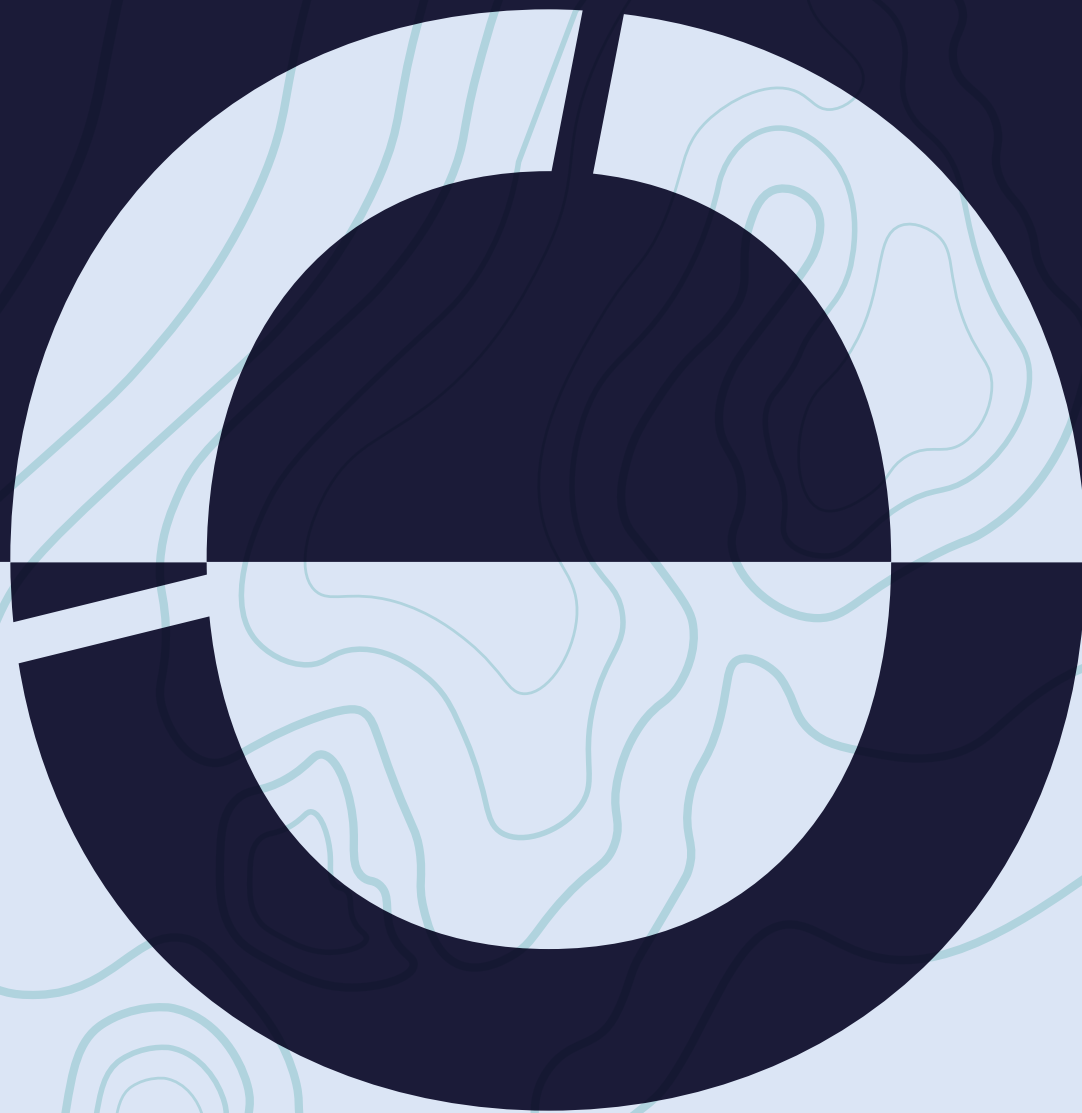


The Nordic State of AI

Third edition



SILO_{AI}

THE REPORT

Table of contents

Introduction	X
Executive summary and key findings	1
Leading in the age of AI	5
From experiments to production	17
Investing in AI	29
AI Talent	39
Trends over time	47
A broader view	55
Conclusion	64
Contributors	65
Methodology	66



Introduction

NIKO VUOKKO,
SILO AI, CTO



THE SPEED OF DEVELOPMENT we have witnessed during the last year has taken many by surprise. The hype that has accompanied it is a double edged sword. At worst it can be blinding, pushing companies to adopt technologies their digital maturity doesn't yet support and in use cases with marginal impact. At best it can induce a sense of urgency, providing a needed thrust for companies to not get left behind while the competition marches on. Getting significant value from AI is a long-term investment that should be done with care and consideration. This report aims to provide insight and understanding so that companies can make more informed decisions.

This is our third Nordic State of AI report. It is intended to provide insights on creating value with AI by understanding what technologies to use and where, the role and importance of AI infrastructure choices, and when to buy AI "off-the-shelf" versus build custom. The report consists of six sections, of which the first four are based on a survey conducted in November of 2023, the fifth looks at what has changed over the last three years, and the sixth puts the Nordics in a broader perspective. The four sections based on the survey cover topics such as

management of AI, adoption of AI from experimentation to production, investing in AI, AI regulation and compliance, and finally AI talent.

AI is not a standalone magic potion, but is built as part of larger technology solutions. Adopting AI and scaling its use requires several new capabilities from organizations, starting from a systematic approach to using data, new types of infrastructure, and even new management practices to better understand and handle probabilistic behavior. While adoption is often about a culture shift to explore new technology and build intuition on where and how it works, scaling AI has proven to be a surprisingly complex undertaking. This is complicated partly by the rapid progress of the technology. Having a great plan and proficient AI talent is not enough if the plan and the people aren't able to improve and evolve along with the technology.

We can see constant maturing in how companies and organizations are embracing AI, yet we are still in the early days of the multi-decade AI journey. The future is shaped by those who learn how to use AI as a cornerstone of their competitive advantage today.

Executive summary and key findings

1

AI IS SET TO DISRUPT ALL INDUSTRIES, but the conversation around AI often focuses on big technology companies such as Google, Meta, and Microsoft. This report is focused on more traditional companies and organizations - the ones set to be disrupted. The report is based on a survey where the median age of the responding companies and organizations was 87, with several over 100 years old.

AI is a long-term investment and leadership is crucial for harnessing the potential of strengthening one's competitive advantage with the help of AI. How and where AI is deployed influences the return on investment significantly. The best opportunities for generating good returns are in deploying AI at the core of a company's products or services or in high-value business-critical processes.

As companies and organizations

mature in using AI, we expect the satisfaction rate to increase. For one, satisfaction will be achieved through carefully considered investments into AI infrastructure, which over time will lower the investments needed on a project-basis level. Second, their intuition will improve to the point that they can discover use cases with better value and feasibility. Higher satisfaction rates are likely to also come from AI applications improving the more they are used, yielding better results over time.

- AI projects and initiatives are to a large extent decentralized within companies and shared practices around data have yet to be formed.
- Most companies do not yet have frameworks in place to assess the success of AI projects in terms of ROI.
- Approximately 50% of respon-



dents are satisfied or very satisfied with the results they have seen from AI so far. The other half of respondents are mainly neutral.

AI SOLUTIONS HAVE A few specific properties that make build-buy-partner decisions more consequential than usual, possibly requiring a broader outlook either across various parts of the organization or further into the future. Specifically, AI solutions depend on shared data assets and systems and benefit greatly from economies of scale. These matters highlight the need for a comprehensive evaluation of the organization's capabilities, strategic imperatives, and data assets.

The survey results show the effect of the hype around generative AI. While products such as ChatGPT are important product innovations, making underlying technologies widely accessible, it is important not to get blinded by such hype. There is much value to be gained and much "groundwork" to be laid with other AI technologies that have already been available for some time.

- All companies surveyed are experimenting with AI, while a majority also report having AI projects that have advanced all the way to production.
- Generative AI and large language models (LLM) have caught the attention of most companies, but despite that there is a lot of diversity in terms of which technologies are used.
- Most companies are using AI as

a part of their products or as part of production or manufacturing processes.

AI CAPABILITIES AT LARGE are something that practically all companies are investing in. While not everyone was able to disclose the amount of their investments, it is evident that AI is a growing priority with a clear majority planning to invest €0.5-10 million

AI infrastructure, data collection, and data quality are all essential elements of a data-driven organization. Without data engineering excellence, AI advantages are impossible to achieve. AI Infrastructure, while still taking shape as a concept, is by definition an essential investment for scaling AI, sharing the related knowledge between different stakeholders, and ensuring operational readiness.

- Companies are investing more in training and competence development than in recruiting more AI talent, although this is primarily driven by the macro picture and not by changes to underlying strategies.
- Compliance to regulation is an oversight activity the majority of companies will be investing in.
- When it comes to investing in AI development initiatives, experimentation remains the most common mode of operation, highlighting the early stages of AI use in most companies.

AI TALENT IS IN HIGH DEMAND, and the market is becoming increasingly competitive. Companies need to be

proactive in building and maintaining a network of talent, while keeping up with changing needs caused by rapidly developing technologies.

In addition to technical skills, domain expertise is also important for effective AI implementation. AI professionals need to communicate effectively with domain experts, stakeholders, and end-users. A solid understanding of the domain helps bridge the communication gap between technical and non-technical teams.

- Only a small fraction of companies report not planning to recruit new AI talent.
- The most sought after professionals are core technical roles: data scientists, data engineers, and machine learning engineers.
- The need for candidates with a combination of both AI skills and domain-specific knowledge is becoming increasingly evident.

THIS IS THE THIRD EDITION of the Nordic State of AI report. While the report and the survey questions it is based on have evolved over time, interesting observations can be made by comparing the three reports to each other.

- When looking at which AI technologies companies use, the number of options have doubled from the first to the third report, reflecting the evolution, adoption and maturity of different AI technologies.
- The most common answer for

where AI is used has remained the same over the years; as part of a product or service. This year using AI as part of production of manufacturing processes has started to catch up.

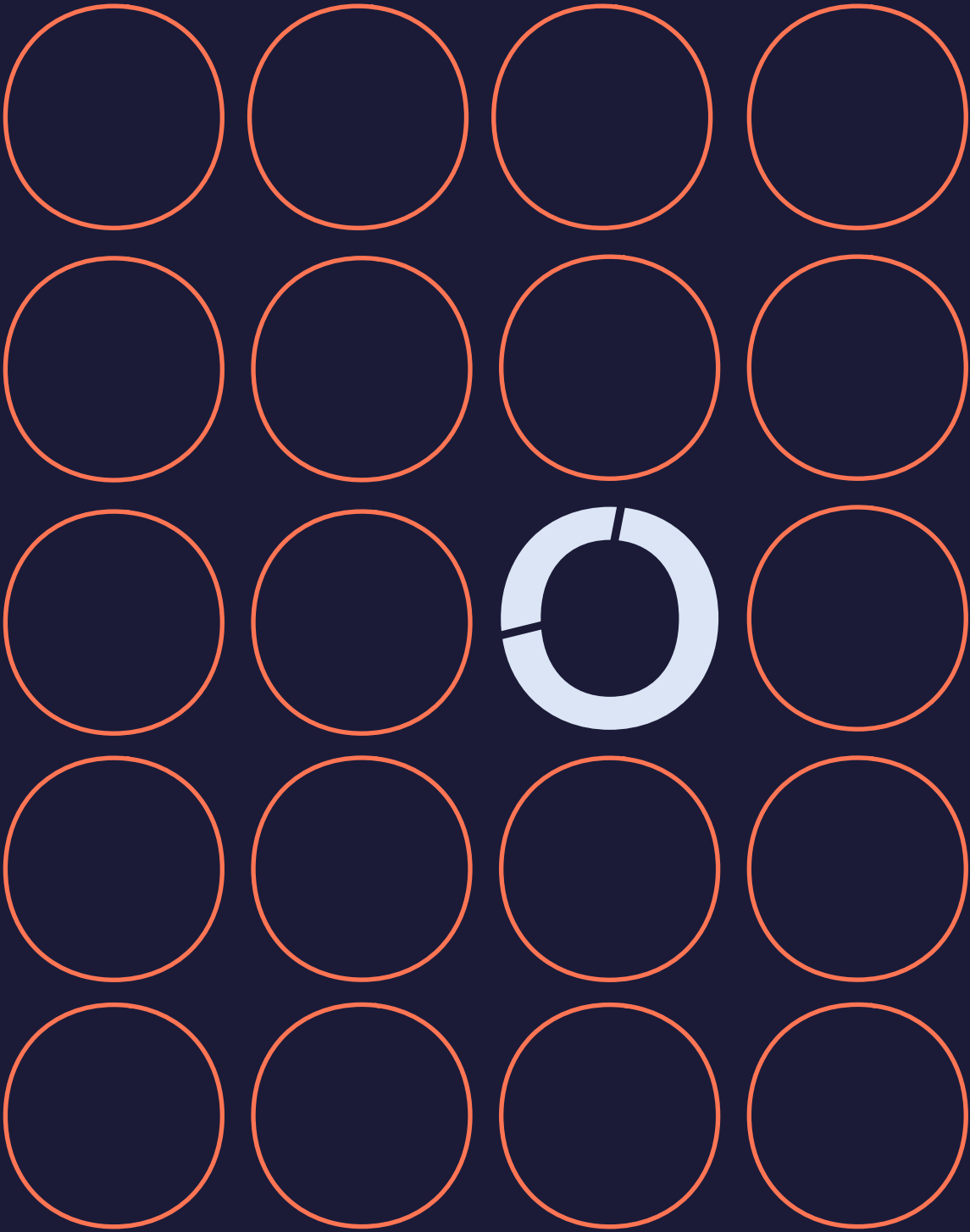
- For the first time, investing in training and competence development surpasses investing in recruiting new AI talent

THE COMPANIES AND ORGANIZATIONS surveyed for this report are industry leaders. What they do affects the Nordic region's standing in a broader way. While Europe and the Nordics lack large high-tech companies, they boast many industry leading companies in various sectors. Their adoption of AI will play a big role in determining Europe's competitiveness on a global scale.

- In the Government AI Readiness Index by Oxford Insights, all of the Nordic countries except Iceland place in the top 15. Finland is the only Nordic country to place in the top 10 with its 4th position.
- Western Europe, with the Nordics included, scores high in the AI Readiness Index in terms of government and data and infrastructure, but lags behind in the technology sector.
- In terms of government AI readiness in Western Europe, Denmark, Finland, Norway and Sweden place in the top 10, with Iceland as 11th.

The executive summary and key findings were authored together with Poro - a family of open models built by Silo AI's generative AI arm, SiloGen.





01

Leading in the age of AI



In the early 2000s, “big data” emerged as one of the hottest buzzwords, as companies and organizations scrambled to become data-driven. This shift, brought on by technology, challenged entrenched ideas about how to lead businesses and conduct decision-making. Yet both big data and being data-driven could today be described as mere warm-up for the shift that AI has ushered in, and of which we’ve only yet seen the beginning.

Company culture, including decision-making processes and leadership, do not change overnight. It’s a continuous process that in this current shift raises questions about the strategic role of AI, what shared practices related to data should look like, and how to best assess the success of AI projects. This section aims to provide insights on these topics and the overall maturity of AI adoption.

- Everybody is engaging with AI at some level.
- AI projects and initiatives are to a large extent decentralized within companies and shared practices around data have yet to be formed.
- Most companies do not yet have frameworks in place to assess the success of AI projects in terms of ROI.
- Approximately 50% of respondents are satisfied or very satisfied with the results they have seen from AI so far. The other half of respondents are mainly neutral.

WHILE AI IS SET TO DISRUPT all industries, the conversation around AI often focuses on big technology companies such as Google, Meta, and Microsoft. This report is focused on more traditional companies and organizations – the ones set to be disrupted. The report is based on a survey where the median age of the responding companies and organizations was 87, with several over 100 years old. These companies and organizations come from legacy industries such as manufacturing, construction, financial services, the public sector, and IT and telecommunication (Figure 1). They are the kinds of companies and organizations that form much of the foundations of our societies. The big question is, how are these companies and organizations embracing AI?

Along with the opportunities ushered in by AI, there are also challenges. Some of these challenges relate to management, culture, and leadership. As with any new technology, there are bound to be some growing pains as companies and organizations learn

and mature in their use and adoption of AI. This section offers a bird’s eye view of how companies and organizations manage AI.

Satisfaction guaranteed?

Given the hype around AI in general, and generative AI in particular, that the world has witnessed during the past year, it makes sense to ask how satisfied companies and organizations have been with the results they have seen from their AI projects. On a scale ranging from “very disappointed” to “very satisfied,” the results show a close to 50/50 split between those who report being satisfied or very satisfied and those who report being neutral at best (Figure 2).

Examining what kind of AI initiatives the respondents have ongoing and what their expectations are related to those initiatives (Figure 3.), can provide a better understanding of adoption levels. The responses show that all participating companies and organizations are engaging with AI at some level. Nearly 70% of respondents have AI experiments or projects

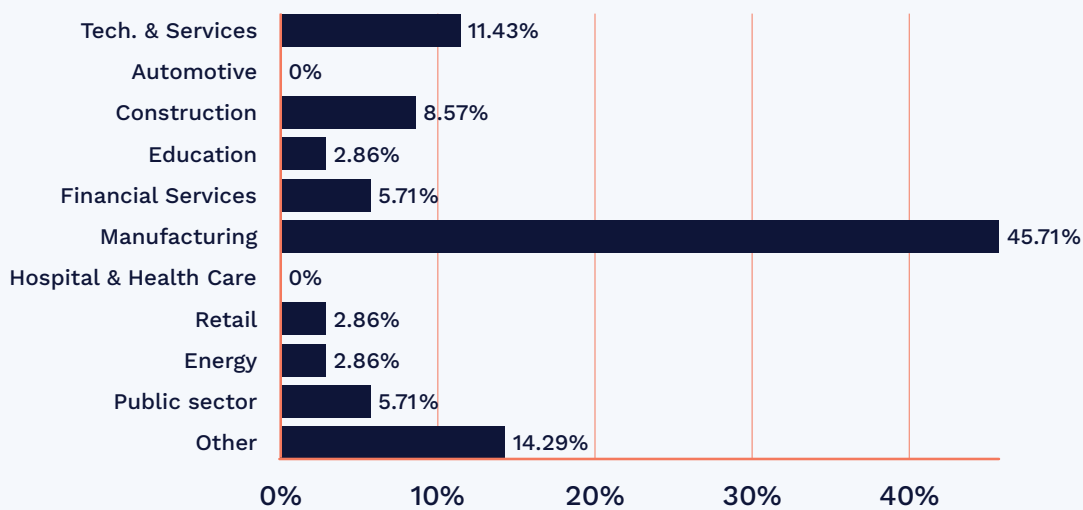


Figure 1. Which industry does your organization operate in?



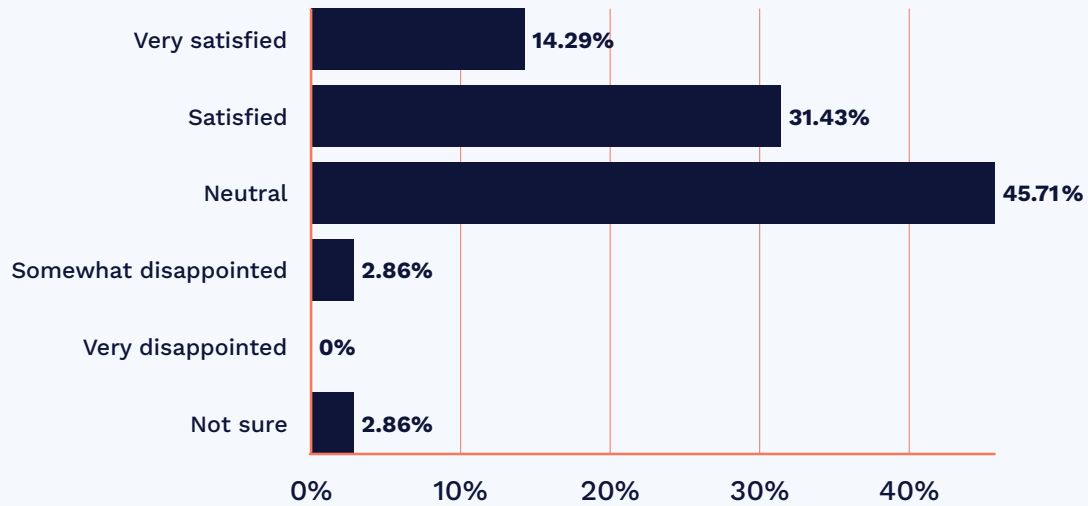


Figure 2. How satisfied are you with the results you are currently seeing from AI projects?

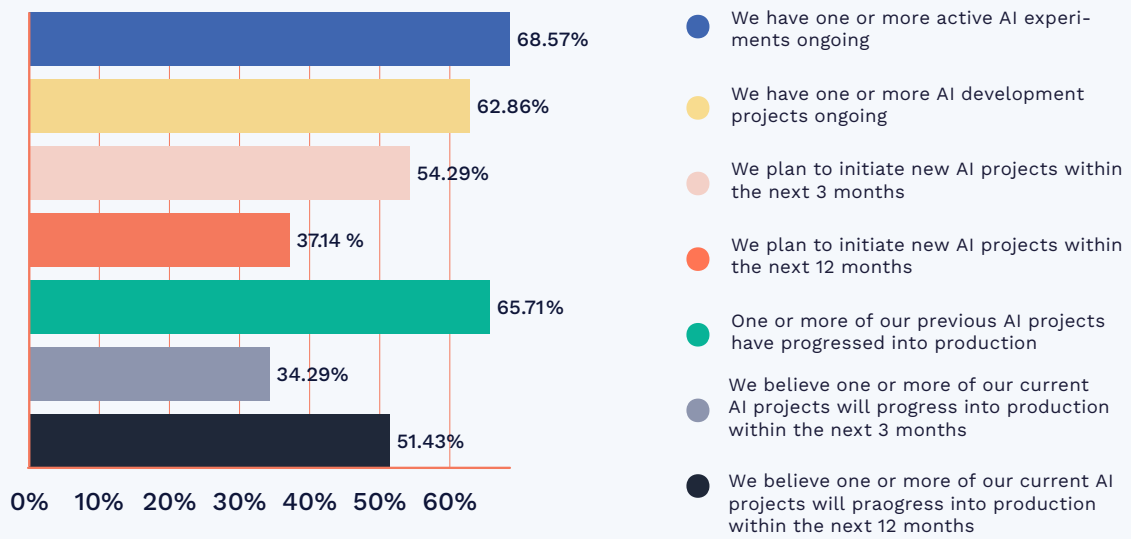


Figure 3. From experimentation to production, where are you now?

in development, with 86% expecting their projects to progress into production within the next 12 months. 65% of respondents also have prior AI projects that have already progressed into production.

Given the diversity of AI experiments

and projects, the question of how satisfied companies and organizations are with the results they have seen so far is increasingly complex. To determine the satisfaction rate, a definition of success is therefore helpful. Slightly over a quarter of respondents have some form of a framework in

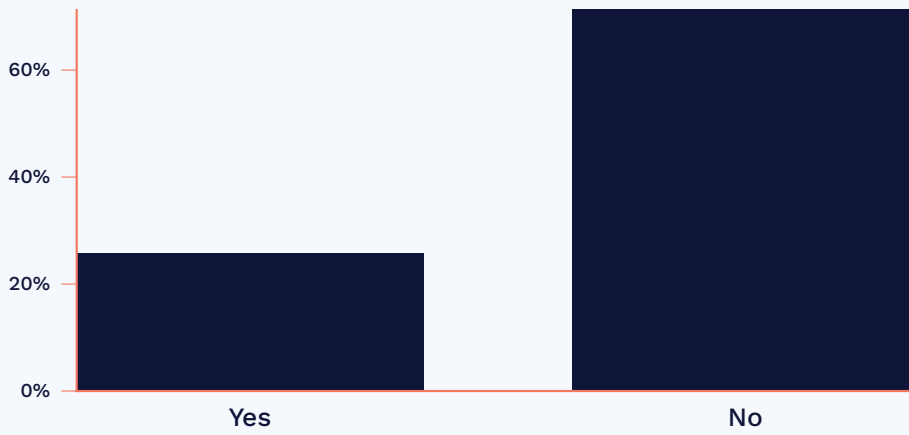


Figure 4. Does your company have a framework in place for assessing the success of AI projects, e.g. in terms of return on investment?

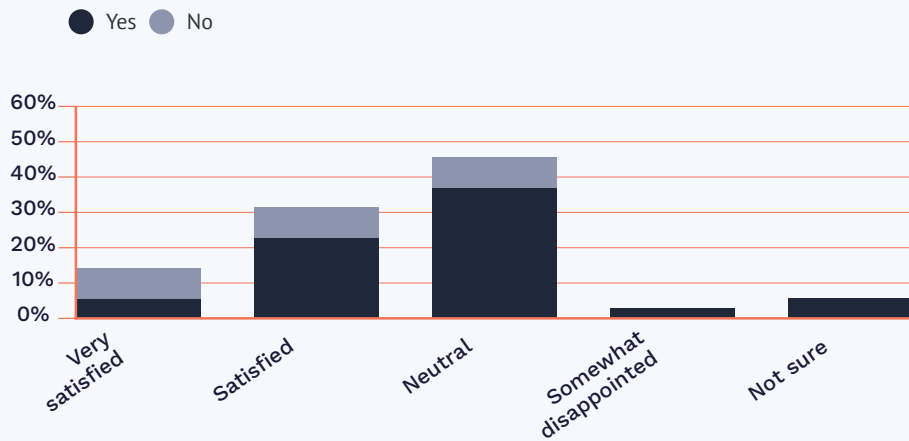


Figure 5. Does your company have a framework in place for assessing the success of AI projects, e.g. in terms of return on investment?

place to assess the success of AI projects in terms of return on investment or other metrics (Figure 4). It is worth noting that 37,5% of those who reported being satisfied or very satisfied have a framework. In contrast, of those who reported being neutral at best, only 15,7% have a framework for assessing the success of their AI projects (Figure 5).

The level of satisfaction can be affected by a variety of factors. One such factor can be the level or degree of AI adoption.

AI is a long-term investment. How and where AI is deployed influences the return on investment significantly. The best opportunities for generating good returns are in deploying AI at the core of a company’s products or services or in business-critical processes — more on this in the next section.

As companies and organizations mature in using AI, we expect the satisfaction rate to increase for a few reasons. For one, satisfaction will be



achieved through carefully considered investments into AI infrastructure, which over time will lower the investments needed on a project basis level. Second, their intuition will improve to the point that they can discover use cases with better value and feasibility. Higher satisfaction rates are likely to also come from AI applications improving the more they are used, yielding improved results over time.

Management of AI projects-

Survey results show various ways in which AI projects are led in different companies and organizations. While there were no clear correlations between ways of managing AI projects and perceived satisfaction with results, it’s clear that the most AI projects are managed locally, either with support from a central AI center of excellence or in collaboration with other departments/business units (Figure 6). Results also show that the majority of companies and organi-

zations do not have a C-level representative responsible for data and AI management. (Figure 7).

What does it take to transition from decentralized experimentation and individual AI development projects to scaling the use of AI across an entire company? When asked about the biggest challenges related to scaling the use of AI, lack of talent was the most common challenge. The second most common challenge was a lack of shared practices around data, followed by unclear business strategy/roadmap and unclear business processes and responsibilities (Figure 8). Comparing the results from this report with those of the previous, in terms of what is seen as the biggest challenges, there are several differences (Figure 9).

Leadership is crucial for harnessing the potential of strengthening competitive advantage with the help of AI.

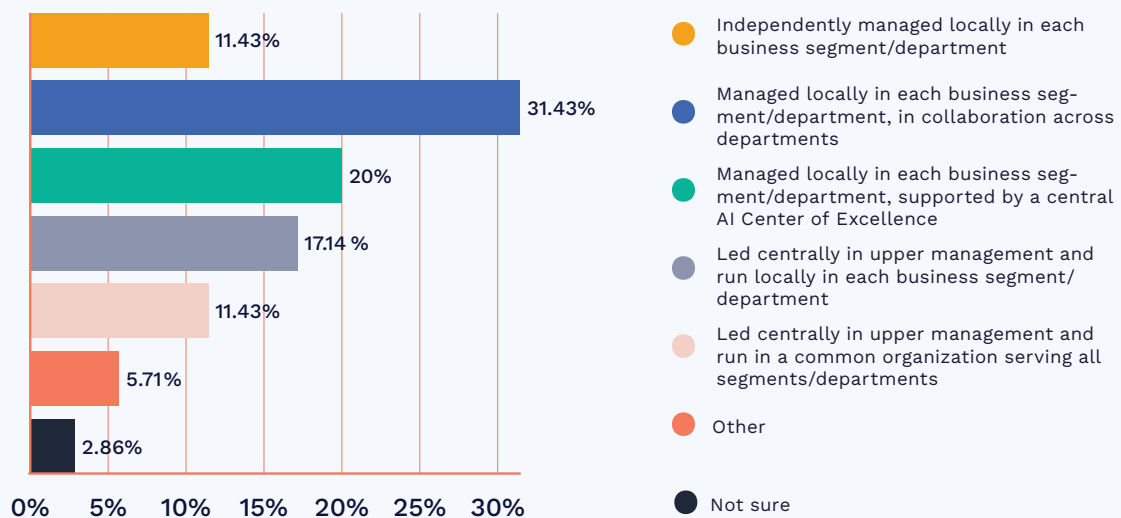


Figure 6. How are AI projects in your company managed and conducted?

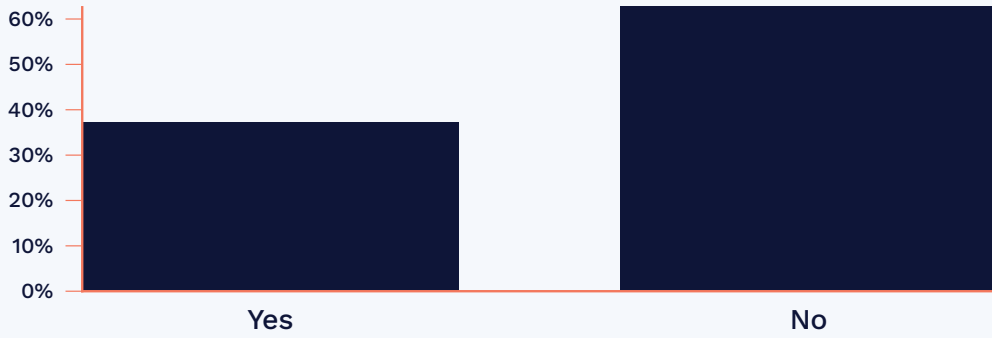


Figure 7. Does your company have someone in the C-suite responsible for data and AI management on a company level?

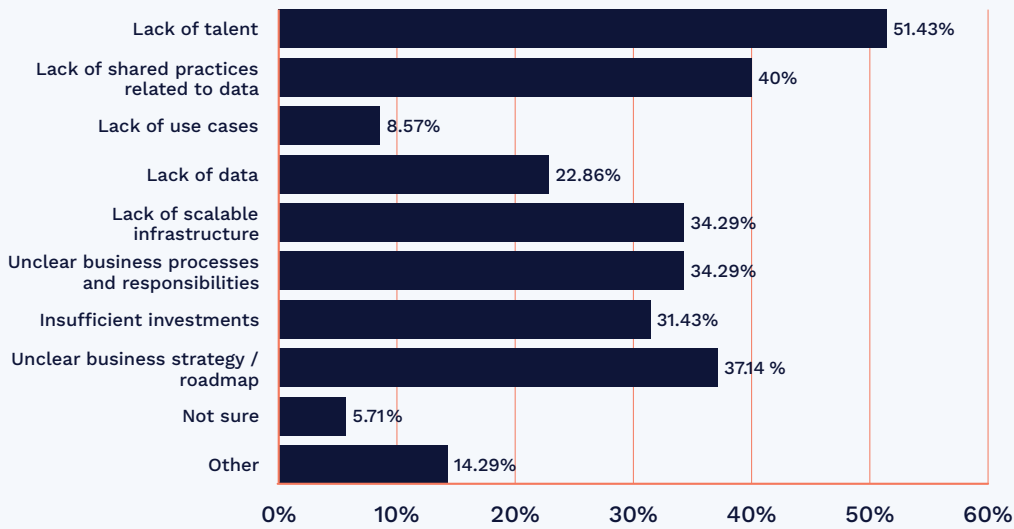


Figure 8. What are your biggest challenges in scaling the use of AI across your entire company?

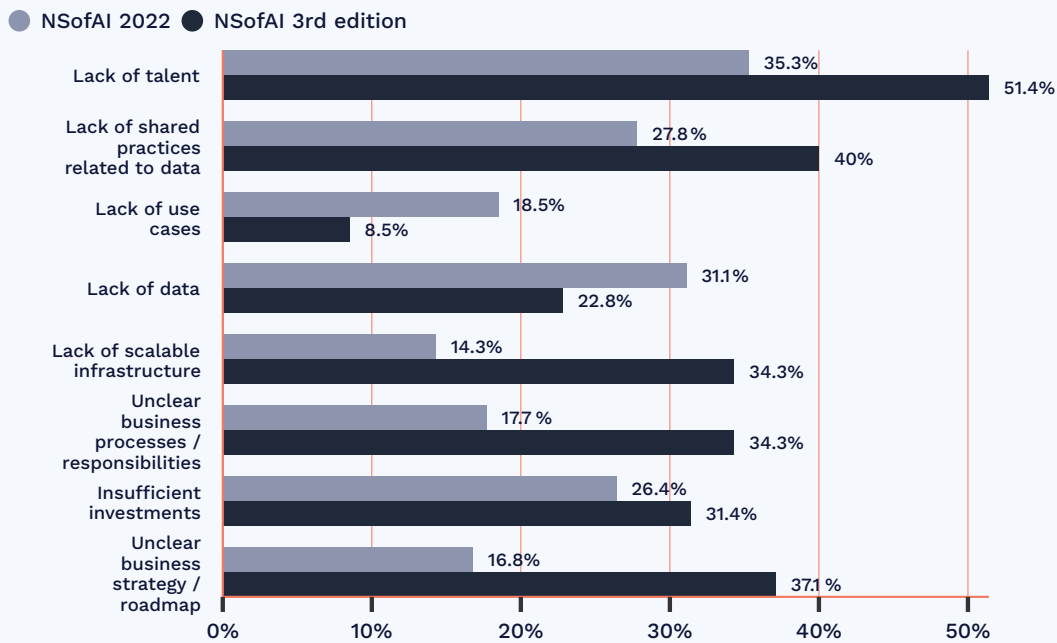


Figure 9. Biggest challenges in scaling the use of AI across entire company? NSoAII 2022 & NSoAI 3rd edition.



Silo Expert insight:

” As the AI landscape matures, increasing attention is being paid to data-centric AI. Focusing on obtaining and engineering high-quality data that is consistently labeled would unlock the value of AI across a variety of domains. As such, developing shared, systematic practices around data is key to ensuring a high chance of success of new projects, while ensuring a high level of operational readiness and minimized turnaround time.

– *Adrian Yijie Xu, Silo AI Senior AI Scientist & Expert Lead*

The majority of AI projects are managed in a decentralized manner. While a degree of autonomy can benefit innovation, the lack of shared practices around data management might be one factor holding back scaling the use of AI across an entire company and thus hampering the value creating potential of AI.

Another obstacle to scaling the use of AI is an unclear business strategy/roadmap. What both of these challenges have in common is that they are tightly intertwined with management and leadership practices. As with any long-term initiative, devis-

ing ambition for significant business results and maintaining the ambition with a disciplined focus on a common direction is essential for success.

We believe that having someone in the C-suite responsible for incorporating AI into the company’s or organization’s strategy, having clear business objectives and understanding the role AI plays in achieving those, as well as developing frameworks for assessing the success and return on investment of different types of AI projects lead to improved results and consistency.

Expert Interview

WITH:
NICOLAS MOCH /
HEAD OF SEBx &
ANASTASIA VARAVA /
RESEARCH LEAD SEBx



HOW CAN A TRADITIONAL BANK successfully deal with technological disruption? SEB, a leading northern European bank, with a history dating back to 1856, has chosen a proactive approach. In 2018, they founded SEBx with the purpose of exploring new technologies and developing new customer offerings. SEBx is a team at the fringe of the organization, outside conventional structures and legacy processes, but with full access to everything the bank has to offer. With this combination of the speed, agility, and legacy-free infrastructure of a fintech startup and the trust, experience, capital, license and knowledge of an incumbent, their mission is to explore new technologies and new business models.

Nicolas Moch, Head of SEBx, and Anastasia Varava, Research Lead at SEBx, recently shared their insights on managing AI projects in large companies.

What is the role of the board and of management in terms of steering AI adoption in your company?

NICOLAS MOCH: In SEBx, there are

two things that may be different from other companies. The first is that we view ourselves as a service company. The role of AI is clear because it's close to what we do. For example, a lot of advancements have been made in combating financial crime and to improve cyber security, which are close to our core business. We use AI to solve real business problems. Secondly, we have a board and management team that is very interested in new technologies, so we have a pull rather than a push to use these new technologies.

ANASTASIA VARAVA: The last point is important. What is challenging is how you implement these things in practice. You can have a lot of support from the top, yet planning the work, securing the resources, and making sure that people at the operational level know what to do, can still be challenging. It's not a strategic problem per se, but a challenge nonetheless.

NICOLAS MOCH: I would add that it's difficult to predict how a technology will evolve. It's good to be flexible and try a

lot of things rather than having a rigid business strategy. The assumptions we had a year ago are not the same as today.

You mentioned that your board is interested in new technologies like AI, and that they help set the agenda. What do you think would happen if the board was not so technology oriented?

NICOLAS MOCH: It's easy to compare because we have colleagues in the financial industry who are still debating if this is something they should do or not. I think that is a strategic mistake. There are ethical concerns, but not trying is a choice that puts you in the backseat when it comes to adoption. If you don't have knowledge, then you will be at the mercy of external actors. I think a lot of banks wonder if they can trust AI and that slows adoption. As a bank, we have a huge moral and ethical duty to our customers. But if we don't try, someone else, a startup, will do it.

ANASTASIA VARAVA: I think it's important to have knowledge internally, and not to do everything from scratch. You need to be able to choose external vendors, to know what tools to buy. I think a lot of non-tech companies don't have that expertise, which is a problem from a strategic point of view.

What is your philosophy regarding shared practices around data?

NICHOLAS MOCH: I don't think there's a one-size-fits-all for this. Historically, a number of things have been true, one of which is that you have to have high quality data and a good way of linking data together.

ANASTASIA VARAVA: Apart from the core data that the bank has, I think the problem is that many processes at the



“ There are ethical concerns, but not trying is a choice that puts you in the backseat when it comes to adoption. If you don't have knowledge, then you will be at the mercy of external actors” – NICHOLAS MOCH

bank are manual and not properly documented. When these processes were put in place it was not with the idea that someday it will be possible to automate them. That's a problem when new technology, such as AI, comes around and suddenly there is a desire to apply it. I think it's important to be more strategic in designing processes with the idea that one day, it might be possible to automate them.

NICHOLAS MOCH: It isn't easy to change processes that have been in place for years. Banking is a very old business.

The first documented transactions occurred 5,000 years ago. There are a lot of rules that exist and you don't know why. So, in banking, there are two opposing forces, one of which is the historical way of doing things because they have always been done that way, and the other is the temptation to do zero-based design, which would be banking if it was invented today. That is part of what SEBx is doing, trying to think that if we were to invent banking from scratch, then what would it look like? A lot of things can be challenged in terms of 0-based design.

We found that in terms of satisfac-

tion with results from AI projects, around 50% are neutral at best. What do you think could be some of the reasons why they were neutral instead of satisfied or very satisfied?

NICHOLAS MOCH: Unrealistic expectations without a doubt. For me, it's just a tool, but people have expectations that AI can do magic. That is what is causing the hype, and we'll probably see a major hangover in a year or two. All companies should try to learn more about AI to better understand the limitations of it. That will make their expectations more realistic.

For one, satisfaction will be achieved through carefully considered investments into AI infrastructure, which over time will lower the investments needed on a project basis level.



Our Key Takeaways



- AI is a long-term investment and the highest potential for value creation comes from deploying AI at the core of your product or service.
- A clear business strategy/roadmap is crucial for harnessing the potential of strengthening competitive advantage with the help of AI.
- Appropriate AI infrastructure, including shared practices around data, is key when it comes to scaling the use of AI throughout a company or organization.

02

From experiments to production



AI is developing at a dizzying pace, making it a challenge to keep up with. Despite the pace, most companies have approached AI with interest and curiosity. This section dives deeper into which AI technologies are most commonly used, where they are being deployed and what solutions are used for computing. By looking at which technologies are used the all encompassing term “AI” becomes more concrete.

Different AI technologies can be used for a variety of purposes. From automation to augmentation, AI is used for productivity gains as well as for new product innovations. This section provides guidance on different AI technologies and an understanding of when to buy AI off-the-shelf and when to develop custom AI.

- All companies surveyed are experimenting with AI, while a majority also report having AI projects that have advanced all the way to production.
- Generative AI and large language models (LLM) have caught the attention of most companies, but despite that there is a lot of diversity in terms of which technologies are used.
- Most companies are using AI as a part of their products or as part of production or manufacturing processes.

“AI” AS A CONCEPT OR TERM can be vague. There is no widely accepted definition of AI, and many technologies fall under the term. As the different technologies get more widely adopted, they often become known by a more specific name, like machine learning or natural language processing. At that point, it is easy to stop thinking of them as AI and just see them as a natural part of the technology stack.

This section examines which AI technologies the survey respondents use, where, and how.

Developing AI

A fairly even distribution of the resources companies and organizations use for developing AI is observed. While internal expertise is used at a slightly higher extent than outsourcing expertise, internal platforms and tools are outweighed by commercial and open source platforms and tools (Figure 10).

With the hype around generative AI, it

comes as no surprise that generative AI and large language models are the two most widely used AI technologies. They are, however, by no means the only AI technologies available. As the graph below shows, respondents use many different technologies (Figure 11). There are some notable differences between this and the previous Nordic State of AI report. According to the results in the previous report, approximately 40% used natural language processing (NLP); in this report 60% of respondents are using NLP. Below are several other technologies where notable differences can be observed (table 1). A change in target respondents explains part of these differences. The previous report was focused on startups and smaller-sized businesses, whereas the current report is based on a survey of large multinational companies and organizations. Nonetheless, these differences are interesting to observe as the data is collected from the same ecosystem. A clear majority of respondents are using AI as part of their product (Figure 12). One

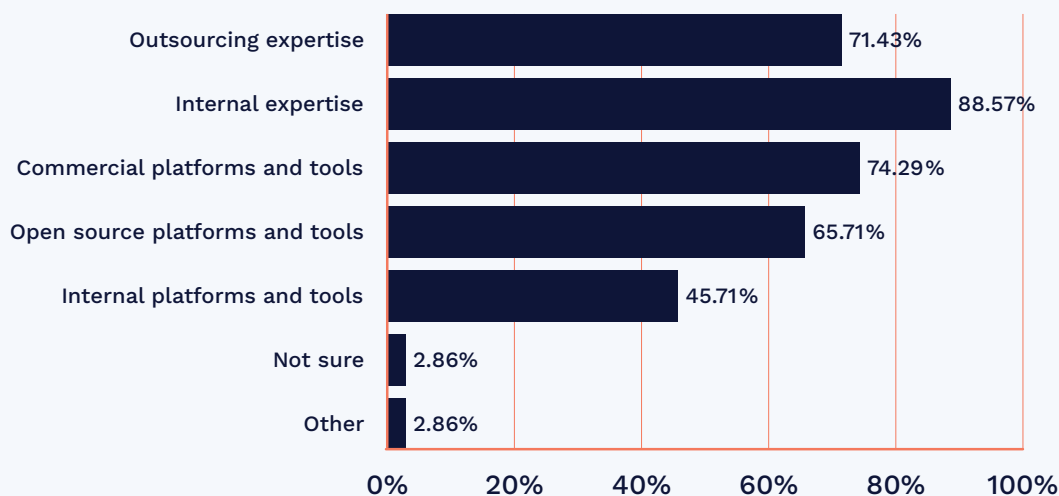


Figure 10. Which resources does your organization use to develop AI?



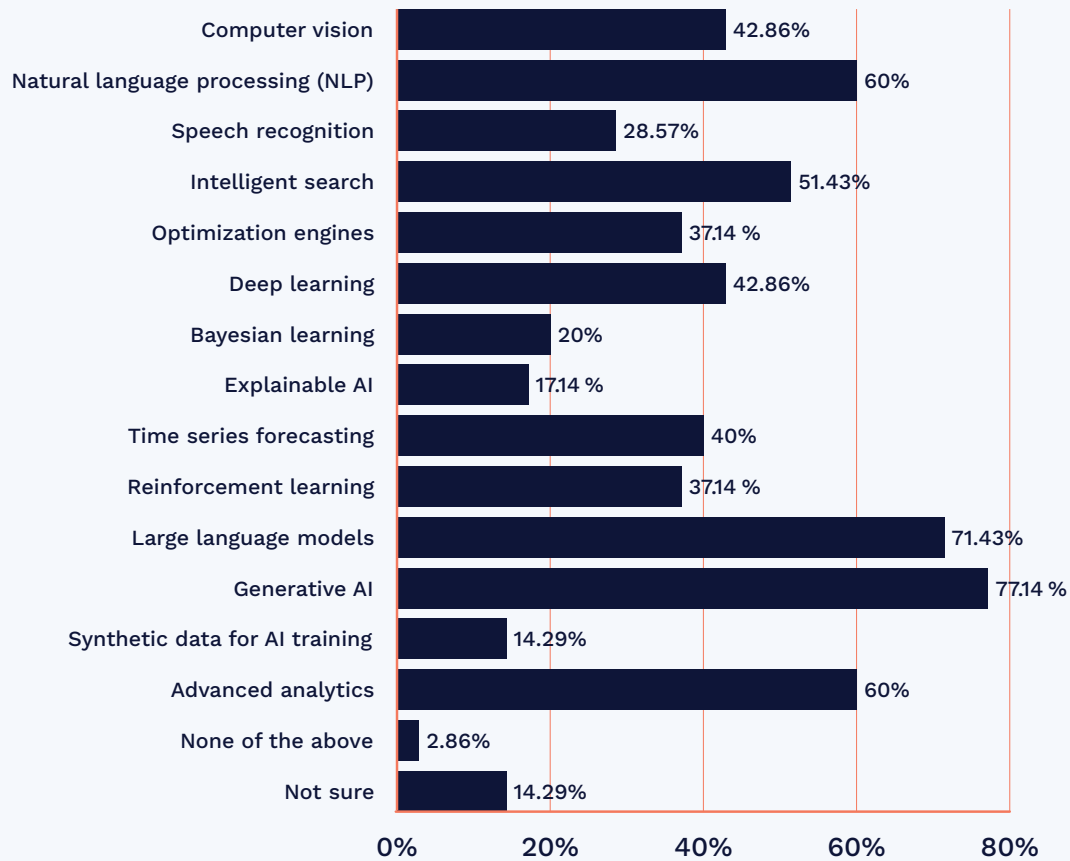


Figure 11. Which AI technologies do you use in your organization?

AI Technology	NSofAI 2022	NSofAI ed.III
Natural language processing	42%	60%
Speech recognition	60%	28.6%
Intelligent search	20.2%	51.4%
Optimization engines	24.4%	37.1%
Deep learning	51.3%	42.8%
Explainable AI	54.6%	54.6%
Time series forecasting	28.6%	40%
Reinforcement learning	11%	37.1%

Table 1.

Silo Expert insight:

” The low priority of “Explainable AI”, especially compared to the previous year, is interesting. With the significant increase in the use of Generative AI/LLM technologies, this indicates a strong prioritization of productivity increases. The lack of adoption of Bayesian learning can be explained by two factors: concerns over the practicality of Bayesian counterparts of cutting-edge neural network methods, and a lack of understanding of the advantages of the Bayesian methods, such as better data exploitation especially in lower-size datasets and a natural expression of uncertainties in predictions. The rest of Figure 10 exhibits predictable changes in the use of technologies, going hand in hand with the overall industry and academic trends.

– Elin Ehsani, Silo AI Lead AI Scientist.

interesting aspect is that 8,5% of respondents are using AI as part of their R&D, an option not listed in the survey response options.

Compared to the previous report, the percentage of respondents using AI as part of their products or services is nearly identical, but two other areas stand out due to the difference in results. Respondents using AI as part of their production or manufacturing processes went from 25.2% to 65.7%, and respondents using AI as part of

customer care/experience went from 20.2% to 60%. As a large portion of the respondents to the recent survey represent the manufacturing industry, it is not surprising to see a rise in the use of AI in production or manufacturing. The other big change might be due to the wide adoption of large language model-based applications and products such as ChatGPT. AI solutions have a few specific properties that make build-buy-partner decisions more consequential than usual, possibly requiring a broader



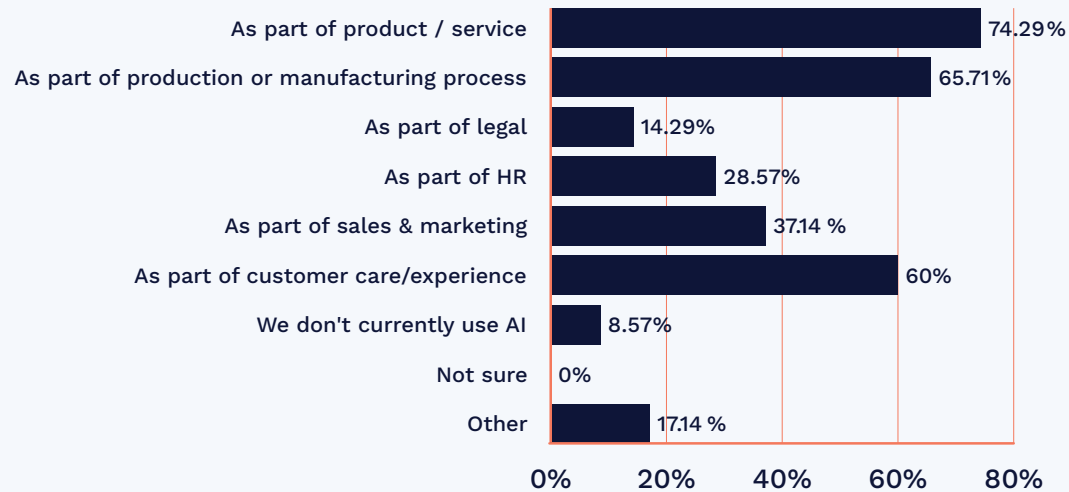


Figure 12. Where do you use AI technologies?

outlook either across various parts of the organization or further into the future. Specifically, AI solutions depend on shared data assets and systems and benefit greatly from economies of scale. These matters highlight the need for a comprehensive evaluation of the organization's capabilities, strategic imperatives, and data assets.

The “build” approach allows the creation of systems and solutions that are finely tuned to the company's specific data assets, operational context, or surrounding technology. This is sometimes necessary simply due to the lack of ready-made, applicable commercial products.

However, most of the time the “build” approach is chosen to seek a differentiating competitive advantage with the new technology. In different situations, this may mean using AI to build e.g. superior product features, unmet operational cost efficiencies, or superior service experience. In any

case, the road to success depends on identifying domains of the business for AI use that have an outsized impact to its overall success in the market.

In contrast, when there is a clear risk of operational complexity growing too high or the target objective of AI use isn't directly tied to the competitive core of the company, off-the-shelf products become a more attractive option. These solutions deliver the advantages of swift implementation and established reliability — essential for businesses in areas where there is lesser capacity or interest to implement differentiating AI capability. Such solutions are also typically accompanied by vendor support, providing a layer of risk mitigation and operational reassurance.

The survey results show the effect of the generative AI hype. While products such as ChatGPT are important product innovations, making underlying technologies widely accessible, it is important not to get blinded by the

hype. There is much value to be gained and much “groundwork” to be done with other AI technologies that have already been available for some time.

Data and Compute

In the previous report, the second most common challenge in scaling the use of AI throughout an entire company or organization was the lack of data. This time around lack of data was the 7th most common challenge. Considering the median age, 87, and the size of the companies and organizations in this report, that is an understandable change. The most common types of proprietary operational data sets are geographic data, followed by customer care and customer behavior data (Figure 13).

Most survey respondents use a combination of different solutions when it comes to the computation of their AI models (Figure 14). The most commonly used option is externally on a public cloud. In contrast, the second most common option is on-premise or in a private cloud. This result is similar to that of the previous report. The question of computing is highly relevant as AI solutions require significantly more computational power to function than traditional software solutions. This is an integral part of the infrastructure needed for AI and should be taken into account in the planning and resourcing for AI.

AI is inherently dependent on the underlying data, giving incumbent companies with big existing data holds and even bigger balance sheets a good leg up against any new entrants. For all solutions, the availability of

domain-specific data is key to ensuring the success of AI models in providing reliable, accurate predictions. Beyond availability, high data quality is also necessary. The definition of quality depends on the domain of the solutions - for example, tabular data machine learning models demand data that is fully populated and without erroneous values, while image-related models define quality as having correctly annotated images with minimal noise.

However, we believe generative AI-based technologies are the future foundation for user experience development. The intuitiveness that these technologies enable will improve the quality of interactions between humans and machines. Even though the “P” in GPT stands for pre-trained, there will still be a further need for high-quality data for fine-tuning models for custom purposes.

Understanding how different data and computing options align with business objectives should be considered at least briefly already at early stages. As the scale of AI use grows, these questions grow exponentially in importance. No matter if the compute environment is the cloud, an IoT system, or an embedded device, running 10 times more AI doesn’t have to mean having 10 times the expenses. For even stronger competitive advantages, understanding how to harness AI for innovations beyond cost-saving and process efficiency improvements is where the greatest opportunities lie.



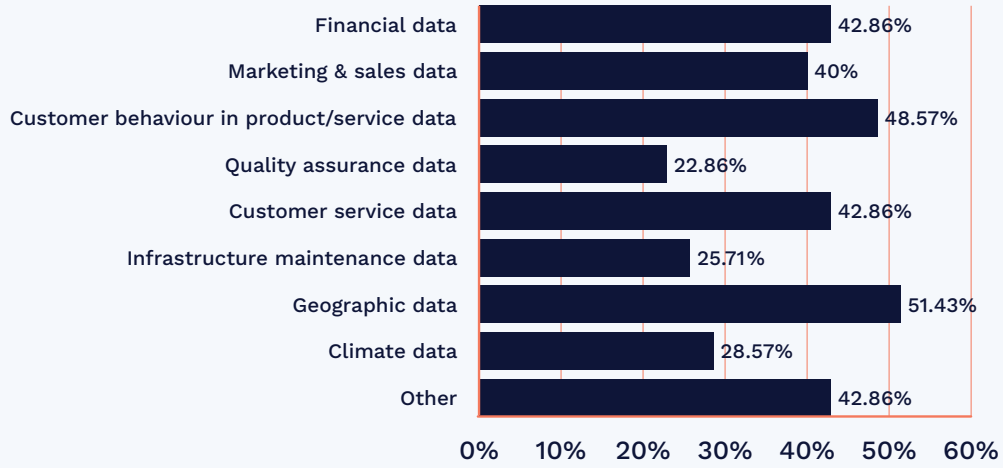


Figure 13. What kind of proprietary operational datasets does your company use in AI projects?

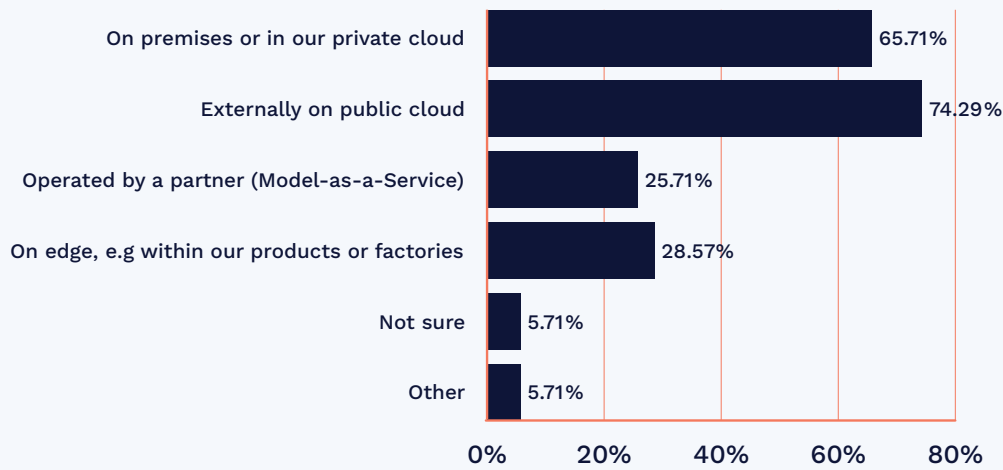


Figure 14. Where does computation of your AI models happen?

Expert Interview

WITH:
KLAS PETTERSEN /
CEO, NORA



NORA – THE NORWEGIAN ARTIFICIAL Intelligence Research Consortium – is a Norwegian collaboration between eight universities, five university colleges and five research institutes within AI, machine learning and robotics. They are strengthening Norwegian research, education and innovation within these fields. *Klas Pettersen*, the CEO of NORA, would like to see even more collaboration between academia and industry. In this interview, he provides an insightful overview of different aspects to be considered in order to succeed with AI.

What kind of choices related to infrastructure and architecture should companies and organizations make in order to be successful with their AI projects?

KLAS PETTERSEN: It depends on what kinds of AI projects you are planning. If you have smaller projects, you might rely on your own infrastructure, but you might require some other, additional service or infrastructure to handle larger projects. It's very dependent on the company and its technological maturity.

For larger models, few can build their

own infrastructure, so they need to rely on other sources. Here in Norway for example, for large language models, we can rely on the Lumi supercomputer, for midrange projects we can use our national infrastructure, and then we have smaller infrastructure for smaller projects provided by universities, for example. We have all of these scales available to us.

Keeping in mind that as new methods and technologies appear quickly, it's important to have a flexible architecture, in the sense that there are small modules that can be changed. That's a good principle in a fast-moving world.

AI in general is dependent on data, generative AI maybe even more so. With almost 80% of our survey respondents reporting they have started using generative AI, what are some things you consider important to keep in mind regarding the data?

KLAS PETTERSEN: Typically, we have seen methods move from supervised learning, where there is an expert putting labels on things, to more self-supervised learning in the field of generative AI. Generative AI technologies rely on

huge quantities of data, but it's not only the data quantity that is important. We have to take care of biases, for example, as much of the data available is not weighted equally to represent minorities.

Data quality is also important. The trend now is that foundation models are being fine-tuned for domain-specific areas. With high quality data, you could have smaller models that have the same performance as larger models.

There are also challenges related to copyright laws and how to deal with the question of what is fair use. The research community has traditionally relied on openness and transparency, but many of these new models have been established by a handful of large companies and are usually not transparent. From a research-community perspective I would like to see more open models. I think it would be good for companies as well. They have to consider privacy concerns and for example determine whether uploading data to servers outside of Europe is something that complies with local regulation.

The field of AI is maturing and we are seeing more off-the-shelf AI products for specific tasks on the market. How can companies and organizations go about determining when to use an off-the-shelf product, and when to build their own custom AI?

KLAS PETTERSEN: If I was a company, I would try to use existing models if possible, but you have to be aware of the licensing issues and privacy issues as they will determine which types of AI projects are suitable for off-the-shelf products.

The world is changing and the field of AI is quickly evolving. So if you are a company of a certain size, I would recommend setting up a research and innovation department that can experiment with AI to develop the company's competences. That way you can determine if

“The trend now is that foundation models are being fine-tuned for domain-specific areas.”

– KLAS PETTERSEN

you need to build something yourself, or if you can use off-the-shelf products.

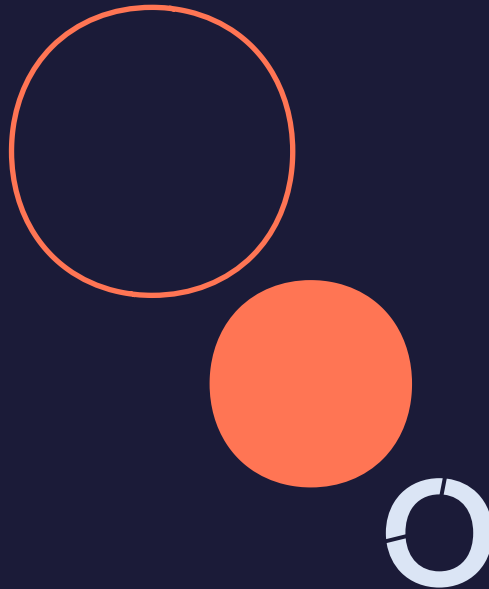
We've gone through infrastructure, data, and whether to build or buy, what else is needed for successful AI projects?

KLAS PETTERSEN: I would say that AI is very multidisciplinary and could be seen in a way similar to how we see statistics. It is something researchers from different fields of science can apply as part of their research. It is of course important to apply appropriate methods and technologies, but there is no fixed recipe for how that is done. Typically, researchers from fields outside of AI would collaborate with technology research groups. We have to try to ensure that we have cross-disciplinary teams, so that the best suited methods for each use case are found.

Do you think the Nordics are well positioned to take a leading position in the application of AI?

KLAS PETTERSEN: Absolutely. The Nordics have been very good in digitalization and we have a lot of public data, similar cultures and a shared set of values. These are important aspects of AI, it's not only about technology. I would like to see more collaboration across the Nordics. I think we could achieve great things together, given our shared values, strong collaborative traditions, and high level of trust.

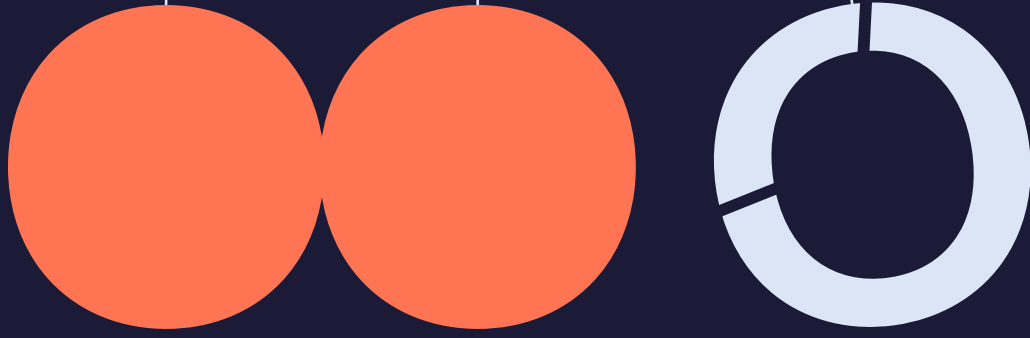
Our Key Takeaways



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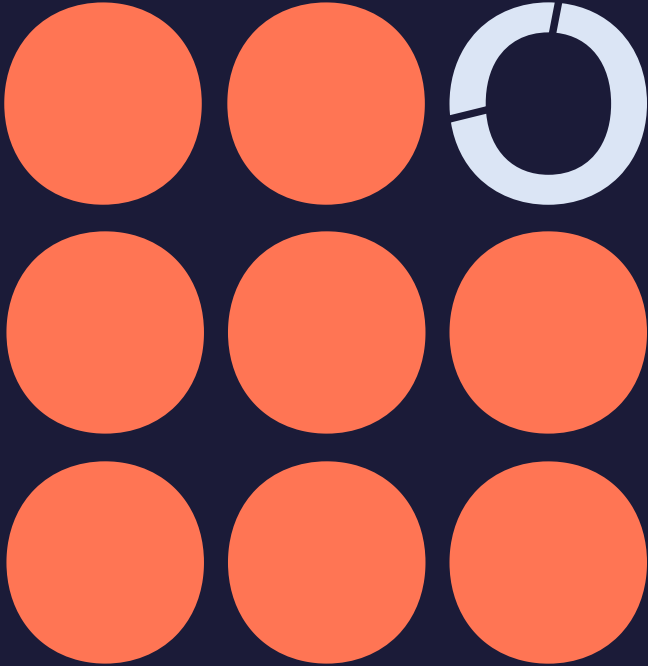
- The quality of off-the-shelf AI products has improved a lot. If you are looking to increase productivity, it is worth considering existing products. If you are deploying AI at the core of what constitutes your competitive advantage, it will make more sense to build custom solutions.
- AI explainability has seen a big drop in its perceived priority. The reason isn't so much its reduced importance than people reframing to see the broader aspects of what makes AI reliable.
- Generative AI is great, but don't get blinded by the hype. There is much value to be gained and much "groundwork" to be done with other AI technologies that have already been available for some time.
- "Premature optimization is the root of all evil" and this applies to AI compute as well. At scale or with unforgiving constraints, however, optimization becomes essential.





03

Investing in AI



Over the last year, we have witnessed a lot of hype around AI, and generative AI in particular. All companies now face the challenge of navigating through this hype and creating actual value with AI.

Understanding the value-creating mechanisms of AI will help to understand where investments are most needed. There is probably no budget out there that lists “AI” as a single line item. Investments into AI span from HR to legal to technology. This section provides an overview of the different aspects of investing into AI.

- More companies are investing in training and competence development than in recruiting more AI talent, although this is primarily driven by the macro picture and not by changes to underlying strategies.
- Compliance to regulation is an oversight activity the majority of companies will be investing in.
- When it comes to investing in AI development initiatives, experimentation remains the most common mode of operation, highlighting the early stages of AI use in most companies.

AI CAPABILITIES AT LARGE are something that practically all companies are investing in. While not everyone was able to disclose the amount of their investments, it is evident that AI is a growing priority with a clear majority planning to invest €0.5-10 million (Figure 15). However, there is a long road ahead. When one considers the many Nordic enterprises that have announced AI as their core vector of investment and competitive stance, and then compares their statements of development and R&D budgets that are allocated to AI, it becomes clear that, beyond very few exceptions, the reality on the ground remains a magnitude (or several) off of their stated aspirations.

agement, and AI oversight activities. These three are further divided into different elements for an even more granular view.

Each of these three aspects deserves careful consideration and should be aligned to each other to ensure the needed resources for successfully scaling the use of AI throughout a company or organization.

Investing in AI development

A clearer understanding is achieved by dividing AI development efforts into seven different elements. These elements reflect different stages, from experimentation to production, as well as different types of activities. Experimenting with AI is the most common investment area with-

This section provides a deeper un-

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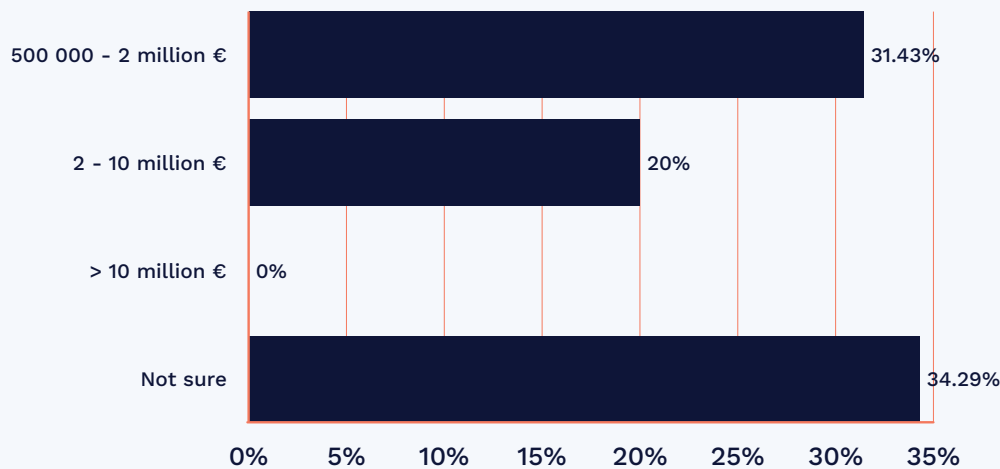


Figure 15. How much are you planning to invest into AI in the next 12 months?

derstanding of AI investments in the Nordics, and goes beyond looking purely at the amounts of investments. It does so by exploring three different perspectives related to AI investments: investments into AI development, AI talent and man-

in AI development, which highlights both the early stages of AI use in most companies as well as how technological progress is forcing continuous discovery. This echoes the results of our previous report.



Approximately 70% of respondents are investing in AI development for production and evaluating AI use cases. 57% of respondents are investing in AI infrastructure, data collection, and data quality (Figure 16).

What is encouraging to see is that the trend is clear: AI is something everyone will be investing in at some level. Over 50% of the respondents report investing from €0.5 million to €10 million during the next 12 months. There is a good reason for these investments. According to studies by PwC, AI will contribute more than \$15 trillion to the global economy by 2030

and global GDP may increase by as much as 14% by the same time. Experimenting reflects a general and genuine interest in seeking a better understanding of this next evolution of digitalization. Data Collection and Data Quality are the foundation of a data-driven organization and the basis of leveraging AI. Without data engineering excellence, AI advantages are impossible to achieve. AI Infrastructure, while still taking shape as a concept, is by definition an essential investment for scaling AI, sharing the related knowledge between different stakeholders, and ensuring operational readiness.

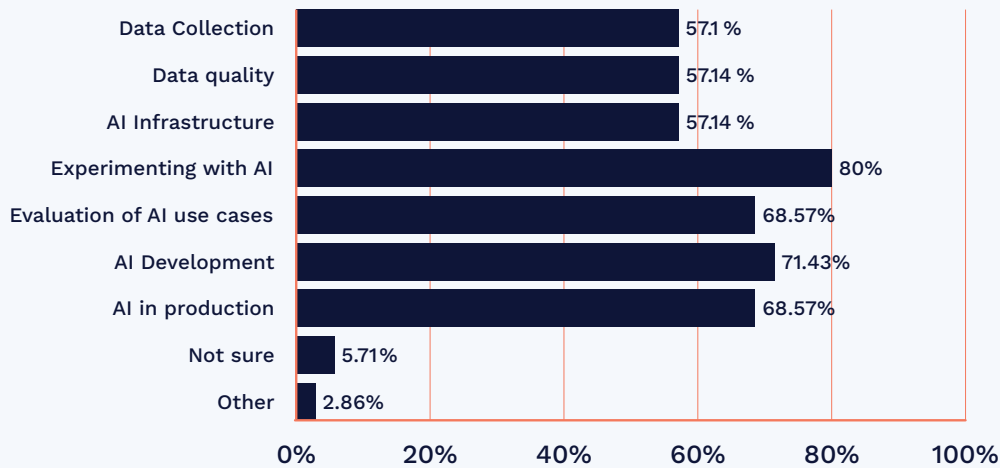


Figure 16. Which AI development initiatives are you investing in financially during the next 12 months?

Investing in AI talent and management

In our previous report, recruiting more AI talent was the main investment subject in terms of talent and management activities, with 47% of respondents reporting this as something they are investing in. Based on our current survey, this has been

largely surpassed by investing in training and competence development, which 80% of respondents report they will be investing in, compared with 60% for recruiting more AI talent. In the previous report, only 25% of respondents said they were investing in training and competence development.

Investing in AI strategy went from 29% in the previous report to 48% in this current report (Figure 16). C-level representation was also added as an investment subject under talent and management. Approximately 28% of respondents report they will be investing in this.

Given the breakneck speed of AI technology development, it is encouraging to see that such a big portion of respondents are investing in training and competence development. Without sufficient internal knowledge and understanding of AI technologies, it becomes very challenging to adopt AI. Companies and organizations that lack

internal understanding run the risks of missing out on opportunities or investing in the wrong opportunities, potentially causing them to lag behind the competition.

A greater understanding of AI technologies also helps in planning the organization's AI strategies, identifying high potential business hotspots for AI, and in choosing the right approach for getting access to the right AI talent.

Investing in AI oversight activities

The third and final aspect of AI investments covered relates to AI oversight activities. With Europe and other regions scrambling to regulate AI,

Silo Expert insight:

” AI is practically an extension to conventional software. The development and use of trustworthy AI requires a foundational understanding of software development but also of data processing and machine learning. The AI landscape will continue to evolve a lot in the foreseeable future, which underscores the need for continuous talent development. Recruitment and talent partnering are probably both needed, given the high demand for senior talent required to guide less-experienced professionals. Significant investment into talent development of both seniors and juniors is necessary along with recruiting and outsourcing.

– Jukka Remes, Head of Expert Development and Community, Silo AI



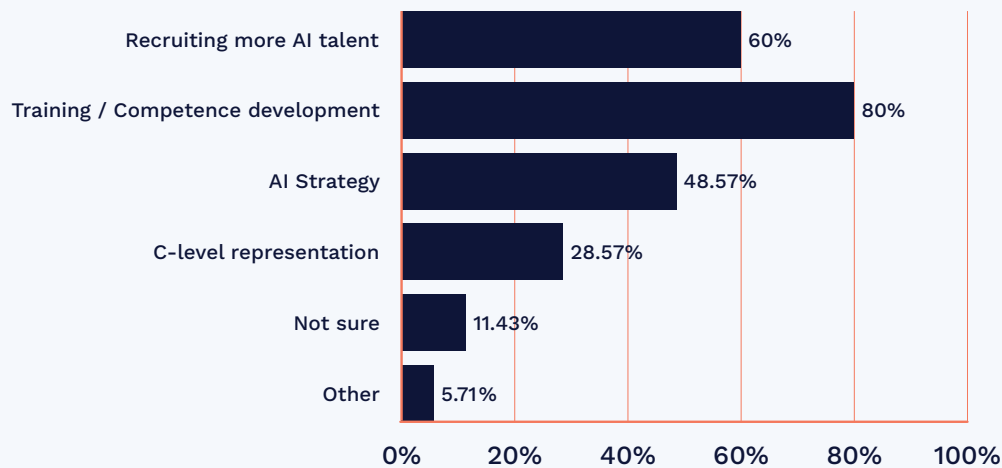


Figure 17. Which AI talent and management activities are you investing in financially during the next 12 months?

and ethical considerations in terms of, for instance, biases in AI models, this topic deserves attention.

Compliance with regulation is the most common AI oversight-related investment priority for companies and organizations, with 54% of respondents reporting they will invest in it. Management guardrails and adapting to a data-driven corporate culture comes in second place at 40%. 28.5% of respondents report they will be investing in quality assurance.

It is worth noting that 25% of respondents report that they are not sure what they will be investing in in terms of oversight activities (Figure 18) AI regulation has been one of the hottest topics of discussion in 2023. While many actors have shown some concern regarding the implications of the legal frameworks they must comply with, the fact that no definitive rules and guidance yet exist has created uncertainty in the market. The European Union's AI Act – the central

rulebook for organizations throughout the value chain in Europe – remains in a convoluted state despite recent steps towards final approval in early 2024. That will start the clock on companies and organizations to become compliant. However, it will also open a window of opportunity for early movers. Companies can gain a commercial advantage over laggards by concluding financial, technical, and procedural compliance investments early.

When it comes to AI Quality Assurance, the data-driven nature of AI adds new complexity. While assessing probabilistic AI behavior in itself is not straightforward, there are often also tradeoffs that can be made between AI, software, and other system components to balance robustness, operational simplicity, and raw performance. Therefore the solution isn't necessarily just tacking on new responsibilities to existing QA experts, but also reconsidering the driving principles of QA.

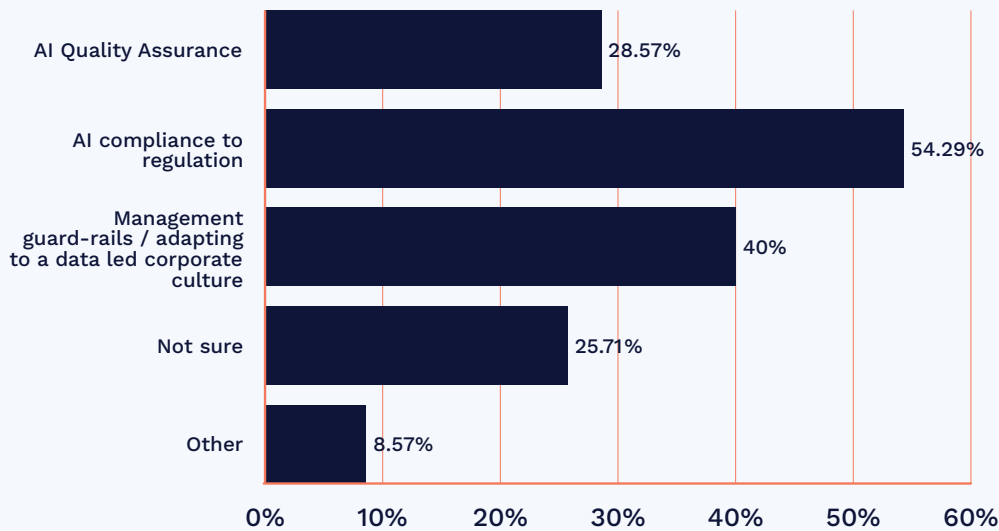


Figure 18. Which AI oversight activities are you investing in financially during the next 12 months?

Companies can gain a commercial advantage over laggards by concluding financial, technical, and procedural compliance investments early



Expert Interview

WITH:
PEKKA MANNINEN /
DIRECTOR OF
SCIENCE AND
TECHNOLOGY, CSC



FINLAND RANKS AS THE 4TH country globally in terms of government AI readiness. Much of this success is due to institutions such as CSC. CSC – IT Center for Science is a Finnish center of expertise in information technology owned by the Finnish state and higher education institutions. Founded in 1971, this is the institution that in 1988 connected Finland to the internet. They provide internationally high-quality ICT expert services for higher education institutions, research institutes, culture, public administration and enterprises. CSC is also home to Lumi, Europe's biggest and one of the greenest supercomputers in the world. *Pekka Manninen*, Director of Science and Technology at CSC, shared his thoughts on AI infrastructure with us.

What is AI infrastructure and how do you determine what kind of infrastructure is needed?

PEKKA MANNINEN: AI infrastructure refers to the different types of tools and resources used to develop and run different types of AI models as part of products, services or processes. Examples are

for instance on-premise hardware, private clouds, commercial cloud services, publicly-funded computing infrastructure such as supercomputers, proprietary data sets and how they are organized, as well as commercial and private development tools.

What a certain company actually needs depends on the type of AI technologies they are deploying, and what type of problems they are solving. Some things that we refer to as AI are actually quite simple and require a simple platform and infrastructure. There are cases that need more capacities, and for them cloud services and/or special on-premise hardware solutions are needed. The latter, on the other hand, requires much more resources both in terms of investment and in terms of knowledge.

Can you give some examples of when these different options might make sense?

PEKKA MANNINEN: The key issue here is intellectual property. Not everybody needs to build generative AI from scratch. For some companies, the best option is to use different types of com-

mercial tools and cloud services.

In other cases, publicly-funded computing infrastructure such as ours is a good option. Our institute is funded by taxpayers, and driven by national science policies, or EU policies. Our mission is to further human knowledge. We have to be transparent and have processes in place through which something can be returned to the community as an open IP. A good example of this for the corporate world is providing the computational resources for the foundation model part of large language models. Training the LLMs is where you have the greatest need for computing.

In that sense, not everything is in the hands of the Googles and Microsofts of the world. I think we may be able to provide an alternative approach here. Companies that need large language models can use foundation models that have been trained using publicly-funded resources, and fine-tune their own AI on top of it. The open-source foundation models add to the transparency of the tools and democratize access to these new technologies.

In terms of investing in on-premise hardware, if you have a big budget and you have the capabilities, then it could make sense. However, building and maintaining a supercomputer is not just a budgetary question, it's also non-trivial to operate and requires a lot of competent staff and a special facility for it.

Among many things, AI infrastructure enables fine-tuning of large language

models. Why is fine-tuning of models for specific use cases or verticals needed?

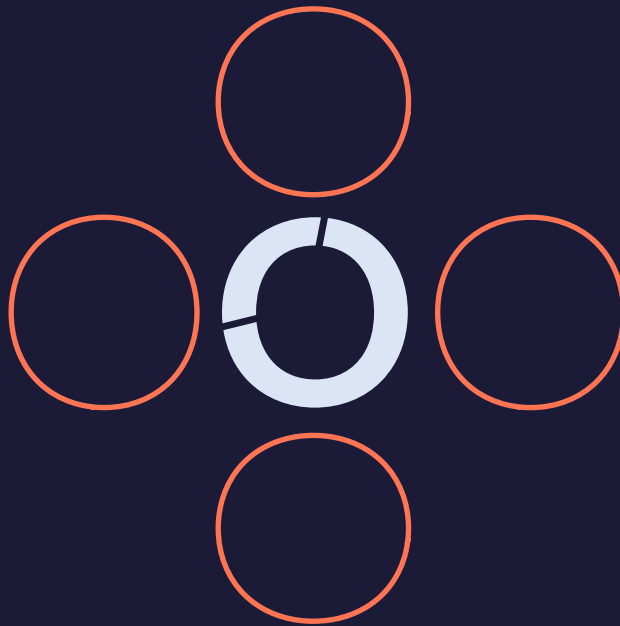
PEKKA MANNINEN: Even if you take the largest foundational models out there, making inferences from them is different from talking to ChatGPT. The models know the language but lack the information and instructions. Developers need to build up the knowledge component. That is where you start to see benefits and can differentiate between just having a rule set and some kind of neural network that understands the language. This is crucial for differentiating your products from your competitors' products.

Speaking of use cases, how can a company determine which use cases for AI are worth pursuing?

PEKKA MANNINEN: This is outside of my role as a supercomputer facility representative, but really it depends on the business. Use cases should be evaluated from the perspective of the business; understanding your market, your customers, your products, and your team's strengths. This, and the digital readiness of your company. There are no shortcuts for these. Whatever shiny new AI technology comes along, your focus should be your business. It is vital to understand which AI technologies will help you reach your goals, and which might just be distracting your focus.



Our Key Takeaways



- Data Collection and Data Quality are the foundations of a data-driven organization and both therefore require investments.
- Having sufficient internal knowledge and understanding of AI technologies will help in making wise investments into AI and staying ahead of competition.
- The EU AI Act will likely be approved in the spring of 2024. That will open a window of opportunity for early movers. A commercial advantage over laggards can be gained by concluding financial, technical, and procedural compliance investments early.

04

AI Talent



Companies are still investing in recruiting more AI talent. At the same time, more and more companies are investing in training and competence development.

With the continued high demand for AI talent, experts have plenty to choose from on the job market. However, companies need to work to retain new hires, as well as to keep talent interested and motivated.

- Only a small fraction of companies report not planning to recruit new AI talent.
- The most sought after professionals are data scientists, data engineers, and machine learning engineers.
- The need for candidates with a combination of both AI skills and domain specific knowledge is starting to become increasingly evident.

TALENT IS A CORE COMPONENT OF discussions about AI. This has already been addressed to some degree in the previous two sections. This section explores what type of talent companies and organizations are looking for, and how much.

In this section, it's worth keeping in mind that definitions for job titles are not uniform and respondents might refer to differing roles when answering what they're looking to hire. Job titles can vary widely in meaning across different organizations due to factors such as evolving responsibilities, company size, industry, technology stack, cross-functional collaboration, organizational culture, and educational background.

Recruiting plans

The majority of respondents are looking to recruit 1-5 or 6-20 new col

leagues within the field of AI during the next 12 months. While these two options make up more than 50% of respondents, it is worth noting that 29% answered either "not sure" or "none" (Figure 19).

In terms of what kind of profiles companies and organizations are looking for, data scientists, machine learning engineers, and data engineers top the list. 40% are planning to recruit system architects and 23% are looking for product owners. Only 20% are looking to recruit AI system QA engineers (Figure 20). Under the category for "other", respondents reported they are looking for people with a combination of technical talent and domain knowledge, and AI advisors as well as strategists.

Silo Expert insight:

” The skills required in an AI project depend on at which stage the project is. At the beginning it's important to have experts that can scope the project well, and at the later stages more technical expertise is required. For this reason it's important to have diversity in the project team and to utilize everyone's strengths to get the best outcomes.

– Sara Tähtinen, Senior AI Scientist, Silo AI



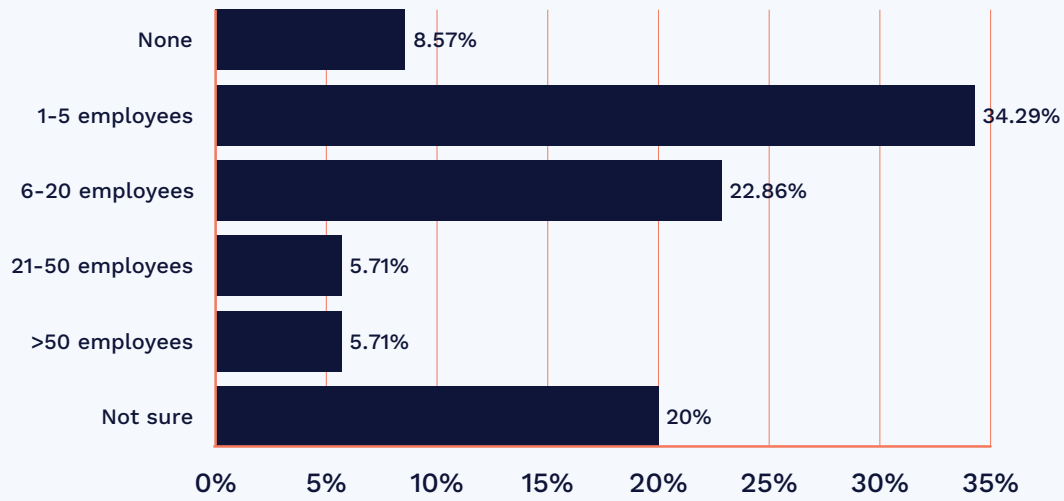


Figure 19. How much new AI related talent is your organization recruiting in the next 12 months?

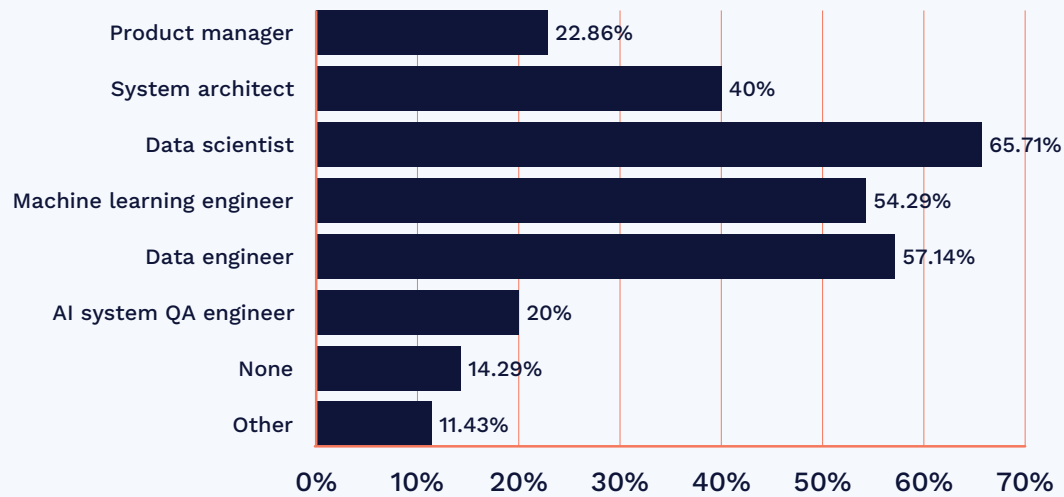


Figure 20. What kind of talent related to AI are you looking to recruit?

With AI becoming increasingly ubiquitous and pervasive, the talent market is becoming increasingly competitive. This in turn reinforces the need to be proactive in talent pipelining by building and maintaining a network of talent, while keeping up with changing needs caused by rapidly developing technologies.

Adding to the complexity of the acquisition of AI talent, is the need to balance both technical skills and domain expertise. Without domain expertise, AI professionals may struggle to understand the nuances and intricacies of the problems they are trying to solve. Domain knowledge allows them to identify relevant variables, interpret results, and make informed decisions. Domain expertise is also needed for effective communication. AI professionals need to communicate effectively with domain

experts, stakeholders, and end-users. A solid understanding of the domain helps bridge the communication gap between technical and non-technical teams. While technical skills are essential for building and deploying AI models, domain expertise enhances the ability to apply those skills effectively in specific contexts.

While many AI professionals are proficient in developing models, there's a gap in skills related to deploying and integrating these models into real-world systems. This includes knowledge of production environments, scalability, and system integration. In this regard it can be beneficial to keep in mind that not everything needs to be done in-house. As long as there is proficient understanding of technologies and objectives, external expertise can also be deployed.

While technical skills are essential for building and deploying AI models, domain expertise enhances the ability to apply those skills effectively in specific contexts.



Expert Interview

WITH:
MARTIN SVENSSON /
MANAGING
DIRECTOR, AI
SWEDEN



AI SWEDEN IS A NATIONAL center for applied AI that brings together more than 120 partners across the public and private sectors, as well as academia. AI Sweden is funded by the Swedish government and its partners. AI Sweden generates tools and resources to accelerate the use of AI for the benefit of Swedish society and competitiveness. We sat down with the Managing Director of AI Sweden, *Martin Svensson*, to talk about AI talent, and he shared very insightful views on how to attract and retain talent, as well as where to focus development efforts.

What competencies are valued when building successful AI teams or AI companies?

MARTIN SVENSSON: I believe that successful adoption of AI starts with the leadership, at a level where there is a solid understanding of the big picture; the business objectives and the resources needed. That way there is a strong motivation and commitment to take AI to production. For the talent side, there is a need for both domain specific knowledge and AI competencies.

With the interdisciplinary nature of AI, how important is it for professionals to have a combination of technical expertise and domain specific knowledge?

MARTIN SVENSSON: It depends on the context and the company size, but I would say that such a combination will strengthen the possibilities to do something meaningful. In some companies this is achieved by creating teams consisting of people with domain-specific expertise and people with technical expertise. I've also seen good examples among our partners where AI expertise is centralized and can serve, or work together with, domain experts from various departments. Regardless of the organizational structure it is important that AI experts and domain experts have a shared language and that they are comfortable using the same modern tools. In many cases this might require domain experts to upskill and update their use of tools.

In today's competitive landscape, what strategies are most effective in attracting top AI talent?

MARTIN SVENSSON: We see a clear trend among talent to move primarily to the private sector, where real world data and necessary resources are available. I think the reason is that many experts want to take on interesting challenges and are motivated by seeing solutions being deployed and generating real value. Talent also wants to be assured that their management is really committed. Value derived from AI doesn't appear overnight. They want to feel that their work is important and that there is a commitment to sustain it for some time. Finally, great people want to work with other great people, so talent attracts talent.

What are the most significant skill gaps in the current AI workforce?

MARTIN SVENSSON: In terms of organizations, I think it's important that leaders have a decent understanding of AI, to better understand its potential. This is still lacking to some extent. Once this is in place the next gap is the ability to break down relevant use cases in order to understand and quantify the value of using AI. Once that is in place you can see what is needed, do you need more data scientists, more people on the legal side, or to build relationships with smaller companies.

Do you see any gaps on the AI talent side?

MARTIN SVENSSON: Well, looking at people coming into the workforce, it's clear that we need to add AI skills across domains. The type of AI skills will vary, but relates largely to what tools are currently used. Large organizations will quickly realize that the domain knowledge is there, but the abilities to use modern tools are not, because uni-

versities have not added this to their curriculums yet. The issue is smallest on the engineering side. It's not a big jump for engineers to use off-the-shelf libraries and models. But there will be an ever increasing need for dialogue and discussion between AI experts and domain experts, or management, and for that to be successful there is a need for upskilling on the domain expert and management side. They need to also understand data and machine learning to a greater extent.

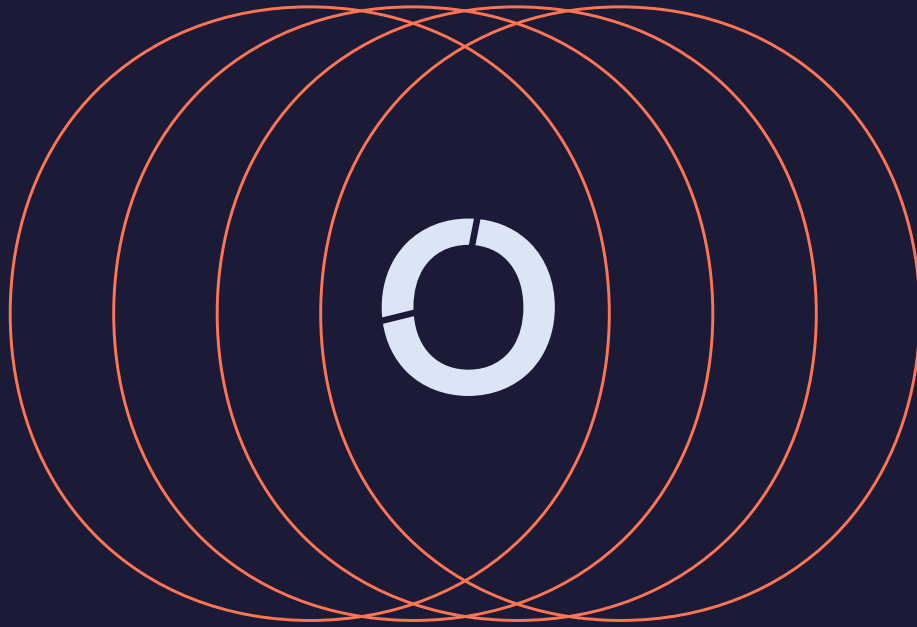
Well, looking at people coming into the workforce, it's clear that we need to add AI skills across domains. The type of AI skills will vary, but relates largely to what tools are currently used.

What are the current and upcoming trends in AI talent acquisition and talent development that the industry should be prepared for?

MARTIN SVENSSON: With more leaders starting to understand the potential of AI, there will likely be a shortage of talent. I think it's already quite obvious in some cases and in some geographies, but maybe less compared to what I expected a few years back. I think we need to prepare for a period when certain skills and talents will cost more than what we expect. I think we also need to collectively, within our nations, address the need for re-skilling and upskilling.



Our Key Takeaways



- Companies need to balance having well-maintained talent networks and talent pipelines with the changing needs caused by rapidly developing technologies.
- Successful teams have a combination of technical expertise and domain expertise, where all share the same language and are able to communicate effectively.
- Not everything needs to be done in-house. External expertise can be used to complement in-house teams.

05

Trends over time

47



This is the third edition of the Nordic State of AI report. While the report and the survey questions it is based on have evolved over time, interesting observations can be made by comparing the three reports to each other.

- When looking at which AI technologies companies use, the number of options have doubled from the first to the third report, reflecting the evolution, adoption and maturity of different AI technologies.
- The most common answer for where AI is used has remained the same over the years; as part of a product or service. This year using AI as part of production of manufacturing processes has started to catch up.
- For the first time, investing in training and competence development surpasses investing in recruiting new AI talent.

THIS IS THE THIRD NORDIC STATE of AI report. This section explores differences and similarities between this and previous reports.

AI technologies from 2021 to today

When comparing results from this report with previous reports several interesting trends and developments emerge. Looking at which AI technologies companies and organizations use, it is noteworthy that even the answer options have increased from 7 in 2021, to 10 in 2022, and to 14 in

this current report. This reflects the development of certain technologies that have become more broadly available and adopted over time. It also illustrates how different technologies are often grouped together under the mysterious “AI”-label until they become more widely adopted for a specific purpose and become a specific, named technology.

Another striking observation is that when a new option has been added, reflecting the current state of AI at the time of the report, the new option has been by far the most popu-

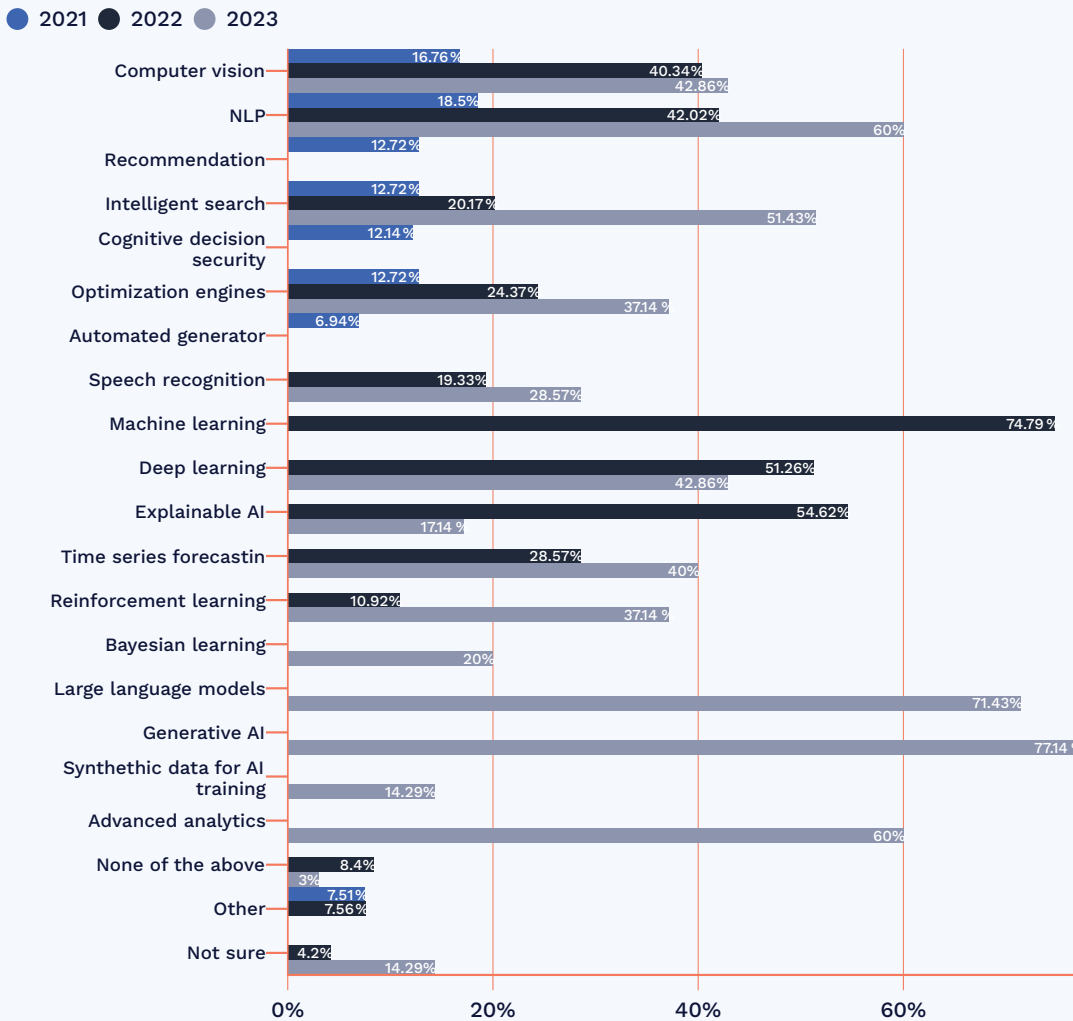


Figure 21. Which AI technologies do you use?



lar one. In the 2022 report, machine learning was introduced as an option and more than 70% of respondents reported using machine learning. In the current report, generative AI and large language models were introduced, both reaching over 70% adoption rates among respondents.

AI technologies are currently being used, there has been an increase in options regarding where these AI technologies are being used. As technologies mature, so does the understanding of different use cases for said technologies.

Where is AI used?

As with the question about which

While “using AI as part of a product or service” has remained the top option over the years, “using AI as part of production or manufacturing” has

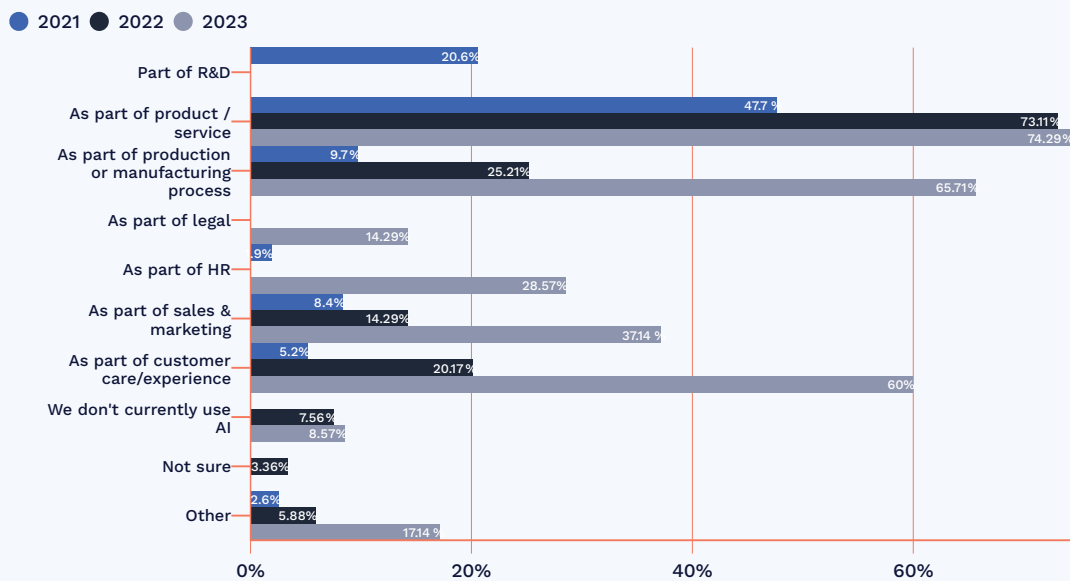


Figure 22. Where do you use AI technologies within your organization?

almost caught up. Naturally this is at least partly due to the respondents in this third edition of the report representing more traditional industries.

interesting to note that in terms of internal versus external tools and resources for developing AI, the answers have gone from a clear majority using external resources in 2021, to a clear majority using internal resources in 2022, to a fairly even distribution between the two in the most recent study.

The increase in use of AI as part of sales and marketing as well as customer experience is a direct result of the onset of generative AI and large language models.

Development toolbox

While this question has been refined since it was first asked in 2021, it is

With the maturing of different AI technologies there is an ever growing supply of off-the-shelf products and components to accelerate AI devel-

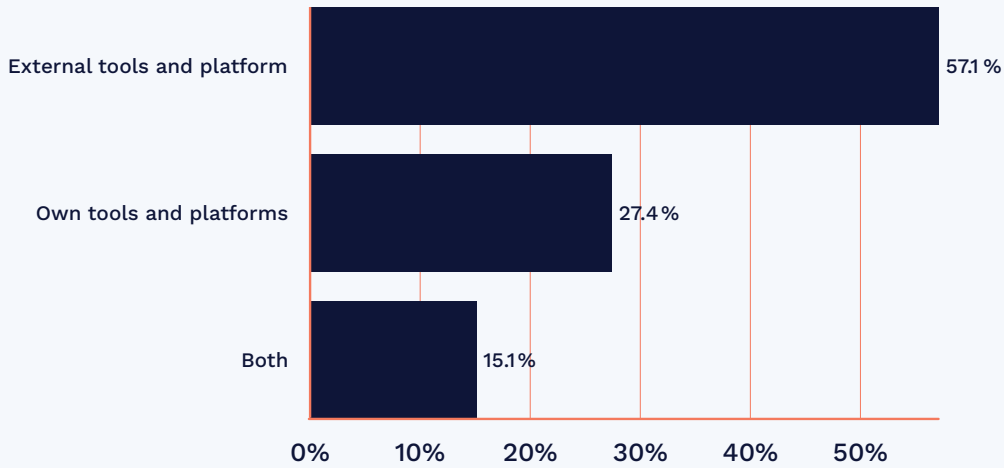


Figure 23. Which resources does your organization use to develop AI? Answers from 2021.

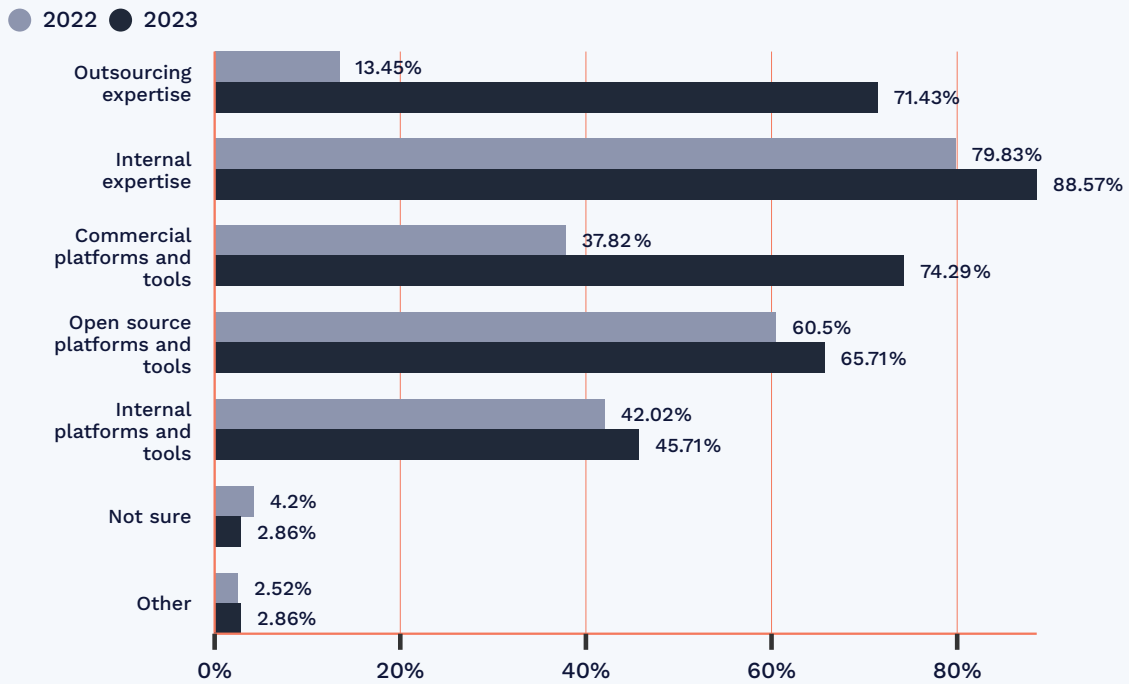


Figure 24. Which resources does your organization use to develop AI? Answers from 2022 & 2023.

opment and adoption. The question moving forward, in addition to what resources to use, is when and where to use which resources. Our opinion is that the closer to your core competitive edge you are looking to deploy AI, the greater the incentive to build custom AI.

Computation of AI models

Connected with the previous question of which resources are used to develop AI, another important factor is the securing of computational resources for AI models. A shift is visible from the 2022 report when the majority of respondents opted for on-premises or private clouds for compute, whereas



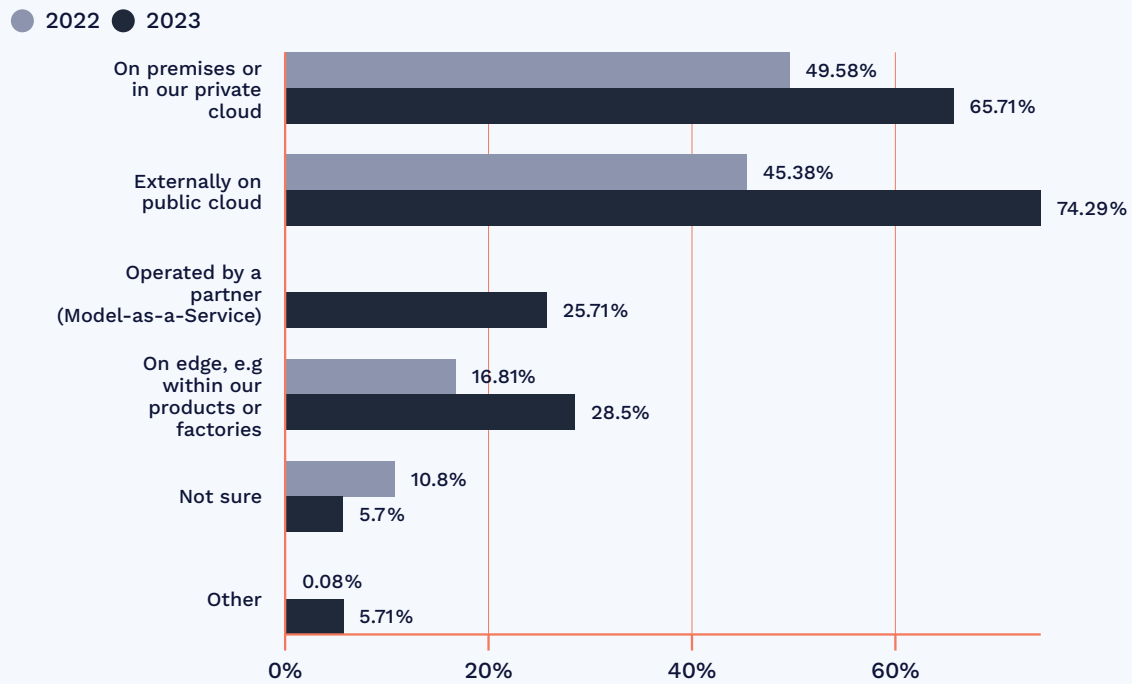


Figure 25. Where does computation of your AI models happen?

the current report shows a slight majority opting for public cloud providers.

Where are the challenges?

The most common challenges in using and scaling AI lie in a lack of resources, whether that be in the form of talent or in the form of time and investment. The second most common challenge throughout the years has been related to data. A lack of shared practices related to data, and just plain lack of sufficient data has been a challenge for many.

With the highly competitive landscape of AI, a lack of talent is likely to be a challenge for many companies and organizations in the years to come as well.

Insufficient investment is another common challenge worth paying attention to, in regards to the competition for talent.

Investing in AI

As AI is rarely a single line-item in the budgets of companies and organizations, the question of where investments will be made has been further broken down into three different categories in this report. This provides a more granular understanding. Experimenting with AI is still the most common focus for investments. Recruiting more AI talent also continues as one of the top options, while this year it is surpassed by investments into training and competence development.

New for this report is the investment category of AI compliance and oversight activities. Within this category, compliance to regulation is the most common option. This comes as no surprise as Europe along with other regions is developing AI regulations. When it comes to investments, it's worth noting that, regardless of being

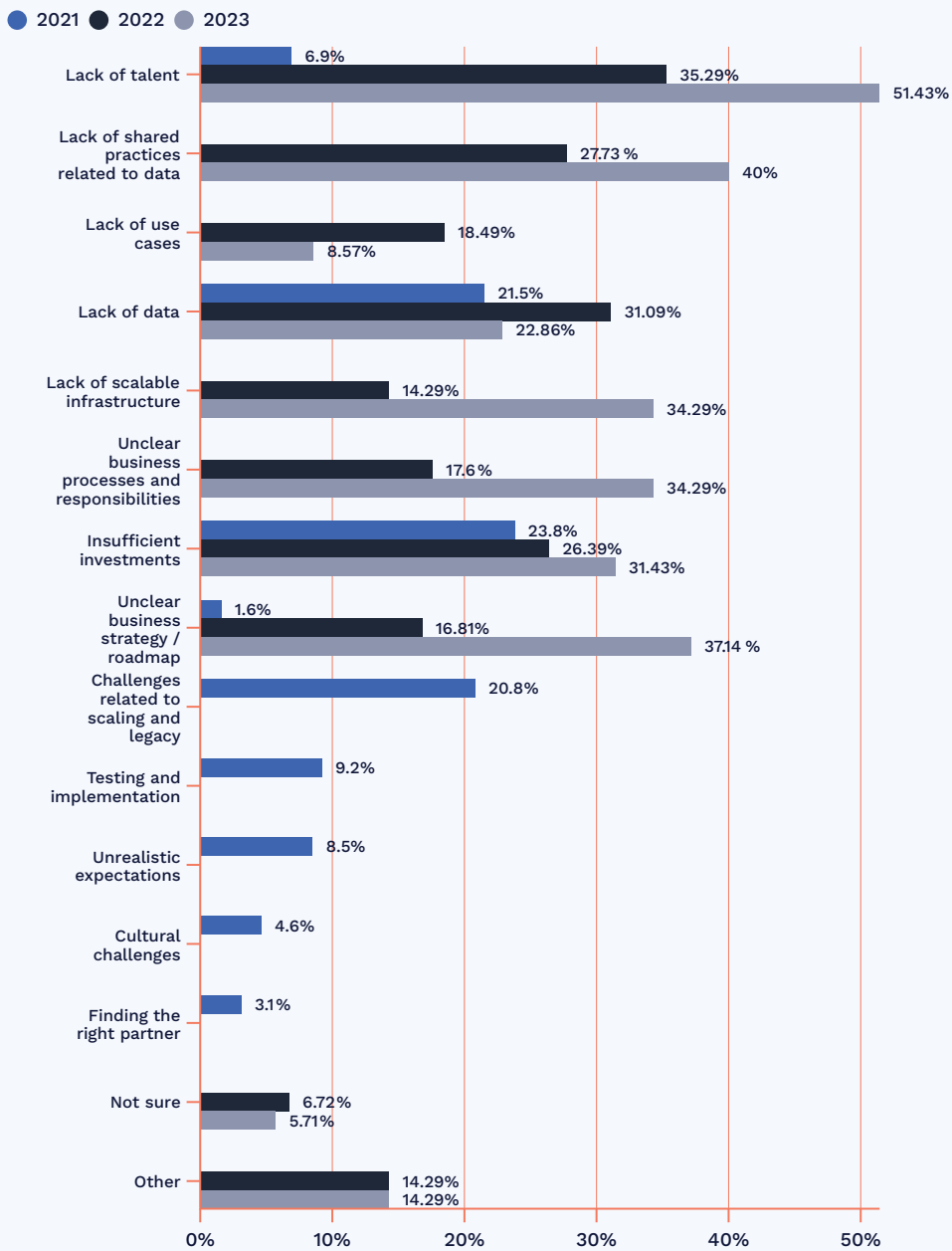


Figure 26. What are your biggest challenges in scaling the use of AI across the entire company?

asked about their plans for the coming 6 or 12 months, respondents in all three reports mostly said that they intended to recruit 1-5 people with AI competencies. Considering that the

most common challenge for scaling the use of AI throughout a company or organization is lack of talent, this is an interesting figure.



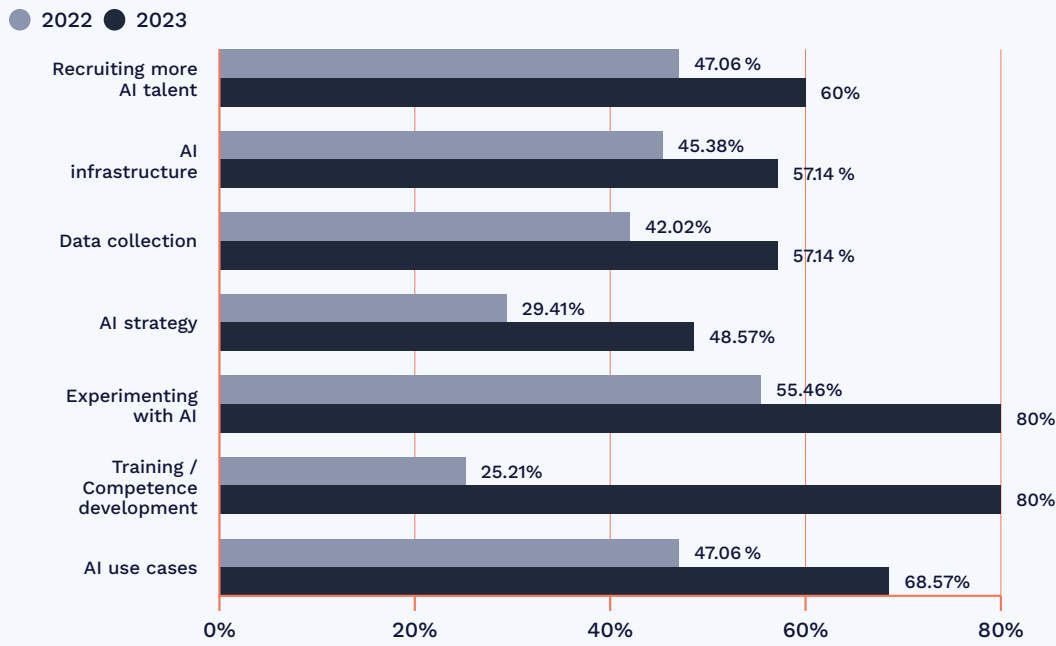


Figure 27. Investments in AI

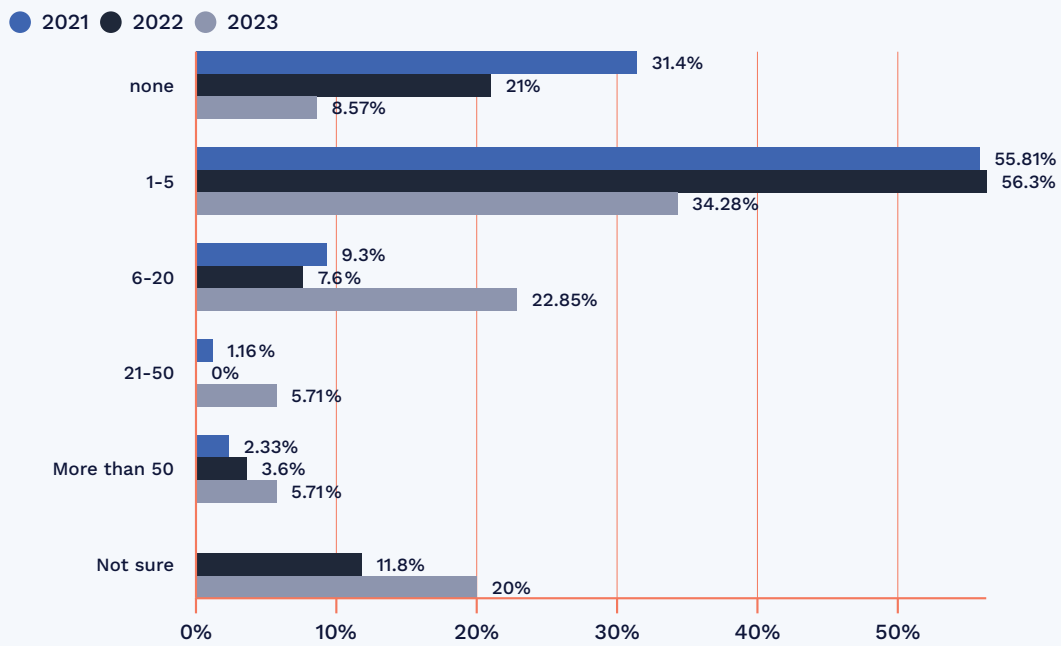
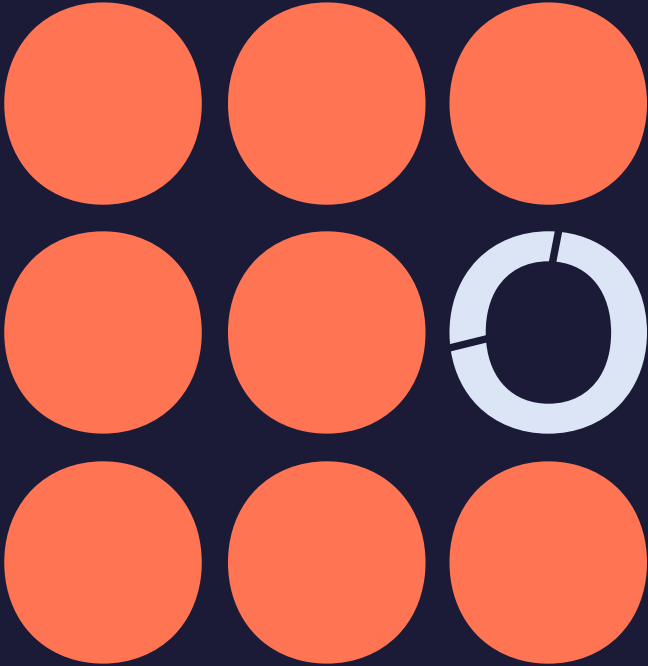


Figure 28. Recruitment of new AI related talent next 6-12 months.

06

A broader view



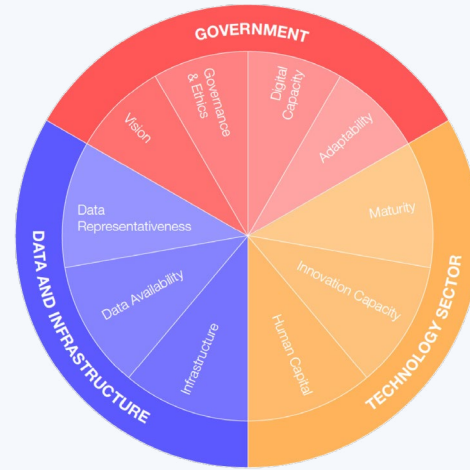
This section briefly shifts the focus from the Nordics to Western Europe and the world at large. The companies and organizations surveyed for this report are industry leaders. What they do affects the Nordic region's standing in a broader way. While Europe and the Nordics lack large high-tech companies, they boast many industry leading companies in various sectors. Their adoption of AI will play a big role in determining Europe's competitiveness on a global scale.

- On the Government AI Readiness Index by Oxford Insights, all of the Nordic countries except Iceland place in the top 15. Finland is the only Nordic country to place in the top 10 with its 4th position.
- Western Europe, with the Nordics included, scores high in the AI Readiness Index in terms of government and data and infrastructure, but lags behind in the technology sector.
- In terms of government AI readiness in Western Europe, Denmark, Finland, Norway and Sweden place in the top 10, with Iceland as 11th

TO GIVE MORE CONTEXT TO THIS report, this section offers a broader view and puts the survey results in the context of larger trends and phenomena in the world in general and Western Europe in particular.

Government AI Readiness

The Government AI Readiness Index is produced annually by Oxford Insights. The index is based on three pillars: Government, Technology Sector, and Data & Infrastructure. These are further divided into 10 dimensions consisting of a total of 39 indicators to produce the index number.



The Pillars of the Government AI Readiness Index. Source: Oxford Insights, Government AI Readiness Index 2023

On a global scale, all of the Nordic countries except Iceland are rated among the top 20 countries in Oxford Insights’ 2023 report. Iceland comes in 21st in the report, which is a remarkable improvement to their 45th place in the 2022 report. Of the Nordic countries, Finland ranks the highest with a 4th position in both 2022 and 2023.

Among Western European countries, Finland ranks 2nd, with Denmark, Norway and Sweden placing in 6th, 7th, and 8th position respectively, and Iceland as 11th. As a region, Western Europe’s average score is the second highest on a global level. Only North America, a region consisting of only two countries, the United States and Canada, which both score high, have a higher average score than Western Europe. Excluding the micro-

Government AI Readiness Index	2022	2023
Denmark	11	11
Finland	4	4
Iceland	45	21
Norway	12	13
Sweden	13	14

Table 2.



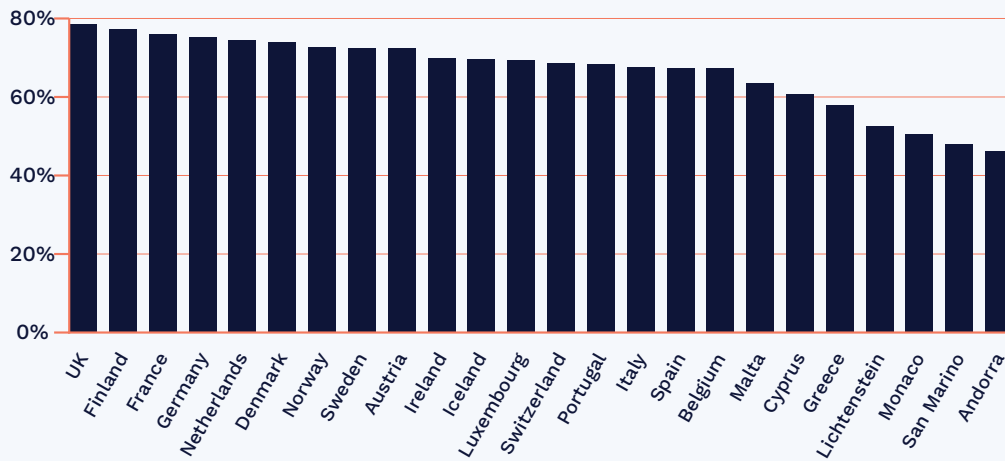


Figure 29. Western Europe, Government AI readiness index 2023. Source: Oxford Insights, Government AI Readiness Index 2023

states, Western European countries exhibit fairly even scores. This can be partly attributed to regional collaboration, with regulatory and funding initiatives by the European Union.

AI regulation

One of the most important events related to AI readiness in Western Europe during the past year is the ongoing development of the European Union's AI Act. The AI Act proposes a risk-based approach to the regulation of AI, imposing legal obligations proportional to the level of risk associated with AI systems. The regulation forms limits and conditions which will provide guidance for EU member states in their efforts to integrate AI within their national governments.

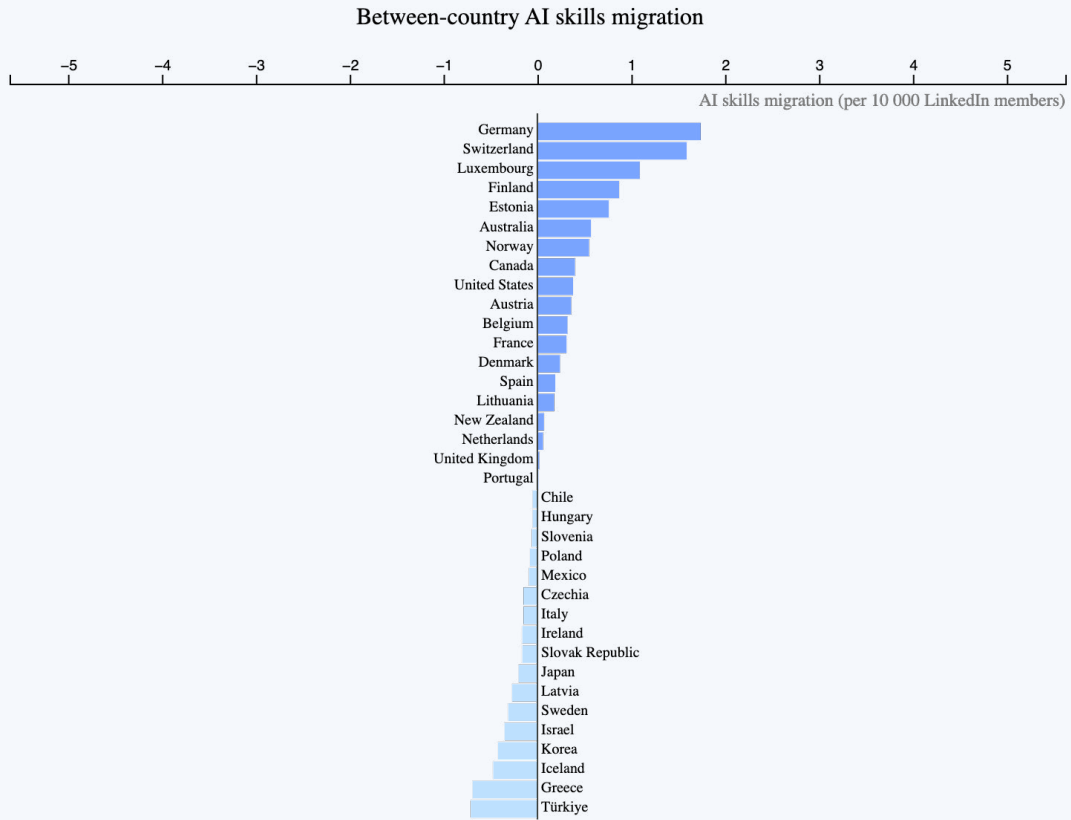
The Western European technology sector

While Western European countries score fairly evenly over the three different pillars of the Government AI Readiness Index, the Technology Sector pillar exhibits the lowest performance. Initiatives designed to

improve AI infrastructure as well as education and research are being initiated throughout the region. AI infrastructure and talent are the key components of competitiveness in the field of AI.

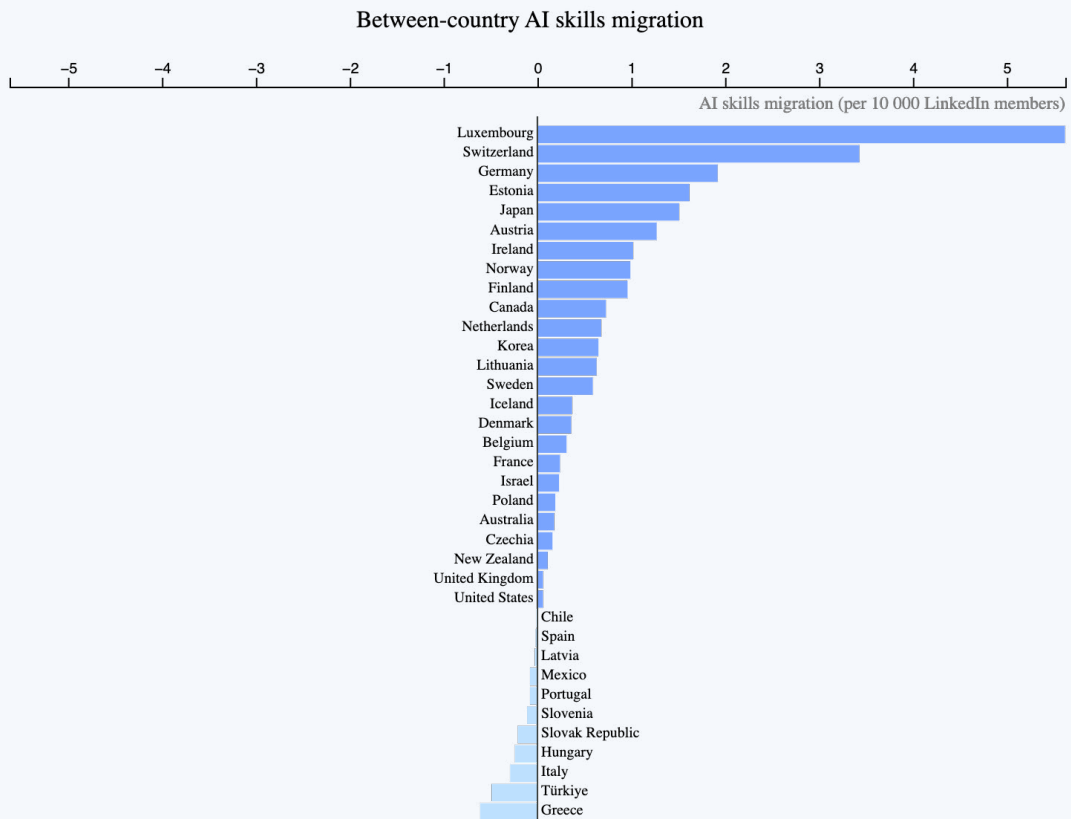
The OECD has been gathering data showing AI skills migration between OECD countries. Below are migration trends from 2019 to 2022. For the most part the Nordic countries have managed to attract more talent.

The OECD also collects data on AI skill penetration in different industries, as reported by LinkedIn users. Looking at the manufacturing industry, Denmark has the highest AI skill penetration of the Nordic countries. Finland, which scored high on the Government AI Readiness Index, has the lowest AI skill penetration of the Nordic countries in the manufacturing industry. Comparing data from different sources is important for gaining a well-rounded understanding of the state of AI. As we have mentioned earlier, there is no one definition for what AI is, and different AI tech-



Source: OECD.AI (2023), visualisations powered by JSI using data from LinkedIn, accessed on 19/12/2023, www.oecd.ai

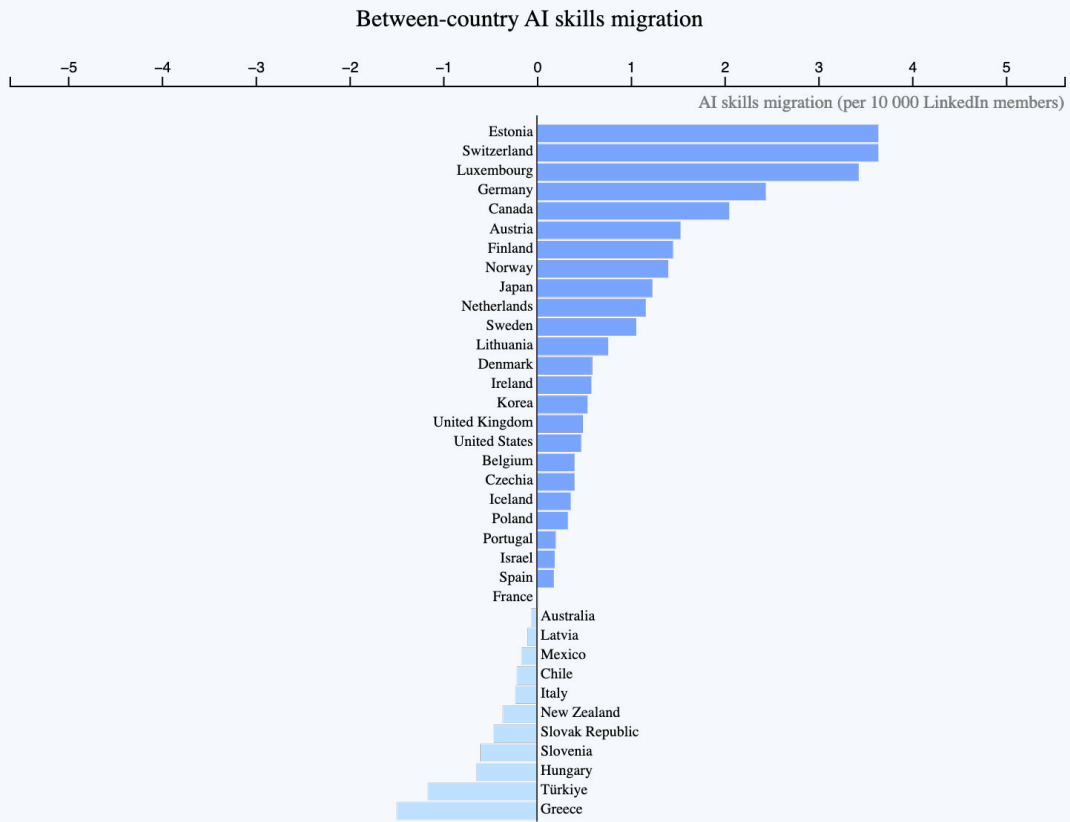
Figure 30. Between-country AI Skills migration 2019.



Source: OECD.AI (2023), visualisations powered by JSI using data from LinkedIn, accessed on 19/12/2023, www.oecd.ai

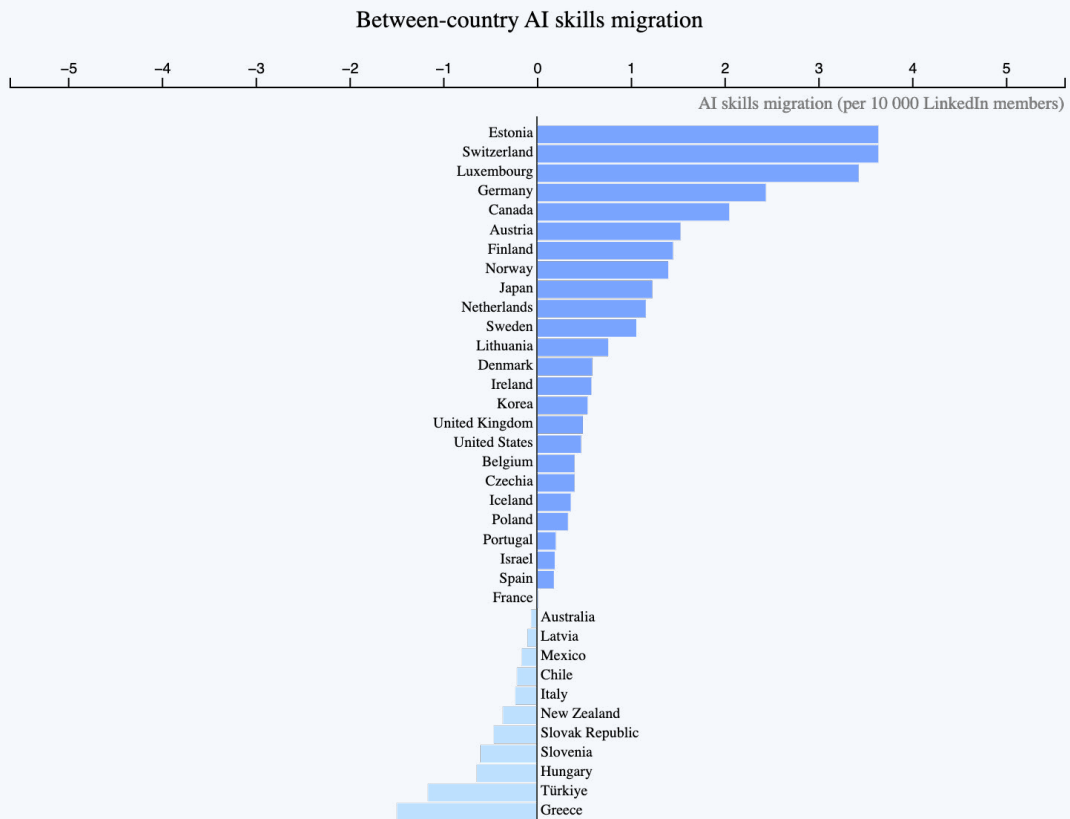
Figure 31. Between-country AI Skills migration 2020.





Source: OECD.AI (2023), visualisations powered by JSI using data from LinkedIn, accessed on 19/12/2023, www.oecd.ai

Figure 32. Between-country AI Skills migration 2021.



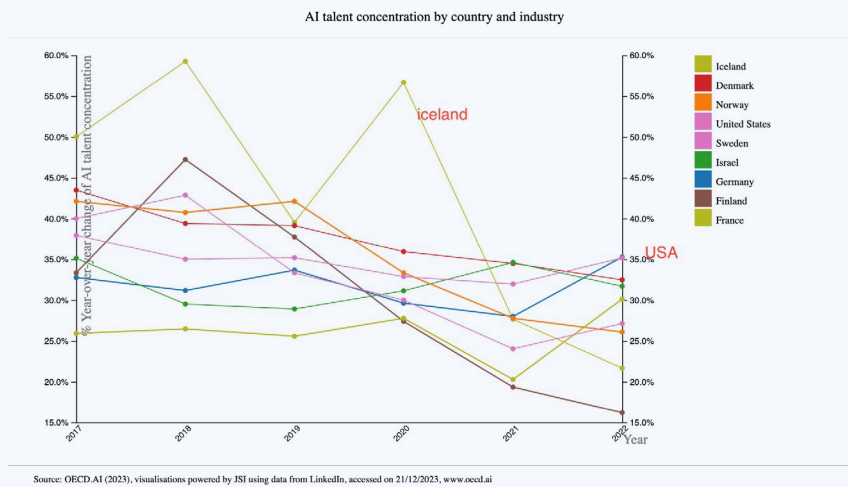
Source: OECD.AI (2023), visualisations powered by JSI using data from LinkedIn, accessed on 19/12/2023, www.oecd.ai

Figure 33. Between-country AI Skills migration 2022.

nologies are known under different names, making accurate measurements difficult.

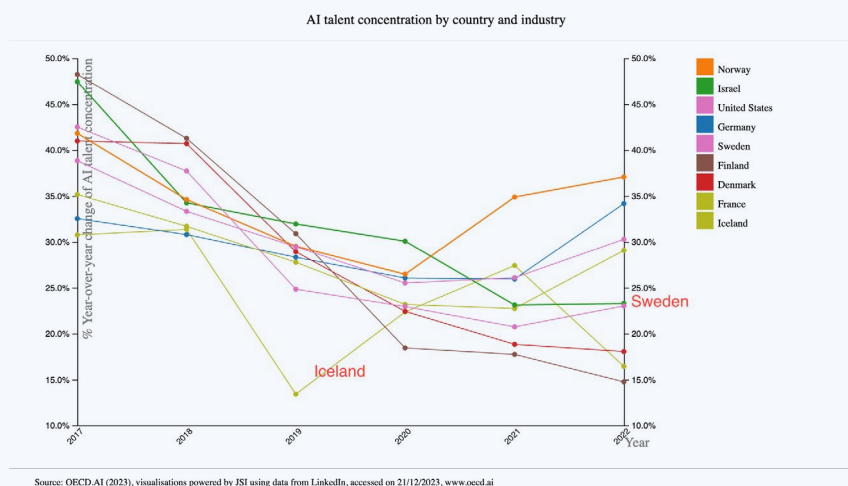
Looking at the AI skill penetration for the technology, information & media industry, Finland and Denmark have the lowest penetration among the Nordic countries, while Norway and Iceland have the highest, leaving Sweden in the middle. These measurements range from 2017 to 2022.

In 2017, the world witnessed the peak of the previous hype wave around AI. As all countries in this graph have come down a bit in terms of AI skills penetration from 2017 to 2022, one might speculate that the previous wave of hype might have impacted which keywords were popular among LinkedIn users in 2017 compared with late 2022, before generative AI started to make big waves.



Source: OECD AI (2023), visualisations powered by JSI using data from LinkedIn, accessed on 21/12/2023, www.oecd.ai

Figure 34. AI talent concentration by country and industry.



Source: OECD AI (2023), visualisations powered by JSI using data from LinkedIn, accessed on 21/12/2023, www.oecd.ai

Figure 35. AI talent concentration by country and industry.



THOMAS MACAULAY, Senior Reporter at The Next Web, shares his insights on why recent developments within the AI scene in Europe has him excited, and what we might see next.

In my seven years of covering AI, I've never before felt such excitement about the field. The tipping point arrived when OpenAI launched ChatGPT in November 2022. Suddenly, artificial intelligence was everywhere. It had captured the public's imagination, the wallets of investors, and the attention of businesses from every sector. In 2024, can the hype become reality?

Opinions are divided — but there are broad points of agreement. One is that artificial intelligence will increasingly be embedded in our daily lives. Another is that generative AI will continue expanding across digital surfaces. A third is that transformative new rules are looming.

In each of these areas, Europe is in a promising position. As Oxford Insights' AI Readiness Index shows, Nordic countries are particularly well placed to take advantage. But there are auspicious signs throughout Western Europe.

Across the region, businesses are adding artificial intelligence to all manner of products, from Deutsche Bahn's predictive maintenance for trains to AXA Switzerland's fraud detection software.

In the generative AI space, meanwhile, a new wave of European leaders is emerging. The recent megarounds raised by Germany's Aleph Alpha and France's Mistral AI added

two new powerhouses. Although Silicon Valley still provides the most fertile ground for startups, the terrain in Europe is also proving fruitful.

Then there are those new rules, which the EU is pioneering. When the AI Act is finalized, the regulation will become the world's first comprehensive law on artificial intelligence. Organizations that react intelligently are poised to profit from the regulation's new requirements.

Nonetheless, there are perilous threats on the horizon. One involves the enormous expectations around AI. If the field doesn't deliver on the hype, experts fear that we will enter another "AI winter" of declining interest and investment.

Their concerns stem from stalling progress, haphazard implementations, and unrealistic hopes. With isolated experiments the *modus operandi* for many businesses, scaling remains a challenge. Boardrooms want more proof that their investments will increase the bottom line. Companies are also struggling to plug the AI skills gap.

These are pressing challenges, but they're not insurmountable. AI deployments are escaping siloes, profitable products are surfacing, and the talent pipeline is expanding.

The breathless hype is now evolving into pragmatic applications — and that's when truly powerful use cases emerge.

Conclusion

This report is the third in our line of Nordic State of AI reports. The previous report was published in November of 2022. In the conclusion of that report we stated that: “AI is moving from a period of startup hype into a phase of enterprise implementations, although a big part of AI investments are still geared towards experimenting with AI.”

63

This was shortly before the launch of ChatGPT.

While a new AI hype has come along, this time related to generative AI, enterprise implementations are also increasing. Reading earlier reports gives a good understanding of how fast AI is evolving. This speed is why it is imperative to start working with AI now. The longer you wait, the further ahead the competition will be.

This report has made it abundantly clear that one consequence of the fast pace at which AI is moving, is an ever increasing need for understanding AI. This understanding of AI is not limited to the various AI technologies, but refers to understanding AI’s role as a part of the bigger picture.

This includes infrastructure, availability, quantity and quality of data, computational resources, regulatory requirements, ethical considerations, skills, and how all of these are resourced to meet the company’s or organization’s objectives.

It deserves repeating, AI is a long term investment. We hope the report has provided you with valuable insights to help navigate those investments.





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Methodology

Online Survey

We followed the structure of last year's report, but this year extended the scope of our survey. In total, we approached around 300 Nordic companies and organizations and received 53 replies, of which we qualified 35 responses based on them fulfilling at least one of our two criteria:

1. Staff size of at least 1000
2. Annual revenue of at least €50 million

Respondents were either C-level executives (7), VP/Director level (21) or senior data scientists or other senior level employees (7). The respondents filled the survey online. The survey consisted of a total of 28 questions, out of which the first 11 were demographic questions.

Other data

In addition to the data collected through the survey we have used data from Oxford Insights' Government AI Readiness Index, OECD.ai and PwC's "Sizing the Price" report.

Interview methodology

This year we conducted four expert interviews with Nordic thought leaders and AI experts with various backgrounds. Each session was approximately a half-hour-long, semi-structured interview. We asked interviewees to reflect on their experiences with Nordic and local AI ecosystems, providing insights into a specific theme or topic related to AI. Each interviewee was carefully selected to provide the best overview possible of what is happening in the Nordics.

