI adoption.

While there is some truth behind such stereotypes, we also heard from several executives who *are* able to build radars that pick up what's happening in technology domains and applications that this *continuous explorative* process is serving them well to get an overview of workable AI solutions that could prove successful in production.

Innovation enablers or blockers

Once companies are able to selectively source new solutions from the outside world, the challenge is then how to enable it. This can be a case of actively encouraging enablement, or at the very least not hindering it. Many companies treat AI as a crucial piece of a

wider digital puzzle, where dots need to be connected across technologies. This means success with established technologies, from cloud and SaaS platforms to getting the basics right with analytics, is key to building on what is already there.

Working with emerging technology also relates to agile development and the ability to trial, test and experiment in iterative, short cycles. This kind of working culture allows companies to work with less stable, untested technology. Enabling innovation requires an outlook from the very top of the organization that accommodates longer investment horizons and at times uncertain financial returns. This is particularly key when working with AI technology that, according to the executives, is often not as mature as the digital solutions deployed for other purposes.

Not all that glitters is gold

Despite the need to explore and navigate a tech sea characterized by uncertainty, a recurring theme when interviewing executives is the importance of balancing excitement with new technology and commitment to an innovative mindset, with one foot planted firmly on the ground.

Seeing past the hype, remembering the business model, and not wasting finite resources on every shiny object is also important. In other words, remembering as a leader that while experimenting is crucial, not all that glitters is gold.

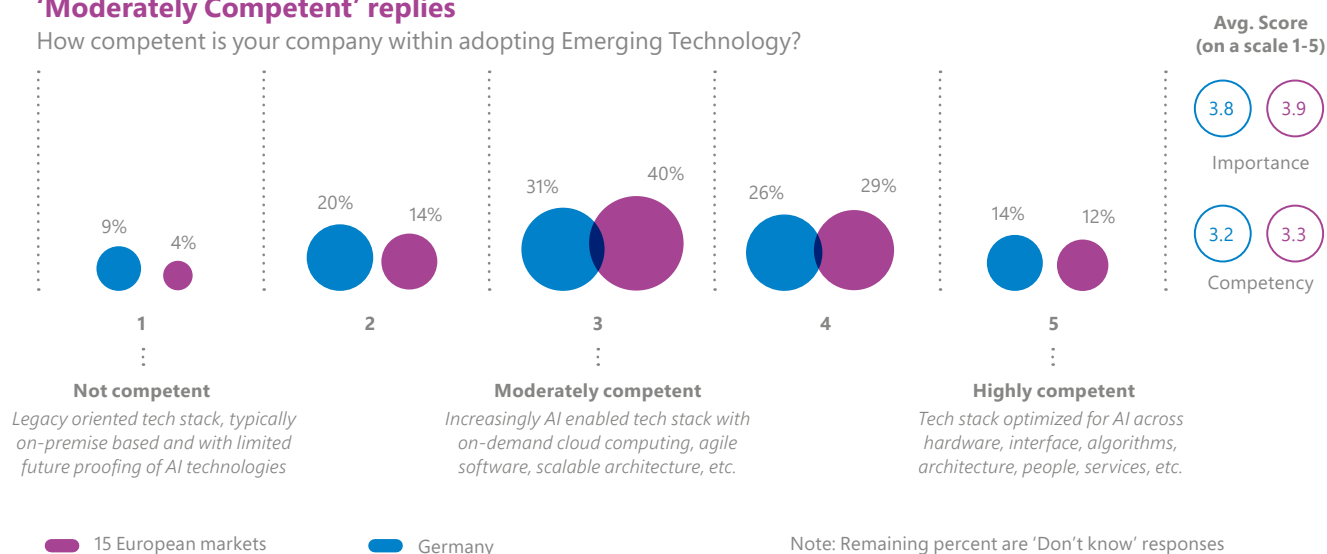


AI will bring many small industry revolutions. It will not just change one or two things, but it will completely disrupt our existing ecosystem through the sheer amount of areas where it can be applied.

— **ProSiebenSat.1**
Media company

Emerging Technology is the AI-enabling capability with most 'Moderately Competent' replies

How competent is your company within adopting Emerging Technology?



The importance of execution

Finally, this capability is also effective execution. Many companies we surveyed across Europe had developed prosperous use cases supported by robust concepts and AI applications - on paper. But technical limitations tend to get in the way of implementation.

Employees with limited technical ability often need upskilling to work with new technology. IT and business may need to work closely together and speak each other's languages to reach common goals. In addition, organizations need to learn to move more quickly and nimbly in this space - whether to complete an acquisition of new tech, to ensure compliance with IT standards, or simply to pair new tech with legacy systems. This ability is often also about speed, not far from the development pace that characterizes the emerging tech itself.

Emerging Technology the second highest competency in Germany

In Germany, 71% of companies report to be at least moderately competent or above in Emerging Technology. This capability is the second highest ranking in terms of competency in Germany. In terms of importance, German companies rate Emerging Technology between moderately and highly important (3.8 average) - slightly below the European average (3.9). The executives report to be on the lookout for new and potentially disruptive technologies while assessing the impact these may have for their company and industry.

What to learn from AI leaders:

1. Build a radar to pick up on merging tech trends and connect them to market opportunities.
2. Look past the technology hype and remember the business model - it may likely need to change in the not so distant future.
3. Cloud solutions can be helpful to engage with multiple datasets across sources - increasingly a priority to capture value from new pockets.



In order to identify and exploit the full potential of AI, skilled employees are needed to enable perfect optimal cooperation between humans and AI.

— **Lanxess AG**
Chemical company

6. Agile Development

An experimental approach in which collaborative, cross-functional teams work in short, iterative project cycles to effectively progress AI solutions



We do not want to be best at every dimension of AI and we do not want to develop all the competencies ourselves, but we want to focus our resources to exploit AI where it strategically matters and creates the highest impact for our business. These areas have our full attention.

— ProSiebenSat.1
Media company

Considering that many AI technologies are still in their infancies, working with them is far from plug and play. To overcome this, many of the companies that are successfully working with AI tend to take an agile, iterative approach to projects. Using this approach, these companies greatly increase their ability to explore AI potential due to a drastically reduced project cycle time and dynamic risk reduction. Short project cycles result in project teams receiving constant feedback on what works and what does not, to continuously steer the direction of the project. This creates a process centered on learning and experimentation, helping to build internal knowledge and capabilities.

Most advanced companies deploy AI top down or via a hybrid model

With an average competence level of 3.2, Agile Development is an area where companies are self-reported to be reasonably skilled. Quickly establishing proof of concept is key to organizational buy-in, and many companies report that an agile, iterative approach helps them build evidence and proof in a fraction of the time it takes for a more traditional project,

This has great significance, as they find that tangible proof of concept instrumental in achieving buy-in and understanding in the wider organization. Efforts to develop proof via agile development processes are often orchestrated by a central unit that collaborates with business units to identify

use-cases. Of the most advanced companies, 80% deploy AI into the organization via top down only or a via hybrid of top down and bottom up.

It varies whether these central units take a leading role in pushing the agenda, or instead focus on gathering knowledge and experience from already existing efforts that are decentralized in the organization.

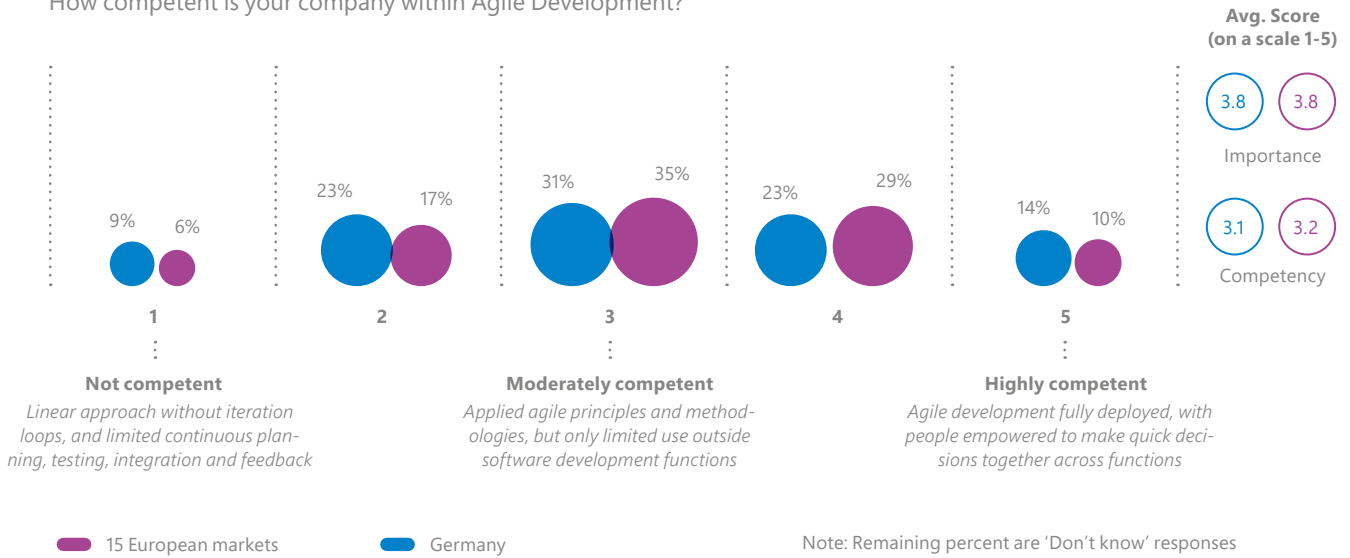
Agility provides the opportunity for informed changes of direction

Taking an iterative approach can also help mitigate risks. Frequent feedback loops allow the project team to better identify, understand, and correct undesired outcomes before the AI application is put into production, potentially doing harm. This flexibility does not only apply to risks, as agile projects can generally use continuing knowledge and experience to make informed changes of direction and avoid the “black box” syndrome.

Contrary to agile projects, ‘big bang’ projects are more destined to fail as they skip the learning process, and lack the important feedback loop pivotal to developing good AI solutions. The world of AI is simply too complex for humans to foresee potential issues, and therefore an agile approach is better.

Companies seem relatively competent within Agile Development

How competent is your company within Agile Development?



Agile development new to many business departments

Most companies fully understand the need for agile development, but less reckon that they have the necessary capabilities for it. Working in an agile manner is very different from what most organizations are used to. While the department running an AI project might be accustomed to following an agile approach, the vast majority of project teams consist of people from other parts of the business.

Several IT and AI departments indicate that this collaboration can be difficult, but still see it as pivotal to drive value from the projects. Getting the business accustomed to working in an agile manner is not easy, as it requires acceptance of new ways of governing and evaluating projects.

The outcome of agile projects is typically less predictable than for traditional projects, and for stakeholders to fully embrace an agile approach, they have to accept this randomness and recognize the value of learning.

Germany is moderately competent in Agile Development

German companies consider themselves on average moderately competent within Agile Development (3.1), the fourth highest competence rating. In terms of importance, Agile Development has the second lowest score in Germany (3.8 average), at par with the European average (3.8). Focusing on agile development is new to many companies as they are in the initial phases of devising these types of approaches.

What to learn from AI leaders:

1. Agile development is effective in engaging people across functions, fostering collaboration, and bridging tech and business.
2. Iterative processes promotes quick internal learning due to their frequent feedback loops.
3. Fast experimentation with pilot projects and use-case testing can quickly show how to create value through AI.



The transparency and comparability offered by AI will surely increase the pressure on the mobility industry.

— **FlixBus**
Transportation provider

7. External Alliances

Entering into partnerships and alliances with academia, solution providers, and AI specialists to access technical capabilities, best practices and talent

AI leaders are increasingly opening up to create collaborative alliances with external partners, enabling them to tap into a significantly larger pool of capabilities and talent, and to reduce the time it takes to develop or deploy working solutions.

This trend seems to be the new *modus operandi*, unfolding across markets and sectors. It is also the capability with the smallest gap between perceived importance and competence level among the participating companies.

Technology, data and service delivery partnerships

Development of AI and delivery of related projects are most often done with a mix of internal and external stakeholders. The rationale is multifaceted – some companies are simply struggling to obtain the needed talent, whereas others see a partnership approach to be a faster, more flexible solution. These external alliances typically come in two forms: being focused on technology and technical AI know-how, or focused on strategy and business development.

To address one of the biggest prerequisites of working with AI, access to large amounts of data, companies state that they are increasingly looking to entering into data partnerships where they either buy or exchange data with other parties. This is a way for companies to get hold of data that they are unable to capture themselves, or simply a way of quickly increasing the size of their datasets.

Others report that they look to pre-developed, out-the-box algorithms, in order to increase the speed of bringing quality solutions in to product.

Academia playing a more noticeable role in collaborating with companies

It is becoming increasingly common for companies to enter into partnerships with universities in order to position themselves within AI and get access to crucial knowledge.

Companies also see this as a way of establishing a pipeline of AI talent already familiar with their business and the problems they face. Some of the more ambitious companies have a strategy of positioning themselves within AI, comprised of active conference participation and multiple university partnerships in which they actively participate in developing courses and programs.



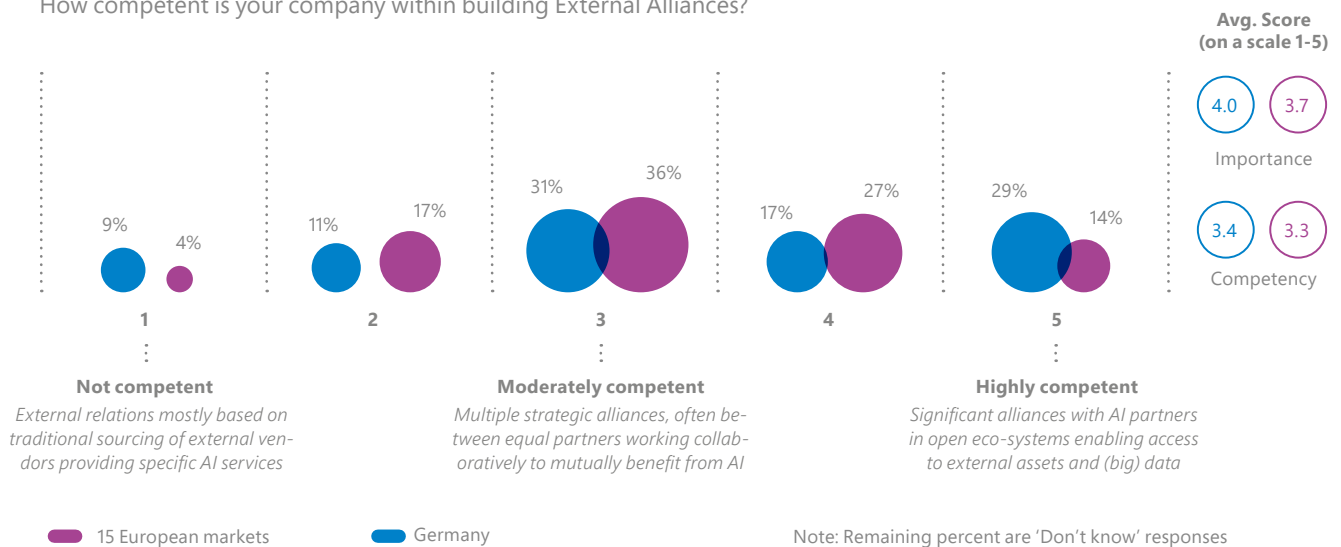
Partnerships with other companies, and universities, are now very important, as talent can be acquired directly from the university and trained internally in order to further develop the necessary skills.

— Omnibot

AI platform provider

Companies generally consider themselves moderately to highly competent forging External Alliances

How competent is your company within building External Alliances?



Documentation of code is proving a challenge - also to externals

The lack of code documentation for self-learning algorithms was often mentioned as very practical issue with AI in general. This led some companies to prefer internal teams and individuals in order to ensure that despite poor documentation, the knowledge about the code at least stays inhouse.

Germany above moderately competent in External Alliances

In Germany, 77% of companies surveyed consider themselves to be moderately competent or above in External Alliances (3.4 average). This capability is the highest ranking in terms of competency and it is almost at par with the European average (3.3). However, in terms of importance, it is somewhat stuck in the mid-field for German companies (4.0). The results suggest that many companies have engaged in partnerships and gained some experience from it. Yet, they are still in the early phases of deploying AI and may consider it more important to focus first on developing internal AI capabilities.

What to learn from AI leaders:

1. Make sure to have internal people in the receiving end before widely engaging with external partners.
2. Academic partnerships are an increasingly sought after way to access innovative eco-systems, gain new insights, and explore emerging AI opportunities.
3. Partnerships can pose a challenge to many business processes; consider involving key functions like legal early, to ensure a productive partnership structure and effective collaboration model.



Partnerships with other companies are important, not just to develop code together but also to collaborate on data and to share ideas.

— **Talentwunder**
Talent search engine

8. Emotional Intelligence

Applying behavioral science to understand and mimic human behavior, address needs, improve human-machine interactions, and ultimately create more human near applications



The phenomenon of implicit process knowledge can only be overcome with artificial intelligence. AI can furthermore help interpret signals that people cannot see or hear, thus improving the resilience of manufacturing processes.

— Werkzeugmaschinenlabor WZL of RWTH Aachen University

AI has for long focused on cognitive capabilities and skills within mathematics, statistics and logical reasoning. Adding human emotion and intelligence, these capabilities move to a new, more complex level: the understanding of human behavior, and the ability to interact accordingly with technology.

Changing the way people interact with technology

One of the limits of traditional AI has been the inability to understand human traits such as emotional state, for instance exhibited in writing, physical condition, or tone of voice. With AI's cognitive intelligence capacities within reach, machines are increasingly able to sense, recognize, and decode human traits.

This holds the potential to fundamentally change the way people interact with machines, making technology capable of handling more complex tasks and ultimately augmenting humans to an extent previously unachievable.

Emotional Intelligence in its infancy

Except for advanced companies, survey results indicate that companies view the adoption of emotional intelligence in AI processes as the least important capability, and the one where they have the lowest competency. When asked to address *why* this is, companies across sectors and markets note that

they are still at a relatively low maturity stage where more immediate requirements such as Advanced Analytics, Data Management and AI Leadership are more relevant and prevalent.

However, when taking a deeper look at the companies that have assessed themselves to be 'Advanced' in terms of general AI maturity - meaning that AI is actively contributing to many processes and enabling quite advanced tasks in the company - it is interesting to see that they perceive the Emotional Intelligence capability as more important with a score that is noticeable higher than the average score for all companies.

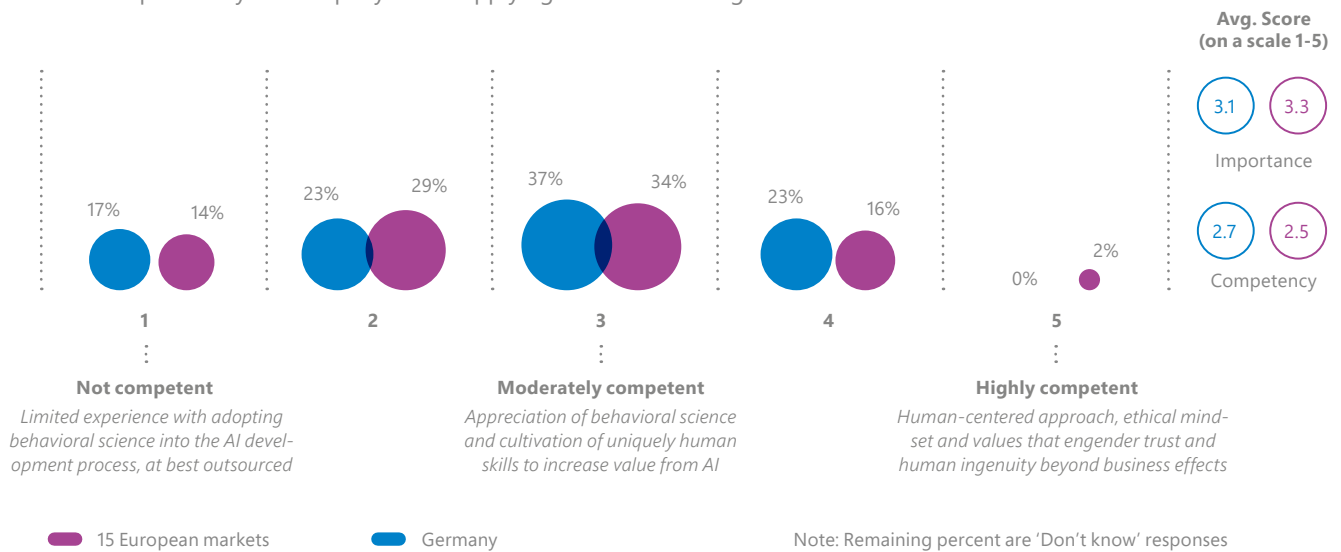
Many advanced companies perceive this to be either 'very' or 'highly' important. Notably, these companies come from five different markets and a wide variety of industries, including Life Sciences, Financial Services, TMT, CPR, and Services & Hospitality.

Value in customer-facing applications

The need for behavioral science to understand human needs is expected to increase with the integration of AI in smart devices, and in customer facing applications such as chat bots, roboadvisories, customer inquiries processing, etc. The most advanced companies' AI technologies are beginning to decode human emotions from text, such as

Companies consider themselves least capable within Emotional Intelligence

How competent is your company within applying Emotional Intelligence?



irony, anger, and frustration. This will obviously become more valuable as it is increasingly applied in customer-facing solutions with the ability to learn and improve.

Human centrism requires strong leadership

While emotional intelligence holds great potential that could lead to early adopters gaining a competitive advantage, long-term success is dependent on not only technological development, but also leadership.

Leaders must drive the transformation that will make humans comfortable with intelligent technology, as a prerequisite for harvesting its potential benefits. What the most advanced companies have shown is that this transformation must augment human ingenuity to become truly effective.

Emotional Intelligence: even the lowest importance rating is above moderately important

German companies rate Emotional Intelligence as moderately important for their success with AI (3.1 average), below the European average (3.3). Even so, in the respective German and European samples, these ratings are lowest of the eight capabilities. The competency with Emotional Intelligence is the lowest for German companies (2.7), which is below moderately competent. The ability to adopt behavioral science in the tech development process is in its infant stages for most local companies, which for the most part are still developing their AI strategies.

What to learn from AI leaders:

1. The most advanced companies are putting emotional intelligence to use within their AI applications, despite its relatively infant stage.
2. Companies must develop their behavioral science capabilities to mimic human behavior and translate it to technology.
3. Many have virtual assistants, chat bots, and NLP a powerful way to get started with building emotional intelligence into AI solutions.



The team “human-AI” has already started in some domains, complementing each other and will become much more important and wide spread in the future.

— Munich Re Reinsurance company



A big reason why people are hesitant towards AI is the understanding of what happens. It works very well when it comes to statistical models but when it comes to more complex Models such as deep learning, although the result is correct, no one knows exactly why. And I think that scares many away from AI. Here the confidence in the machine is missing, that the outcome is robust and can reliably work repeatedly and is also comprehensible.

**— Werkzeugmaschinenlabor WZL
of RWTH Aachen University**

Omnibot

Volkswagen AG (VW) requested OmniBot to improve the productivity and employee usability for a CAD and Virtual Reality (VR) software system, in use for virtualization and planning of automotive design and production environment and processes. This CAD and VR software "IC.IDO" is supplied by ESI Group, a French based engineering software technology vendor and supplier to many large global manufacturers. While the software is best in class in the industry, it is very broad in functionality and is complex especially for newer users. VW requested a voice UI that would improve the efficiency, while also making it easier for new users to become proficient faster. The project scope was to create an advanced Voice Assistant UI as well as a real-time training assistant.

OmniBot created a comprehensive Smart Voice Assistant UI that allows users to command & control every function within the CAD/VR software by voice. More importantly, less experienced users can

to more easily utilize the IC.IDO software while enabling them to quickly learn new functions through the Virtual Training Assistant. VW deemed the project a success and plans to deploy the OmniBot Virtual Assistant in facilities throughout Germany as well as to apply OmniBot's to other applications like office assistance, employee services and contact center use cases.

In the near future we will have virtual assistants like an "OmniBot", a secure, private and transparent – personal – smart assistant. A Digital Twin, acting as a single point of contact to our digital life. Constantly learning and improving to serve us in our business and private spheres.

quickly learn to use any function within the CAD/VR system simply by asking the Virtual Assistant "show me how" to perform a specific task.

By enabling the OmniBot Virtual Assistant as part of the VR system, VW has successfully empowered its employees

Through the power of advanced AI, natural language understanding and highly accurate speech technologies, the OmniBot Virtual Assistant has become a highly efficient communication layer between humans and machines, allowing both to better understand each other and to be more productive together.

OMNIBOT® ONE FOR ALL

OmniBot is Europe's "Voice 1st" Conversational AI platform provider and is currently the only EU based Conversational AI vendor to own a complete set of Speech, Voice, NLP and advanced Dialog technologies & IP. Headquartered in Oldenburg, Germany, the company serves a wide range of partners and customers in various industries including network carriers, retail, marketing, sales and Industry 4.0. OmniBot's platform allows organizations to easily build and manage advanced voice enabled Bots & Virtual Assistants for nearly any use case while maintaining control over their users, data, privacy and security.

What next?

OmniBot's Conversational AI platform is one of the industry's most customizable platform today. The Industry's future will be defined by successfully incorporating advanced deep learning AI technology innovations, including unstructured NLP data query (Q&A), automated language translation, autonomous self-learning and human supervised machine learning, as well as voice biometrics and voice analytics technologies. AI technology is evolving rapidly, and organizations can already deploy Smart Virtual Assistants that provide secure voice payment facilities, coach and educate employees, and to freeing them from mundane & repetitive tasks. OmniBot serves with such an end to end "One For All" platform other partners and customers like Deutsche Bahn, Deutsche Telekom, Netcall and Bigtincan.



The future of AI "human to machine" is human centric – and the human voice will be the primary communication channel between both.

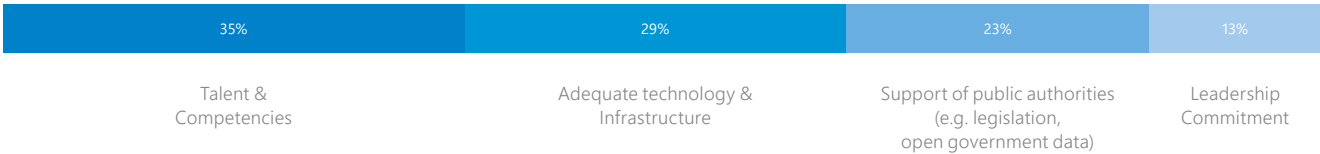


The future of AI is human centric - machines and software will adopt to humans and not vice versa.

AI Landscape in Germany

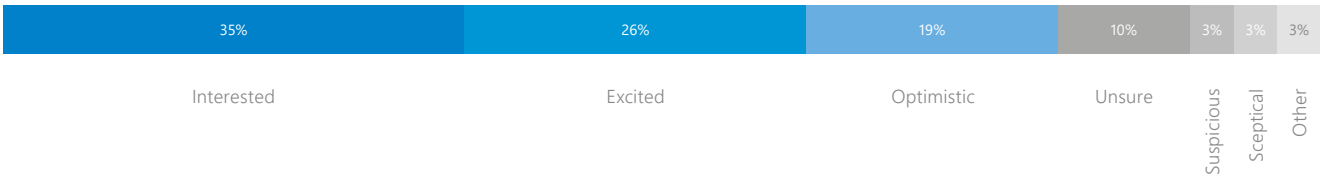
German companies' wish for AI: technological infrastructure and AI talent

Companies were asked: "If you had one wish: What would help you in succeeding to implement the potential of AI?"



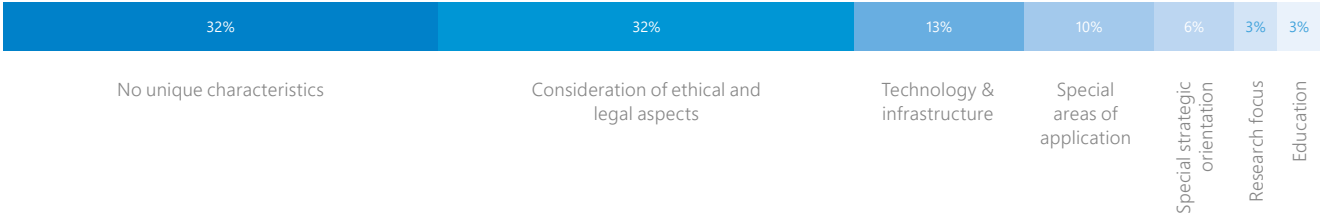
German companies are positive about AI.

Companies participating in the survey were asked: "From a company perspective which of the following words best describes the emotions/feelings concerning AI?" Over three quarters of companies state positive emotions about AI.



More than half of German companies see Germany's national AI policy, AI-made-in-Germany, as differentiated from other national plans. However, almost one third of the participants don't see any unique characteristics in the German strategy.

We surveyed German companies on their thoughts about the recently released German national AI strategy, AI-Made in Germany. We asked: "How do you see AI-made in Germany, and how far does the German market differentiate on a global level?"



These extra efforts are important, as we do face the risk as Europeans and as a European company to fall behind other parts of the world, where the boundaries of ethical and moral behavior are not the same.

— **Bayer**
Pharmaceutical company

Bayer

Bayer has started the digital transformation journey a few years ago, applying AI methods and technologies especially in two areas: digital solutions for healthcare and agriculture. In the Digital Health area, it will be possible to identify diseases at an earlier stage, to provide more individualized treatment and to bring innovative medicine to the world much faster. In agriculture the application of fertilizers and crop protection can be set to meet the specific needs of every square meter of soil, what will make farming more sustainable.

Use cases on the intersection between technology and science can help to reduce patients suffering. Hence they will

participate in studies aimed at collecting medical data and genomics information more willingly. For example Vitrakvi, a new drug designed to attack the particular type of cancer tumors that test positive for certain genes. If a doctor knows whom to prescribe

In the Digital Health area, it will be possible to identify diseases at an earlier stage, to provide more individualized treatment and to bring innovative medicine to the world much faster.

this medicine it can greatly contribute towards the wellbeing of affected patients. But to apply testing for this

very type of genetic change in cancer tumors routinely is very expensive and in fact patients have gone untreated as the mutation was never discovered.

Bayer therefore wants to use AI to segment and stratify patients to identify the individuals that are more likely to suffer from this type of tumors and should be tested. In order to do this, Bayer is parsing through hundreds of thousands of collected images, many of them donated by patients with bio-mutations or patient advocacy groups, using image recognition to find recurring patterns and then supporting physicians with a recommendation for patients to be tested.



Bayer is a Life Science company with a more than 150-year history and core competencies in the areas of health care and agriculture. With its innovative products, Bayer is contributing to finding solutions to some of the major challenges of our time. The Bayer Group is managed as a life science company with three divisions – Pharmaceuticals, Consumer Health and Crop Science – and the Animal Health business unit.

On December 31, 2018, the Bayer Group comprised 420 consolidated companies in 90 countries throughout the world and employed 116,998 people. In Germany it had 32,140 employees, which was 27.5% of the total Bayer Group workforce.

What next?

Bayer aims to transform its core business by offering new types of solutions to its customers. One of the use cases currently under joint development with partnering farmers in the US aims at increasing yields by applying AI to introduce digital farming solutions.

To do that it is designing an AI-based platform with the ability to collect weather information, seed and crop information and soil characteristics, providing the farmer with recommendations to maximize their yield.



Technology and science collaborate closely in effective data science and AI projects.



AI is here to both transform our core business, but also to fuel completely new business models.

Fast Forward

How to get started and take AI to the next level?



1. Choose a step-by-step approach in getting familiar with AI

Given the wide scope of AI and variations in use cases, it is key to start out by identifying what problems to solve and what opportunities to pursue. High level prioritizing between engaging customers, optimizing operations, empowering employees and/or transforming products and services adds clarity, is helpful to structure the discussion on a strategic level, and ensures a step-change approach to taking the company to the next AI level. Identify the problems you aim for AI to solve, prioritize the value with business owners, and acknowledge the capability gaps to get there. You need to get on the AI train, but do not jump on the AI wagon blindly. AI should serve your business plan, not vice versa.



2. Display executive leadership and approach AI from a position of strength

Leadership comes from the top, also in the case of AI. For this to happen, executives must understand AI essentials and strategic perspectives, and they must communicate a clear AI ambition to the organization. AI leaders must actively sponsor and mobilize AI adoption on all levels, from the Board and Executive levels, through Management and the operational employees. Staying ahead in the accelerating AI race requires executives to make nimble, informed decisions about where and how to employ AI in their business. When doing so, look to strongholds before bringing in the AI 'twist'. Amplifying existing company strengths is an excellent way to catalyze motivation and internal support.



3. Hire new skills ahead of the curve – or focus relentlessly on training existing talent

A key challenge for putting AI to productive use and accelerate intended outcomes is the war for skills and talent. This not only relates to data scientists and software engineers, but also to skill sets and experience within human and behavioral science. Opting for a follower strategy and being late to the game can prove risky, as talent seeks to go where talent is already. If aggressive poaching for insourcing talent is difficult to embrace, then work bottom-up by training the engineers you already have on the new AI paradigm and collaboratively ride on the backs of the others. Regardless of strategy, focusing relentlessly on building required skills and talent is key to staying ahead and progressing along the learning curve.



4. Build a data strategy and technology stack purposefully fit-for-AI

Training your AI products essentially requires significant data. Useful data. Valid data. Establishing a solid data strategy and practice in your organization to proficiently acquire data, identify data, clean data, measure data, and manage data will ultimately make your organization flourish with AI. Build your AI resources around data engineers who organize the data, data scientists that investigate the data, software engineers who develop algorithms and implement applications. Make sure that your structure and governance harness the power of data, and that your technology stack across products, solutions, and applications nimbly enables your AI priorities. When doing so, remember that your business model is likely to change.



5. Beyond all, engender trust and enable human ingenuity

When designed with people at the center, AI can extend companies' capabilities, free up creative and strategic endeavors, and help achieve more. Humans are the real heroes of AI – design experiences that augment and unlock human potential. Opt for a “people first, technology second” approach. This entails designing AI for where and how people work, play and live, bridging emotional and cognitive intelligence, tailoring experiences to how people use technology, respecting differences, and celebrating the diversity of how people engage. Thereby putting people first, reflects human values and promotes trust in AI solutions.

Designing for people

Microsoft believes that, when designed with people at the center, AI can extend your capabilities, free you up for more creative and strategic endeavors, and help you or your organization achieve more.

The following principles guide the way we design and develop our products:

- Humans are the heroes. People first, technology second. Design experiences that augment and unlock human potential.
- Know the context. Context defines meaning. Design for where and how people work, play, and live.
- Balance EQ and IQ. Design experiences that bridge emotional and cognitive intelligence.
- Evolve over time. Design for adaptation. Tailor experiences for how people use technology.
- Honor societal values. Design to respect differences and celebrate a diversity of experiences.

Innovation is what creates tomorrow.

Learn about our AI platform to innovate and accelerate with powerful tools and services that bring AI to every developer.

Explore Intelligent applications where you can experience the intelligence built into Microsoft products and services you use every day.

Learn about our AI Business school founded in cooperation with Insead to get insights and practical guidance from top executives on how to strategically apply AI in your organization.

Who to Contact

from Microsoft

The team in Germany that can empower your company to achieve more with AI



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Hannah Hinkelmann holds a degree in business administration from WHU – Otto Beisheim School of Management. She started her career with Microsoft in 2016 and is currently responsible for Microsoft Germany's marketing and communications activities related to artificial intelligence. Before joining Microsoft she worked with Amazon and Deutsche Telekom. Hannah is in charge of the study from the Microsoft side. For any questions she can serve as a first point of contact to establish a connection to the right person within Microsoft.



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Thorsten Herrmann holds a degree in business informatics from the University of Mannheim. He started his career at IBM in 1989. In 1997, he moved to Compaq, where he worked in sales for SAP R/3-Infrastructure and later became regional sales manager. Since the merger with HP, Thorsten has held various senior sales positions before being appointed to the management board of Hewlett Packard Germany in 2009. He joined the Executive Board of Microsoft Germany in 2017. Since then, he has taken responsibility for the key account business in Germany.



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Joao holds a degree in engineering and a MBA from the Technical University of Lisbon. He spent three years and a half at Microsoft as head of the Microsoft subsidiary in Portugal before joining the Executive Board of Microsoft Germany in 2016, where he is responsible for Marketing and Operations. His responsibilities are all strategic marketing operations but also managing Microsoft's Windows & Surface, Office, Dynamics and Cloud & Enterprise operations. Furthermore, in 2017 Joao took responsibility for the SME business in Germany.



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Andre Kiehne holds a degree in business informatics from the University of Hagen. Before joining Microsoft, Andre Kiehne was responsible for transformational business at the IT service provider Dimension Data for over three and a half years. In this role, he actively shaped the business transformation at Dimension Data and drove the company's positioning as a cloud provider and partner for digital transformation. In 2017 he joined Microsoft's Sales operations as lead specialist and was appointed to the executive board the same year. He has ever since been the segment lead for Cloud & Solutions.

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'Artificial Intelligence Report: Outlook for 2019 and Beyond'



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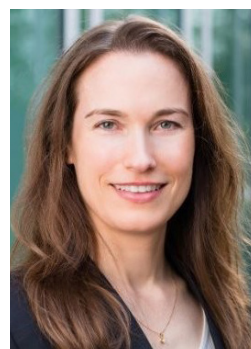
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Based in Mannheim.

