



Accelerating the energy transition:

How AI empowers the wind industry workforce to achieve more

Table of Contents

03

A decade for action

04

Labour needs are a growing concern

05

Closing the gap with AI and digital technology

06

Elevating the industry with generative AI

08

Generative AI use cases for talent and skills development

10

Generative AI use cases for wind power production

12

Early learnings on generative AI are encouraging

13

Empowering people to achieve more

14

How we win together

A decade for action

The climate emergency is intensifying as global average temperatures continue to rise each year. 2023 was the hottest year ever recorded, with each month in the last half of the year breaking all-time records.¹ 2024 is expected to break records again,² inching the planet towards the 1.5°C limit. Experts agree that to avoid the worst impacts of climate change, we need to reduce emissions by almost half this decade. The data indicates we are not moving fast enough to transition to renewables, and the time to act is now.

But how do world leaders tackle such a crisis? More than 85,000 attendees and government officials came together at the end of 2023 for the COP28 UN Climate Change Conference to discuss how they could accelerate action. In what has been called a historic meeting, nearly 200 countries made explicit agreements to phase out fossil fuels.

Momentum and commitments toward renewables are growing, and the International Energy Agency now predicts that wind- and solar-powered electricity will more than double in the next five years with more investments flowing into clean energy than ever before.³

If this is our decade for action, wind power needs to do its part, fast—as we are all counting on the wind industry to win.



Labour needs are a growing concern

As the wind industry expands to realise its ambitions and meet growing needs, it must also address a fundamental issue: the industry is facing a significant labour shortage. The gap is caused by multiple factors: an aging workforce that's nearing retirement, the ongoing need for reskilling as roles become more digitised, a workforce that isn't growing as fast as the industry, and increasing competition over skilled workers.

At a project level, as companies add more turbines into an increasingly complex and multi-directional energy system, they are drowning in an influx of data flowing into their systems. An average turbine can include 300 sensors, generating up to 200 gigabytes of data

per day. As the volume and complexity of data increases, so does the need for more people with the skills to manage and analyse it. If the industry is to continue growing at the current rate, people are a key factor—and scale will be an ongoing challenge. While the number of turbines may double, the volume of data generated will be exponentially higher.

Based out of Brussels, WindEurope is a trade association that actively promotes wind energy across the continent and has more than 500 members spanning the entire value chain it serves. WindEurope predicts the number of needed jobs will nearly double in size from 2020 to 2030. Its members are concerned that workforce numbers and required skills

may not be achievable, thereby jeopardising environmental goals.

That's why WindEurope started an industry-wide effort to reshape the future of the wind workforce, working to shift perceptions about the wind industry so that young people, professionals, and educators are aware of the many career opportunities in wind energy.

The organization is also hoping these efforts will help fill the people pipeline to enable wind power expansion. Once people are hired, employers need to create strategies for employee reskilling and retention—and to help all workers be more productive.

“The nature of the work itself has changed and now requires more interdisciplinary skills. Workers with those skills are in high demand with fierce competition to recruit them.”

- Peter Enevoldsen, Vice President and Module Owner, Vestas

The wind industry alone will need 515,000 workers by 2030, up from 300,000 today. Of these 515,000 jobs, 360,000 will be direct employment from the wind industry.

Source: WindEurope

Closing the gap with AI and digital technology

Technology can play a major role in helping people and businesses tackle large, complex challenges.

It can't solve all our problems, but it can be a powerful ally. Now more than ever, AI holds the promise to augment human potential by helping workers be more productive. And there's growing evidence that employees who use AI believe these productivity gains are real.⁴ Workers who feel more productive are likely to feel more accomplished, which may in turn contribute to higher levels of employee engagement and job satisfaction.

Microsoft and WindEurope are teaming up to offer new insights and potential solutions into how empowering people and enhancing productivity in the wind industry can take shape and what impact we can make. We believe AI and digital innovation can help people throughout the wind energy industry and across the energy ecosystem—not by reducing jobs or replacing people with technology, but by enhancing human capability.

AI can help amplify environmental, social, and governance (ESG) and sustainability efforts as organizations focus on their own digital maturity through a “twin transition,”⁵ where sustainability and digital transformation goals intersect.

Microsoft has a history of investment in technologies to address environmental sustainability ever since we set our first carbon emission reduction goal in 2009. We'll continue zeroing out our annual emissions, and also go back in time to remove from the atmosphere an equivalent amount of all the carbon the company has emitted either directly or by our electricity consumption since we were founded in 1975.

“For the first time, we have access to AI that is as empowering as it is powerful.”

- Satya Nadella, Chairman and CEO,
Microsoft

At scale, digital technologies could reduce emissions by 20% by 2050

5



Source: World Economic Forum and Accenture⁶

Elevating the industry with generative AI

Before the advent of generative AI*, the wind industry adopted digital technologies to aid in various aspects of its operations, ranging from turbine design to predictive maintenance, remote monitoring of wind farms, collecting and analysing data from sensors, and more. This approach has focused on elevating machine and equipment performance—where AI has played more of a behind-the-scenes role.

With the rise of generative AI, employers can now look to elevate people performance. Generative AI provides us with a copilot where humans are at the center of the experience, accessing powerful technology through a natural language interface.

In the wind industry, we are just scratching the surface of what's possible with generative AI. But we know that in industries where documentation plays a heavy role, large language models can help people quickly access and analyse information that would normally require considerable manual effort. This can help improve decision making and enhance everyday execution—and have a transformative impact on industries that are weighted down with complex

documentation and manual workloads, as the wind energy industry has been for years.

Through the power of natural language, workers can prompt AI systems to access and retrieve information intuitively without having to manually search for it across vast datasets—to create human-like content seamlessly, summarise key themes and insights, even generate software code based on a prompt.

In the critical area of cybersecurity and data security, generative AI can help cybersecurity professionals detect threats before they cause harm and respond in minutes, not hours. It can help defenders catch what other approaches might miss and augment an analyst's work with natural language prompts and simplified reporting. Generative AI can also help train and upskill these workers in a complex and fast-changing domain.

This broad set of capabilities can help enhance functions across an entire organisation—elevating not just individual performance, but a whole industry.

*Generative AI is a type of technology that uses algorithmic models to create new written, visual, and auditory content when given prompts or existing data.

Generative AI offers unique and powerful capabilities



Content generation



Data interpretation



Summarisation



Semantic search

Be more

Creative

Productive

Analytical

Knowledgeable

AI in action

Vestas, a global leader in sustainable energy solutions, is using an AI assistant to help users obtain climate analytics through a free speech conversational interface that interprets the user's request and delivers climatic insights for any use case without the need for programming.

Vestas

Generative AI use cases for talent and skills development

There are two main segments of the wind energy workforce where AI can help drive productivity gains: talent and skills development and wind power production.

Talent management teams are responsible for attracting, engaging, and retaining qualified workers across a wide ecosystem of workers. In the EU, recruiters are struggling with a lack of skilled workers that's driven in part by an aging workforce, and a shortage of younger workers entering the wind and energy industries. Because technology is evolving so rapidly, many roles now require digital competencies and skills most workers aren't receiving in training centers or universities. Add to this complexity the fact that European training certifications aren't universally recognized across countries, and the available talent pool for qualified candidates can be a real challenge. As a result, recruiters can't find the skilled workers needed for new roles, especially younger talent—and the burden to train new digital skills often falls to employers.

Because reskilling is such a high priority for workers too, the opportunity to learn how to use AI can act as an incentive for employees to join companies that are using it. In this way, recruiters can use AI as a tactic to attract younger, more tech-savvy workers or workers looking to develop new skills. The fact an employer uses AI can also help recruiters position their company as being more relevant to job seekers.

Once workers are in role, a key challenge is how to keep their skills current with ever-changing work requirements. AI can help training professionals accelerate knowledge transfer to help workers stay current as roles evolve. It can also facilitate this knowledge transfer among co-workers and break down expertise siloes. Training professionals can use virtual reality (VR) and mixed reality (MR) to deliver training curricula and personalize content to individual learner needs. This approach can help companies keep workers current with required health and safety certifications, and reduce the time needed to consume content from one year to eight months.



AI use cases to boost productivity and collaboration

With AI, companies can empower their workforce by expanding technology tools to workers with little or no prior technology experience to automate tasks like reporting that in the past would have taken days and weeks to complete.

Talent leaders then need to consider how they retain employees once they are staffed and trained. AI can help talent professionals better understand potential reasons for employee turnover by analysing historical data and engagement metrics to uncover possible risks. AI-powered sentiment analysis tools can help provide insights into employee feedback, survey responses, and communication channels to gauge overall sentiment within the workforce so leaders can identify areas of opportunity and maintain a highly engaged workforce.

AI in action



Portuguese energy provider EDP has moved to deploy machine learning, artificial intelligence and IoT technology to make even more of the data and insights it generates. “More than the technology itself, it’s the impact this project is having on our people that’s truly outstanding. You can just see how much more empowered, aware and inspired to innovate they’ve become.”

[Learn More](#)^z

Talent and skills management

- ✓ **Recruiting**
Find qualified candidates and use AI as a recruiting tool
- ✓ **Employee training and upskilling**
Create individualised learning curricula and deliver training via interactive simulations
- ✓ **Employee retention**
Improve sentiment analysis of employee feedback and provide virtual employee assistance

 **70%**
of employees more productive with generative AI⁸

Generative AI use cases for wind power production

Wind power production involves a complex network of stakeholders, from the planners and developers who site new wind farms, to the manufacturers and suppliers who build turbines, parts, and equipment—to the field workers who keep operations running smoothly.

The beginning phase of the production process is perhaps one of the biggest areas needing efficiency gains. The time to obtain wind farm operation approval typically takes years, with considerable nuance between on- and off-shore project requirements.

The development lead time is driven in part by complex regulations, required analyses, and the manual workload that's generated by all the above. Planners and bidders need to wade through mountains of documentation to understand what's required for environmental impact assessments, site suitability for new farms, and what's needed from a regulatory standpoint.

Turbine projects can hit delays based on unforeseen supply chain issues, inventory outages, or labour shortages. Because modern wind turbines can include hundreds of components sourced from multiple manufacturers and OEMs, a shortage for just one part can impact production schedules and push out install dates for an entire project.

Once a wind turbine is up and running, energy service providers and field service workers are responsible for routine maintenance and remote monitoring of assets to ensure optimal performance. They play a vital role in maintaining operations through proactive maintenance and facilities monitoring, and to respond to incidents or malfunctioning assets through troubleshooting. But since many wind farms are often located in remote, physically challenging environments, on-site access can be incredibly difficult for field service workers—in some cases requiring workers to access a turbine by skis, or in the case of an off-shore farm, by helicopter.

AI in action

Vestas is unlocking a range of distributed automation and optimisation opportunities enabled by AI, including prediction and forecasting, use of NLP* and LLMs* for automation of back office tasks, and computer vision in manufacturing.

The Vestas logo, consisting of the word "Vestas" in a bold, italicized, sans-serif font.

* NLP: Natural Language Processing

* LLM: Large Language Model

AI use cases to boost productivity and collaboration



Across each of these disparate roles, data is a **common thread**—and an opportunity for AI to help production teams use AI to work smarter, not harder. For planners and developers, to use AI to expedite plan approval by analysing large volumes of text. For manufacturers, to use AI for predictive demand planning for turbine components and parts. And for field workers and incident response teams, to use AI to query the status of energy assets, troubleshoot and diagnose incidents, ask for performance metrics, and receive real-time updates on energy production—all through natural language.

Empower teams to make faster, better decisions with AI

- Accelerate planning and development
- Optimise turbine and wind farm output
- Get more support and information at your fingertips

Early learnings on generative AI are encouraging

In Microsoft's exploration of generative AI, we've uncovered exciting possibilities. It's not just an add-on technology, it's a vital enabler that transforms how we operate the grid, serve our customers, and achieve industry goals.

AI as a catalyst for our energy transition

Zooming out to a broader view, AI can be a powerful ally on our journey toward sustainable energy. And guess what? It isn't a distant promise—it's already here, making a tangible impact today.

Empowering people with generative AI

Generative AI creates a kind of bridge between human creativity and technological power, giving everyone access to cutting-edge technology right at their fingertips.

Real-world insights: a global experiment

Just last year, we collected data from more than 30,000 individuals across 31 countries who embraced generative AI in their daily routines.⁸ The early findings? Promising!

Increased productivity: most employees reported feeling more productive and creatively charged.

Time efficiency: mundane tasks vanished, thanks to generative AI.

Our commitment to responsible AI

Microsoft is committed to making sure AI systems are developed responsibly and in ways that warrant people's trust. In July 2023, Microsoft announced support for new voluntary commitments created by the United States' Biden-Harris Administration to help ensure that advanced AI systems are safe, secure, and trustworthy.

30,000

individuals surveyed across
31 countries

75%

spent less time searching for
information

71%

saved time on mundane tasks

Empowering people to achieve more

We're all counting on the wind industry to win, and empowering the wind industry workforce to do so will be crucial. To meet increasing renewable energy demand, the industry needs to grow rapidly, safely, sustainably, and equitably. Digitally empowering the workforce is a critical path to enabling industry growth while increasing employee efficiency and productivity. Wind is increasingly competitive and like any other business, it needs to be economically viable for all stakeholders to thrive.

"AI serves as an enhancer, not a replacement. To ensure the prosperity of our economies and provide people with stable, secure, and safe employment, it is imperative that we recognise AI as a key component."

- Mariana Batista, Senior Advisor, WindEurope

Generative AI is opening new possibilities for how humans use technology. This democratisation of data and technology—and recent learnings and insights—provide hope we can confront expected labour concerns with powerful digital enablers like never before—to go smarter and faster by removing some of the manual, repetitive tasks that have limited wind energy companies' ability to scale and to provide productivity gains throughout the system.

As we continue our energy transition journey together, transitioning to a net-zero world is vital to addressing global warming and powering a sustainable future. But to keep pace with clean energy expansion, the wind industry needs people to fuel its growth. With generative AI, the industry can drive workforce productivity gains, expand renewable energy generation, and better realise the full value of wind energy.

But as with any great breakthrough in history, it isn't the technology itself that can change the world, it's what people do with it.




How we win together

Business and human resources leaders play a pivotal role in the transition to AI by creating the right environment for adoption. Some are arguing that because the technology is evolving so rapidly, we can't take a "wait-and-see" approach, that driving workforce adoption of AI is a leadership imperative and the time to act is now.

Leading organizational change at this scale is no small feat. It requires vision to reimagine how work gets done, and courage to consider what tasks we can delegate outright to AI—and what tasks require using AI as more of an assistant. If we're successful, we'll not only find new ways to automate tedious, time-consuming tasks, but also new ways of working. And ultimately, that will help our workforce work smarter, not harder, by making people feel more productive and satisfied with their work.

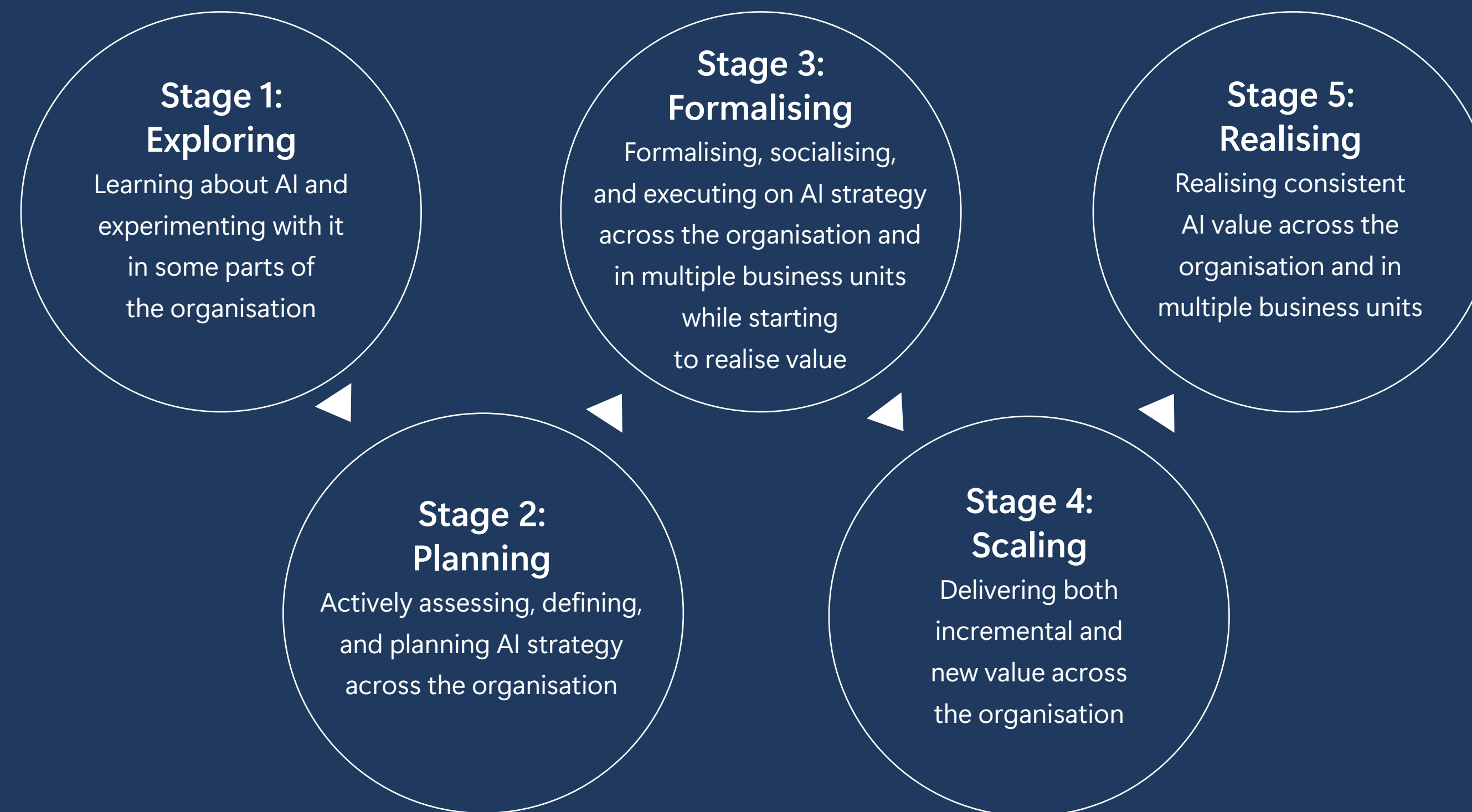
Microsoft is committed to sharing learnings and insights and supporting efforts to create more impact from new technology—to accelerate learning by sharing experiences and collaborating within and across organisations so we can all learn together and scale at speed.



"I believe that unlocking the full potential of AI is a leadership imperative. Innovations in AI are happening at a staggering pace. As we navigate AI's impact on the workplace, organisational leaders must start cultivating the right environment now to make sure no one is left behind. Simply putting AI tools in the hands of employees is not enough. When we foster an agility-based culture, reimagine the ways we work, and build the human skills needed to get the best out of AI, we can help our organisations and employees thrive in this new era."

- Kathleen Hogan, Chief People Officer, Microsoft

Building a foundation for AI success



Five pillars of AI success:

Business strategy

Clearly defined and prioritised business objectives, use cases, and measurement of AI value

Technology strategy

An AI-ready application and data platform architecture, aligned parameters for build vs. buy decisions, and plans for where to host data and applications

AI strategy and experience

A systematic, customer-centric approach to AI that includes applying the right model to the right use case and experience in building, testing, and realising AI value

Organisation and culture

A clear operating model, leadership support, change management process, access to continuous learning and development, and strong stakeholder engagement

AI governance

Implementation of processes, controls, and accountability structures to govern data privacy, security, and responsible use of AI

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