
Capgemini
RESEARCH INSTITUTE
Smart bet,
only option,
or both?
Biopharma R&D
turns to AI.
Make it real.

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Executive summary

The pharmaceutical and biotechnology (biopharma) industry faces persistent, long-standing challenges to its R&D efficiency. Top among them are the high cost of drug development and elevated clinical failure rates. The return on R&D investments has undergone a steady decline to a now flat, but unacceptable level, making it increasingly difficult to bring successful new drugs to market.

AI is now emerging as a powerful catalyst for breakthroughs in R&D, precisely in the areas where the industry has struggled most in recent years. By streamlining discovery, optimizing trial design, and enabling predictive insights, AI is poised to bring to biopharma R&D more agile, data-driven, and outcome-oriented processes.

Converging technology including advances in biology, physics, and computational power are unlocking this breakthrough now.

Our global research reveals that biopharma organizations recognize this potential. It finds that 82% of executives believe AI will fundamentally transform biopharma R&D, and 60% agree that companies failing to scale AI will fall behind in innovation and market relevance. Executives also see AI as a key enabler in early-stage R&D, where the most complex challenges reside, supporting the design of experimental approaches and refining models and prototypes. In fact, 63% anticipate that most new molecular entities (NMEs) will originate from AI-driven platforms within the next decade.

Recognizing the transformative potential of AI, most biopharma organizations (79%) are actively developing strategies to integrate AI across their R&D value chain. For example:

- In drug discovery, 74% of executives believe generative AI (Gen AI) holds significant potential. Our research reveals that target identification is the most widely adopted AI use case in the drug discovery phase, with 43% of organizations implementing it. Of these, 32% report productivity improvements with an average time savings of 28% compared to before adopting the technology.
- In clinical trials, organizations are already using AI for predicting endpoints and dosing

Executive summary

regimens, selecting trial sites, and predicting adverse events and treatment responses. More than 60% affirm that Gen AI can substantially improve the efficiency and outcomes of clinical trials.

- In regulatory submissions, AI accelerates processes by automating data compilation from internal and external sources, enhancing quality through predictive modeling, and embedding responses to anticipated regulator queries upfront. A strong majority (73%) agree that Gen AI has the potential to fundamentally transform regulatory submission and approval workflows. Among organizations using AI to prepare and submit regulatory documents, 37% report productivity improvements, with an average time savings of 19%.

Organizations are also actively exploring and piloting AI agents in R&D, with nearly three in 10 already piloting initial use cases. Plans for growing levels of investment indicate that companies expect transformation to accelerate.

It remains unclear, though, whether the industry will have the capacity to use AI for R&D in the most effective ways. Despite having established foundational data capabilities, many biopharma organizations remain underprepared in data readiness. Data quality, external data procurement and integration, and data sharing, among other areas, are top challenges. Operational and cultural readiness to scale AI also remains a significant hurdle. To unlock the full potential of AI in biopharma R&D, organizations must address these gaps. We conclude the report with recommendations for accelerating the adoption and scaling of AI:

- Ensure top-down support with senior leadership buy-in
- Assess organizational risk profile and define clear goals
- Balance building core AI capabilities with strategic partnerships
- Build a data- and digital-savvy workforce
- Advocate for organizational data readiness and industry data standards.

Who should read this report and why?

This report is intended for C-suite executives at global pharmaceutical and biotechnology (biopharma) organizations. It offers recommendations to help senior biopharma leaders benchmark their AI maturity and understand the benefits that AI can bring to the drug discovery and development process. Given the potential that the technology has to transform the R&D value chain, this report will also be of high interest to executives across clinical and technological roles and functions. This report offers insights into how large and mid-sized biopharma organizations can implement AI and scale their AI use cases.

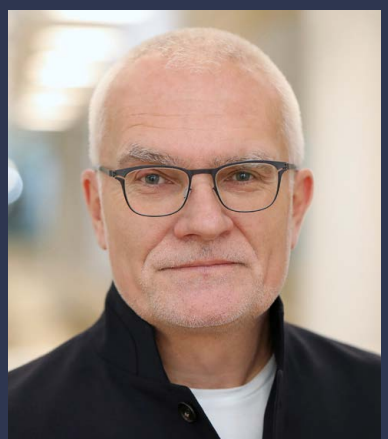
This report is based on original findings from an industry survey of 500 senior executives (director level and above) at leading biopharma organizations across nine countries. All have revenue above $500 million and over half (61%) above $1 billion. Half of executives surveyed work in early-stage R&D (e.g., discovery, preclinical research) and half within late-stage R&D (e.g., clinical development, regulatory submission). We also convened an industry advisory board of two senior executives for this report. Advisory board members served as a sounding board from research development through analysis and report publication. In addition, we interviewed more than 10 senior biopharma executives at leading organizations. Please see the research methodology at the end of the report for more details.

Thank you to our advisory board members

Our advisory board members provided highly valuable input on multiple occasions that helped us shape and develop our report.

Anna Berg Asberg

Senior Vice President and Global Chief Information Officer, Gilead Sciences



Matthias Essenpreis

Chief Technology Officer, Roche Diagnostics

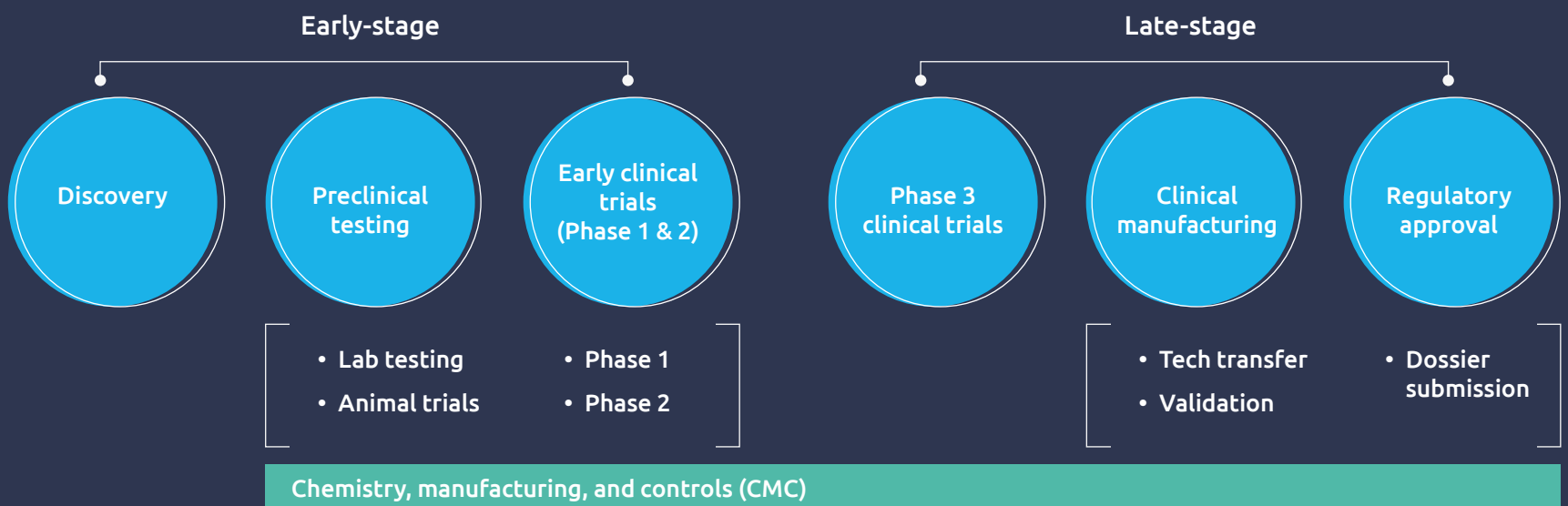
Key definitions

In this research, when we refer to artificial intelligence (AI), we mean the full range of technologies that enable machines to learn, reason, and make decisions – either by analyzing data, generating content, or taking autonomous actions.

We use AI as a collective term to reflect the full spectrum of capabilities. This includes, but is not limited to:

- **Machine learning (ML)**: Systems that learn from data to make predictions or identify patterns.
- **Generative AI (Gen AI):** A subset of AI that harnesses the power of extremely large models and massive scaling of data and computing power to plan, reason, and create generative features (i.e., new content based on patterns and data they have learned from) including text, image, video, and code.
- **AI agent:** Any AI system that can interact with its environment, collect data, and use this to autonomously perform tasks to meet predetermined goals.
- **Agentic AI:** The deployment of AI agents in a real-world environment where agents can detect signals, plan and reason, make autonomous decisions, and achieve set goals independently without human intervention – such as adjusting manufacturing processes in real time or planning and executing lab experiments.

The biopharma research and development (R&D) value chain as defined in our research covers drug discovery through regulatory approval/dossier submission. We acknowledge that the nomenclature within the value chain might differ by organization; however, for the purposes of this research, below is our classification to allow for standardization of responses in our survey.



Source: Capgemini Research Institute analysis.
Note: *CMC* is the process that ensures the drug can be reliably and consistently manufactured into a safe and effective medication that meets all required quality and safety standard; *tech transfer* is transferring knowledge, processes, and technology from R&D phase to clinical manufacturing stage to ensure the drug can be manufactured consistently, reliably, and in compliance with regulatory standards; *validation* ensures that the processes, procedures, and activities performed during the manufacturing of drug generate reproducible results that meet quality standards.

01 AI is the biopharma industry's prescription for ailing innovation

The growing imperative for AI-driven transformation

Biopharma R&D productivity, or the average investment required per successful new drug, has been worsening since the 1950s. Eroom's Law observes that, from 1950 to 2010, the number of new drugs approved for a given, inflation-adjusted R&D spend fell by about 50% every nine years. Put another way, even after discounting for inflation, a new product cost biopharma 100 times more to develop in 2010 than six decades earlier.[1] More recent estimates from 2024 place the average cost of bringing a new drug to market at $2.6 billion, and taking 10 to 15 years on average.[2] Helping drive this daunting level of outlay is the roughly 90% failure rate in clinical trials.[3] The most common culprits are products that do not work well enough or that have unmanageably severe side effects.[4]

Already high, and rapidly increasing, R&D inefficiency is unsustainable in normal times. *"It is impossible to overestimate how vital it will be to see technological disruption revive biopharmaceutical R&D. Without it, the industry will find it increasingly difficult to fulfill its social mission, let alone attract investors interested in fair returns,"* says Thorsten Rall, Executive Vice President, Global Life Sciences Industry Lead, Capgemini. The growing need for breakthrough and novel therapies makes the issue more pressing. Help, though, appears to be at hand. Several converging trends will allow AI to transform biopharma R&D. These include the simultaneous growing data breadth, advancing computing power, better algorithms, and increased industry readiness. In particular:

- *Expanding volume and variety of available biological and chemical data* – The cost of sequencing has drastically declined, and omics data (genomics, proteomics, metabolomics) are now being linked at scale in public databases, such as the UK Biobank, National Center for Biotechnology Information, and Cancer Genome Atlas.
- *Improvements in computational infrastructure and advances in large language models (LLMs)* – Cloud computing and high-performance "cheap" computing power, makes it feasible to train and deploy AI models on vast datasets. Such tools can now, among other activities, predict protein structures, generate novel drug-like molecules, optimize synthesis routes, and analyze unstructured R&D documents to better understand biology and chemistry at a systems level. Beyond LLMs, AI techniques like autoencoders enable efficient processing of complex biological and chemical data, complementing generative models to accelerate discovery.
- *Integration of AI across the R&D value chain* – Companies are using these IT improvements to embed AI in every part of R&D, from target identification and molecule design, through preclinical safety and efficacy prediction, to clinical trial design.
- *Regulatory momentum* – The FDA and EMA are actively engaging with AI models and tools.[5][6]
- *Industry and AI-native partnerships* – Large pharmaceutical companies are partnering with AI-native start-up and biotech firms. Examples include those between Sanofi and Exscientia (now Recursion) and between Pfizer and Insilico Medicine.[7][8]

In short, AI-driven R&D could provide the increasingly necessary transformation for biopharma R&D to continue to bring to market the new products society needs at prices it can afford.

"It is impossible to overestimate how vital it will be to see technological disruption revive biopharmaceutical R&D. Without it, the industry will find it increasingly difficult to fulfill its social mission, let alone attract investors interested in fair returns"

Thorsten Rall,
Executive Vice President, Global Life Sciences Industry Lead, Capgemini

Companies will use AI to rebuild drug discovery and development, or quickly fall behind

The competitive clock is ticking for deploying AI across R&D. Our expert interviewees, and a large majority of our executives surveyed, agree that widespread change has already begun and will quickly reshape this field in various ways.

AI adoption within R&D has already started. Jim Weatherall, Chief Data Scientist, Biopharmaceuticals R&D at AstraZeneca, writes that, *"Data science and AI are transforming R&D, helping us turn science into medicine more quickly and with a higher probability of success. We are applying AI throughout the discovery and development process, from target identification to clinical trials, to uncover new insights to guide our drug discovery and development."*[9] He is not alone in his thinking. Over eight in 10 executives believe that AI will fundamentally transform biopharma R&D. The expected widespread adoption of AI in

R&D springs from fear as much as from hope: 63% warn that organizations failing to scale AI will fall behind in innovation and market relevance (see Figure 1). As Brian Eden, Vice President, Global Life Sciences, Capgemini puts it, *"AI-driven R&D transformation is more than an attractive choice. It is a basic strategic necessity. Companies that wait for others to figure out the new way of doing things will disappear."* A senior executive at a global pharmaceutical company believes, *"In the next five years, companies will see internal process improvements and better outcomes from AI. Drug development will benefit from enhanced data generation and analysis, such as digital pathology (i.e., managing and analyzing information generated from digitized specimen slides) over a longer period."*

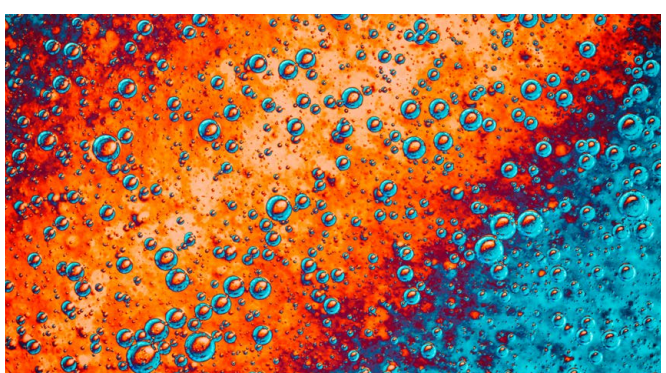
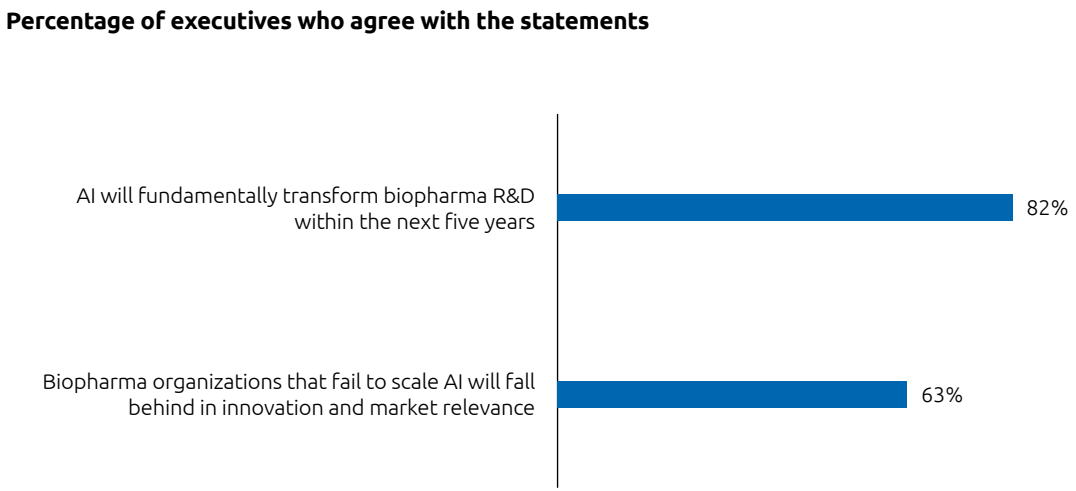


Figure 1.
The majority of executives agree that AI will transform biopharma R&D



Source: Capgemini Research Institute, Impact of AI on R&D productivity survey, August–September 2025, N=500 pharmaceutical and biotechnology executives.

"AI can revolutionize drug discovery. With better data and smarter selection, especially in small molecules and peptides, we can dramatically improve how we identify promising candidates."

Alexandre Malouvier
Senior Director Scientific Affairs and Digital Innovation, MAPI Research Trust/AI Centre of Excellence at ICON plc

The forecast gains outweigh the perceived risks

Such expectations of widespread AI-driven R&D transformation reflect a growing consensus on risk and reward. Of respondent executives, 63% agree that, within 10 years, AI-driven platforms will find most new molecular entities (NMEs) (see Figure 2). At the companies of those surveyed, on average today 12% of pipelines are AI-discovered targets. This share is expected to reach 34% in five years and 60% in 10 (see Figure 3). More generally, 61% say that the technology will dramatically accelerate drug discovery process. Bob Bradway, CEO at Amgen puts it simply: *"Machine learning and AI better enable us to choose what we think can be the winning molecules."*[10] The industry impact looks set to be huge. Already, Sanofi's new discovery engines, powered by AI, machine learning, and experimental validation, have unlocked seven novel drug targets in just one year.[11]

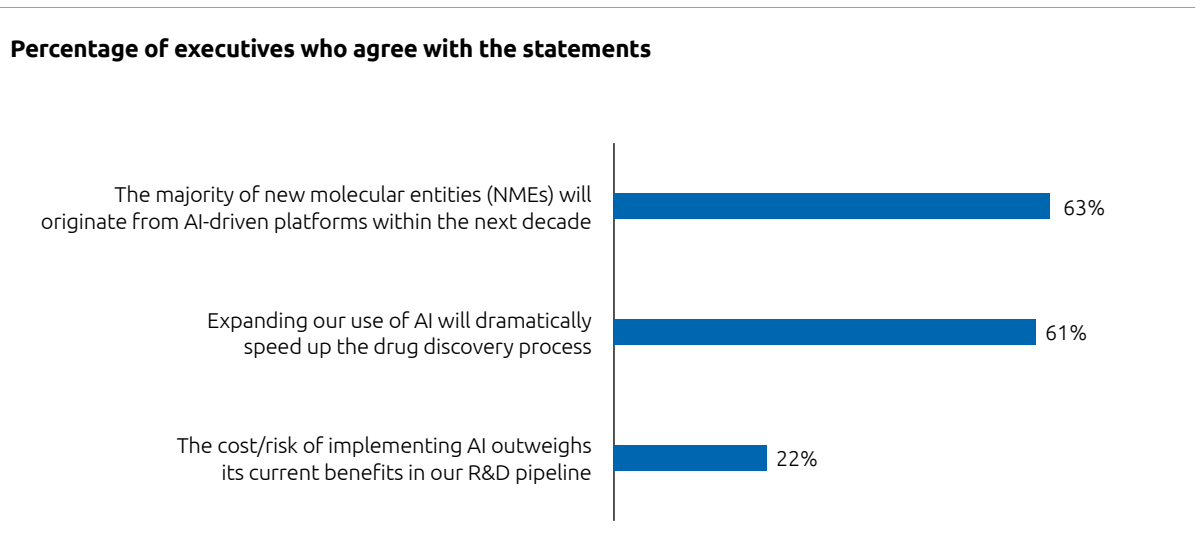
Meanwhile, only 22% of executives agree that the cost and risk of implementing AI outweigh its current benefits for their R&D pipeline. These advances may take patience to demonstrate, but they will occur, says a data, digital, and

IT executive at a global pharmaceutical company: while efficiency gains observed to date *"are more modest than initially expected. I believe benefits will improve as AI scales. Sure, there was initial hype around AI in R&D, but perceptions are now stabilizing as organizations focus on practical use case augmentation and overcoming challenges to realize real value."* A digital and data science executive at a US-based biotech company, also thinks that *"AI will reshape biopharma R&D over the next five to 10 years, but not without challenges. As digital health tools become more widely adopted, they will provide high-quality, structured data, ideal for training machine learning models. [Then] we will see real productivity gains."*

61%

say that the technology will dramatically accelerate drug discovery process

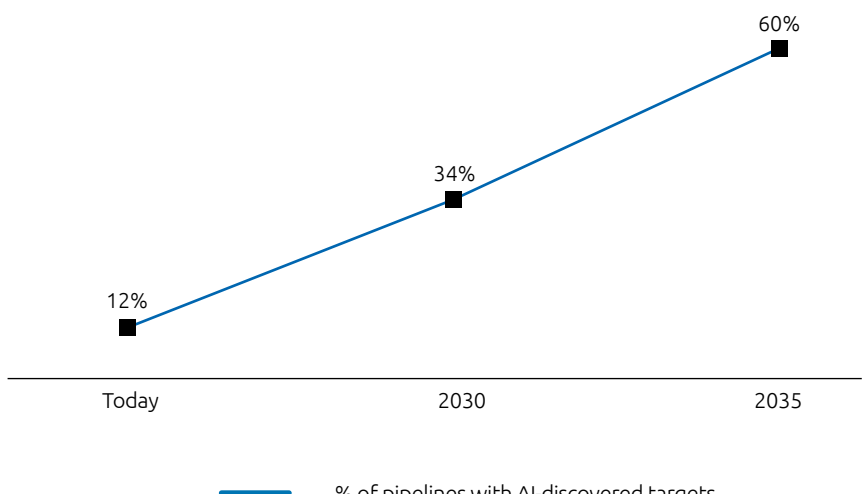
Figure 2.
Most executives agree that AI will accelerate drug discovery



Source: Capgemini Research Institute, Impact of AI on R&D productivity survey, August–September 2025, N=500 pharmaceutical and biotechnology executives.

Figure 3.
The share of AI-generated targets is projected to reach 60% in the next decade

Average share of pipelines that are AI-discovered targets, today and projected in five and 10 years



Source: Capgemini Research Institute, Impact of AI on R&D productivity survey, August–September 2025, N=500 pharmaceutical and biotechnology executives.

AI will evolve beyond an efficiency tool to help steer the strategic future of biopharma R&D

There was a consensus among survey respondents and interviewees that AI has the potential to impact each stage of the R&D lifecycle. For example, the data, digital, and IT executive at a global pharmaceutical company says that the technology will *"revolutionize the biopharma space by accelerating early-stage drug discovery, unlocking hidden patterns in biomedical data, and enabling faster, more confident decision-making. Over the next five to seven years, we will [also] see shorter timelines from lab to bedside, smarter knowledge management, and more targeted upskilling, ultimately transforming healthcare R&D and making investments in this space more lucrative."* Alexandre Malouvier, Senior Director Scientific Affairs and Digital Innovation, MAPI Research Trust/AI Centre of Excellence at ICON plc, adds that, *"AI can revolutionize drug discovery. With better data and smarter selection, especially in small molecules and peptides, we can dramatically improve how we identify promising candidates. That's where my hope lies for the next five to 10 years."*

Figure 4 shows our view on what the future of drug discovery could look like when reshaped by AI.

Figure 4.
AI will transform every element of biopharma R&D in the years ahead

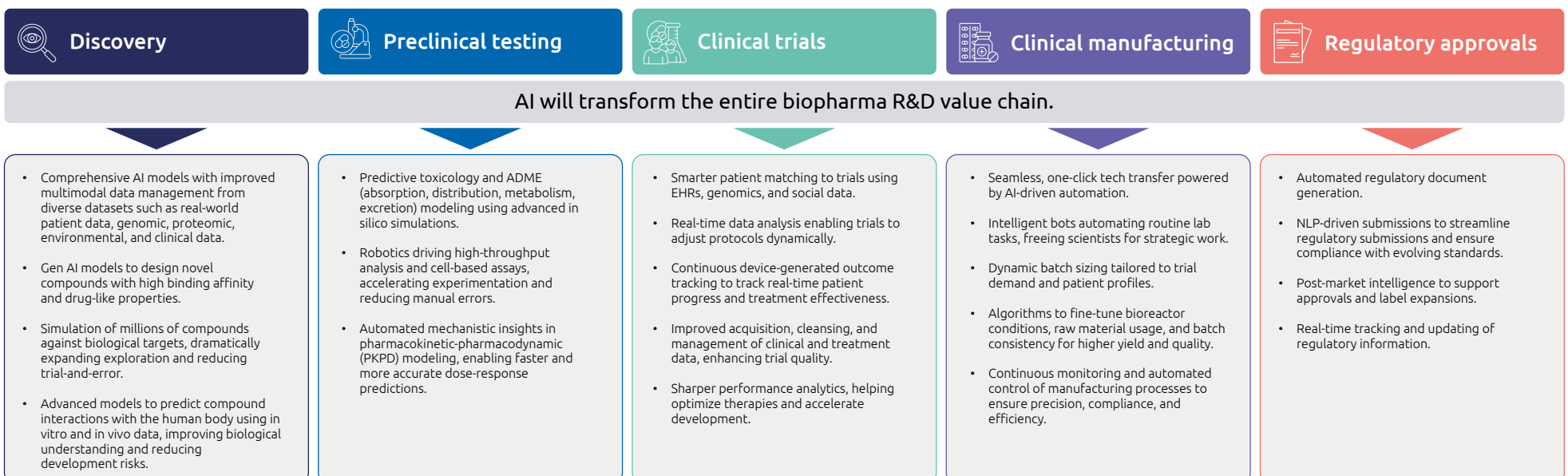


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Figure 4.
AI will transform every element of biopharma R&D in the years ahead – Part 2

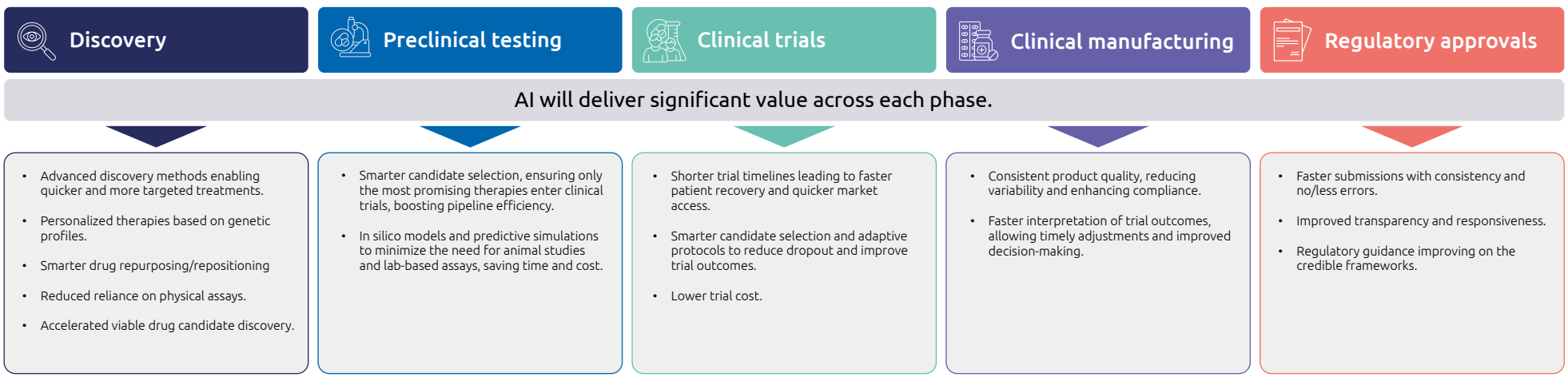

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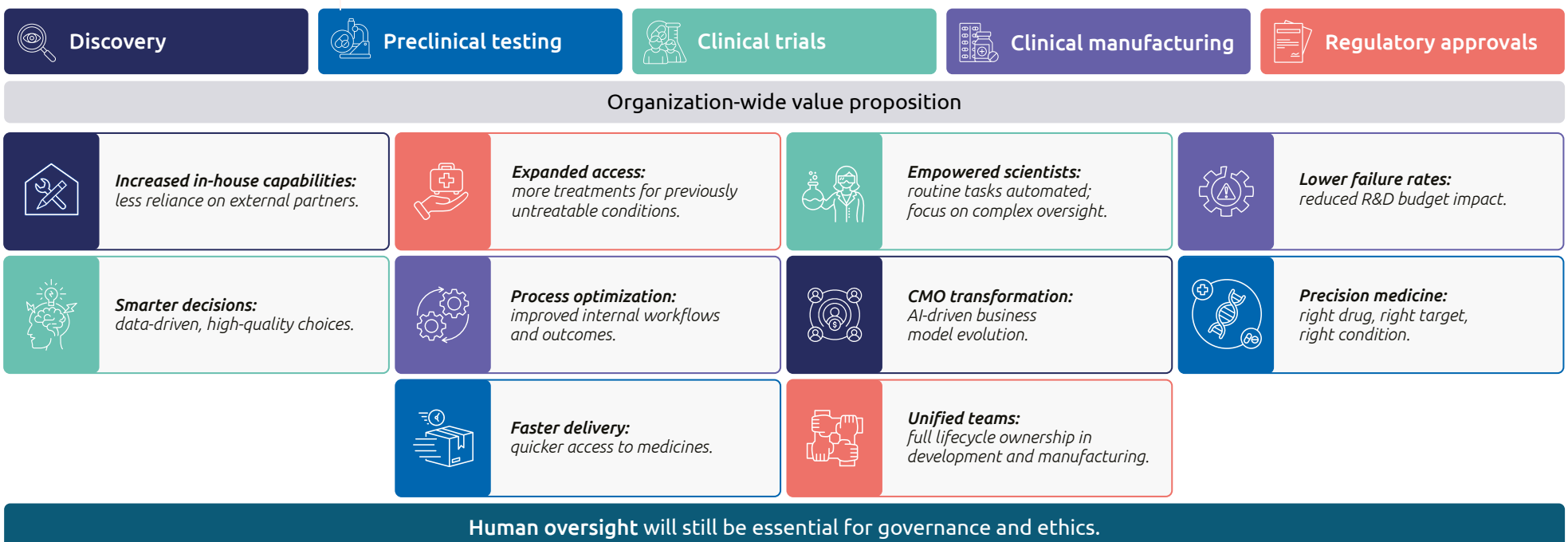
Figure 4.
AI will transform every element of biopharma R&D in the years ahead – Part 3



Source: Capgemini Research Institute analysis.

02 Laying the groundwork for big bets on AI in R&D

Our research assessed how advanced companies were on AI adoption in R&D. It found most to be at early stages, but ready to ramp up quickly.

Most biopharma companies are setting or beginning to implement strategy

A majority of executives work for organizations that are formulating an organization-wide strategy for AI in R&D or are looking to roll one out (71%). Only 8% are actively implementing a strategy and roadmap (see Figure 5). Maturity here increases with company size. For example, just 2% of companies with $1–5 billion in revenue have begun implementation. For those with more than $20 billion in revenue, that figure reaches 41% – much higher, but still a minority. Justin Melnick, Director, Global Life Sciences Incubator, Capgemini says, *"For years, large companies have been building strong teams that set them up to move quicker into the strategy phase. However, they face challenges on scaling that the smaller more agile firms do not. They need to commit to and drive rapid transformation at scale if they are to stay ahead of the more agile firms."*

"For years, large companies have been building strong teams that set them up to move quicker into the strategy phase. However, they face challenges on scaling that the smaller more agile firms do not. They need to commit to and drive rapid transformation at scale if they are to stay ahead of the more agile firms."

Justin Melnick
Director, Global Life Sciences Incubator, Capgemini

Figure 5.
71% of organizations are currently formulating a strategy for AI in R&D or preparing for rollout

Percentage of executives who say their organization has a strategy for implementing AI in R&D

Source: Capgemini Research Institute, Impact of AI on R&D productivity survey, August–September 2025, N=500 pharmaceutical and biotechnology executives.

A blend of internal development and external innovation is the most common way to build capabilities

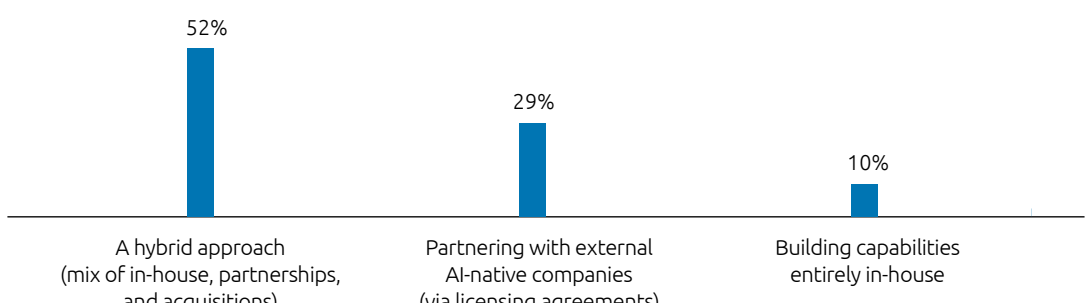
Slightly over half (52%) of executives report using a hybrid mix of in-house activities, partnerships, and acquisitions to develop AI capacity in R&D. Another 29% are primarily partnering with external AI-native companies. Only one in 10 organizations are relying wholly on internal capability creation (see Figure 6).

52%

of executives report using a hybrid mix of in-house activities, partnerships, and acquisitions to develop AI capacity in R&D

Figure 6.
Half of organizations build AI in R&D capabilities internally and with external partners

Percentage of organizations by primary strategy for building AI capabilities in R&D

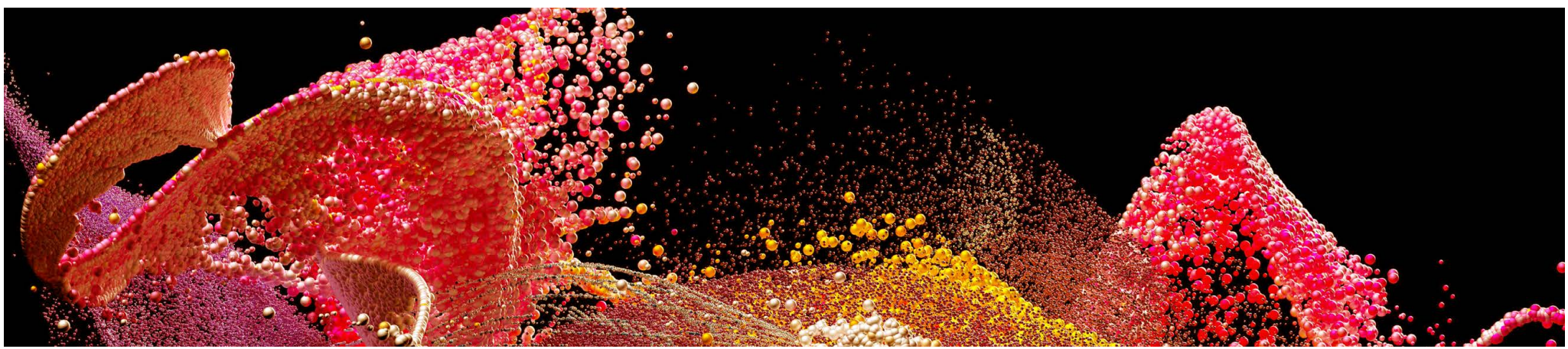


Source: Capgemini Research Institute, Impact of AI on R&D productivity survey, August–September 2025, N=500 pharmaceutical and biotechnology executives.

Novartis is a good example of what hybrid development looks like. It has a dual-track AI strategy, building strong in-house platforms, talent, and tools while partnering with firms like Isomorphic Labs (an AI-first drug design company),[12] Generate:Biomedicines (an AI-driven therapeutic development firm)[13] and Microsoft [14] to tackle complex R&D challenges and develop core AI infrastructure. Novartis also co-leads MELLODDY (Machine Learning Ledger Orchestration for Drug Discovery), an AI platform shared among several pharma companies.

AstraZeneca is also taking a hybrid approach. Besides building tools in house, it has: developed a protocol assistant with medical writers;[15] signed a $555 million deal with Algen Biotechnologies to use the latter's AI platform for immunology research;[16] and partnered with BenevolentAI, an AI-native firm, for the discovery and development of new treatments for chronic kidney disease (CKD) and idiopathic pulmonary fibrosis (IPF).[17] AstraZeneca also collaborates with Stanford Medicine to tap into its research and tech expertise.[18]

Roche, a Swiss pharma multinational, adopts a similar model. Its subsidiary Genentech's research and early development group (gRED) operates independently within Roche, preserving a startup-like culture while collaborating on new medicines.[19] Roche also partners with experts in drug discovery, including a four-year AI-driven collaboration with Recursion. This partnership recently produced a second neuroscience-focused whole-genome map, offering a novel approach to identify targets and pathways tackling key challenges in neuroscience drug discovery.[20]

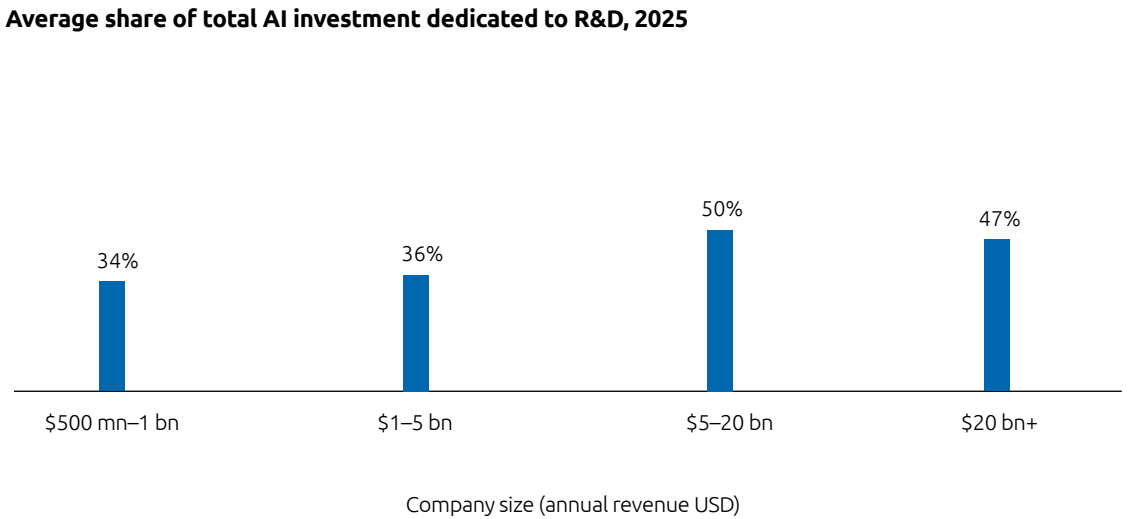


Biopharma organizations expect that today's investments in AI in R&D are just the beginning

Over two-thirds of executives (68%) expect their corporate AI investment in R&D to increase between 2025 and 2026. Of all companies surveyed, the average forecast increase is 12%.

Larger companies are making bigger proportional bets on the technology. For example, in 2025, surveyed organizations with annual revenues between $500 million and $1 billion dedicated 34% of total AI investment to R&D, for an average total of $1.8 million that year. For companies with more than $20 billion in annual revenue, the equivalent figures are 47% and $70 million (see Figure 7). This disparity looks set to grow. Over eight in 10 of the larger companies (81%) expect to increase investment in AI, well above the 60% average among the smallest companies ($500 million to $1 billion in revenue), likely because larger organizations can spread platform investments across a broader portfolio, making size a significant competitive advantage.

Figure 7.
The share of total AI investment dedicated to R&D increases with company size



Source: Capgemini Research Institute, Impact of AI on R&D productivity survey, August–September 2025, N=239 pharmaceutical and biotechnology organizations.

AI investment is most common in drug discovery but should be the norm across the value chain in five years

Of surveyed organizations, 57% currently invest in AI for drug discovery, while 41% plan to do so in the next three to five years. This is already having marked effects. The number of biologics and vaccines developed at Sanofi with the aid of AI has nearly doubled since 2019.[21] Looking ahead, Novartis will shift drug discovery from AI-enabled to fully AI-driven across R&D.[22] Meanwhile, AstraZeneca's Centre for Genomics Research aims to analyze up to two million genomes by 2026, using data science and AI to accelerate insights.[23]

While fewer companies are investing in AI elsewhere in the R&D value chain, the overwhelming majority plan to do so within five years. By then, 11% or fewer will not have deployed AI in any given R&D phase (see Figure 8).

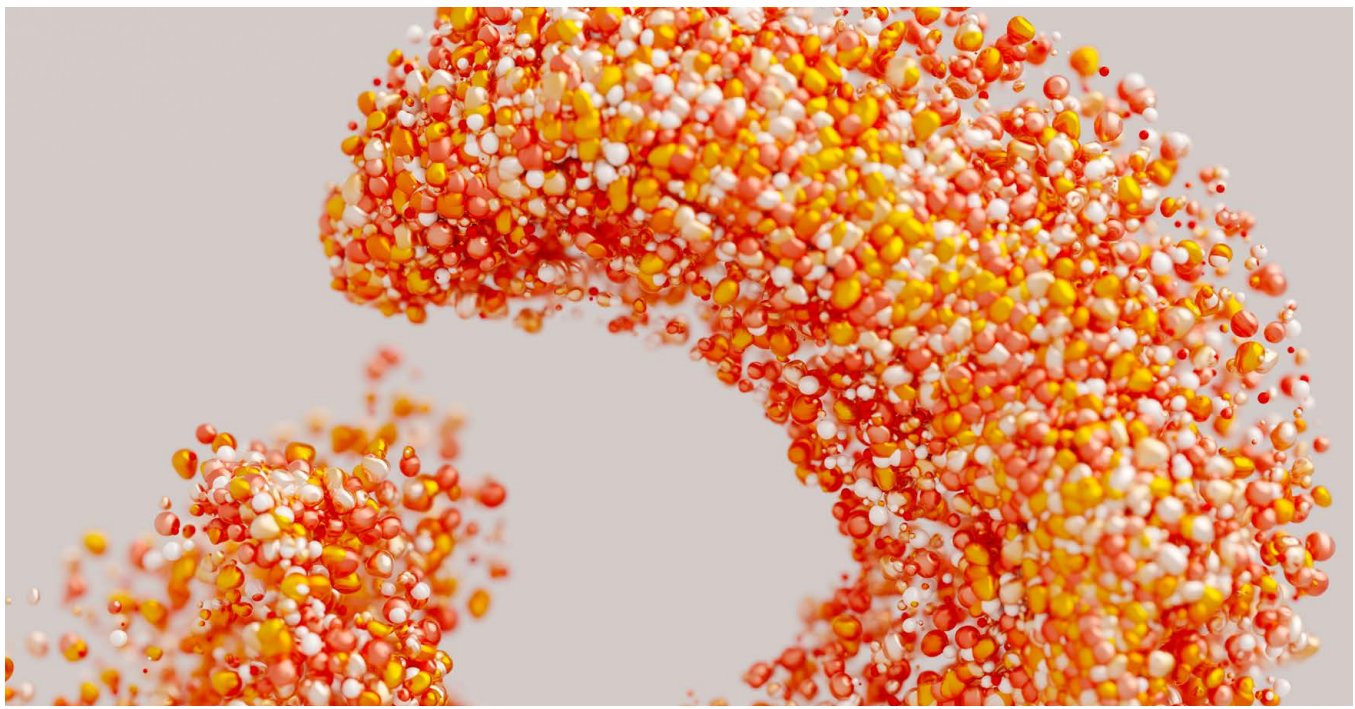
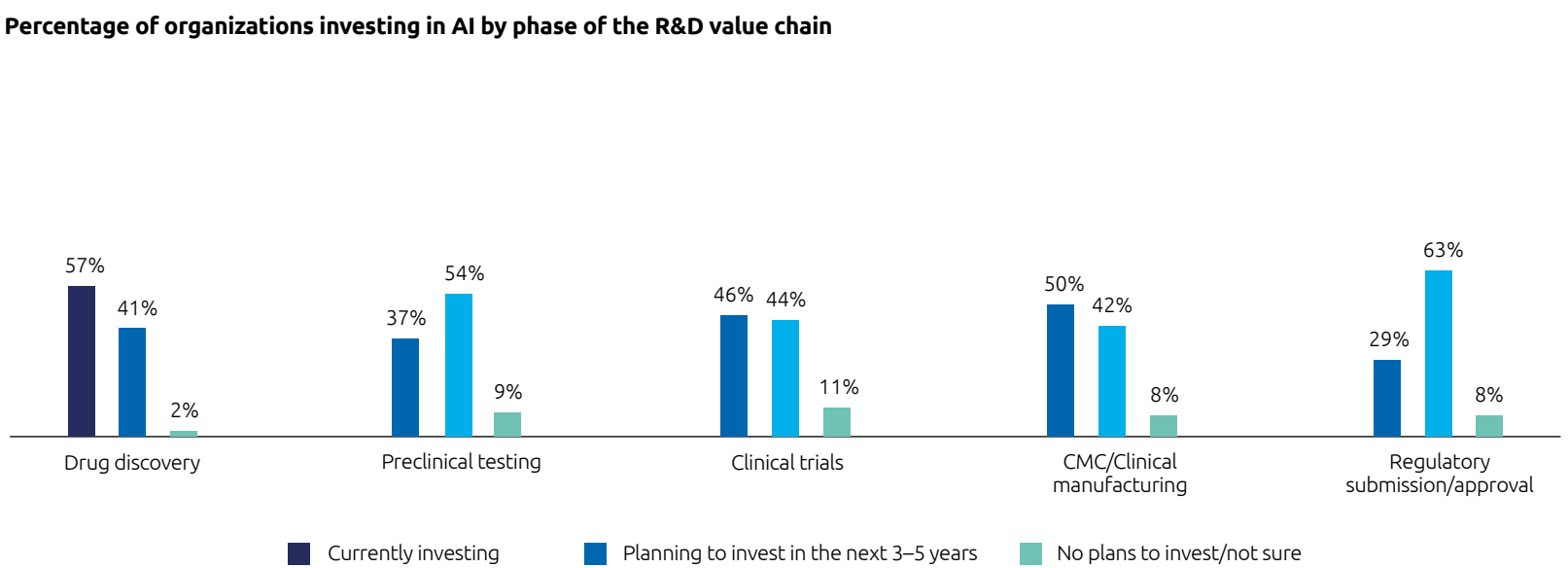


Figure 8.
The vast majority of organizations are currently investing, or planning to invest, in AI across all value chains stages



Source: Capgemini Research Institute, Impact of AI on R&D productivity survey, August–September 2025, N=450 pharmaceutical and biotechnology executives.
CMC: Chemistry, manufacturing, and controls.

03 How AI is reshaping parts of the R&D value chain today

The impact of different forms of AI will vary across R&D phases

Helping to drive more widespread investment is the impact of AI already apparent from use cases in every R&D phase.This section takes a closer look.

AI's utility within the R&D value chain varies depending on the specific application. Most surveyed executives, for example, see Gen AI transforming drug discovery (74%) and regulatory processes (73%). For pre-clinical testing, only 39% say Gen AI will have that impact. Instead, natural language processing (NLP) is expected to transform that field (51%). Machine learning, meanwhile, is widely expected to have an important effect on drug discovery (72% of respondents) and clinical trials (66%). Overall, more than half say that at least one type of AI, and usually more, will be transformative (see Figure 9).

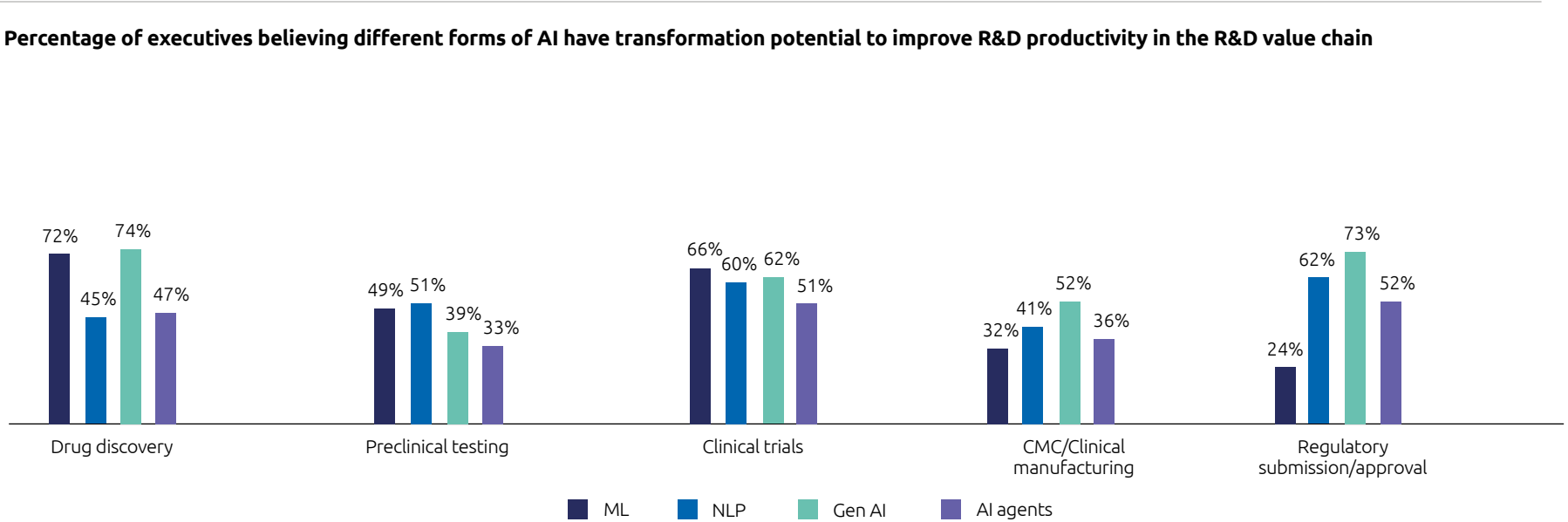
What this will look like in practice will differ by R&D phase. Flavius Martin, M.D., Executive Vice President, Research, Gilead Sciences says, *"The use of generative AI in drug development, enabled by people, science, and other new technology, has shown potential to accelerate the discovery of molecules for challenging targets."*[24] Meanwhile, AI can accelerate regulatory submissions by automating data compilation across internal and external sources. It can also enhance quality by anticipating regulator queries and embedding responses upfront. As Boris Braylyan, Vice President and Head of Information Management at Pfizer explains, *"In the future … [w]e may … be able to improve our submissions by predicting in advance what regulators are likely to ask, and coming prepared with those answers."*[25]

Novartis is already using AI to ease the manual load of regulatory compliance and reporting. It has invested in Yseop to use that firm's NLP technology in order to automate clinical report writing.[26]

74%

of executives see Gen AI transforming drug discovery

Figure 9.
Seven in 10 executives believe Gen AI will improve drug discovery and regulatory submission



Source: Capgemini Research Institute, Impact of AI on R&D productivity survey, August–September 2025, N=478 pharmaceutical and biotechnology executives.
*CMC: Chemistry, manufacturing, and controls.

Most organizations are exploring or piloting AI agents in R&D

Of respondents' organizations, 38% are exploring potential applications of AI agents in R&D. An additional three in 10 are piloting initial use cases. Only a very small proportion (a mere 6%) say that they have no plans for AI agents in this (see Figure 10).

The reason for this interest is simple. A data, digital, and IT executive at a global pharmaceutical company explains that *"AI agents have the potential for higher efficiency and user-friendly outcomes."*

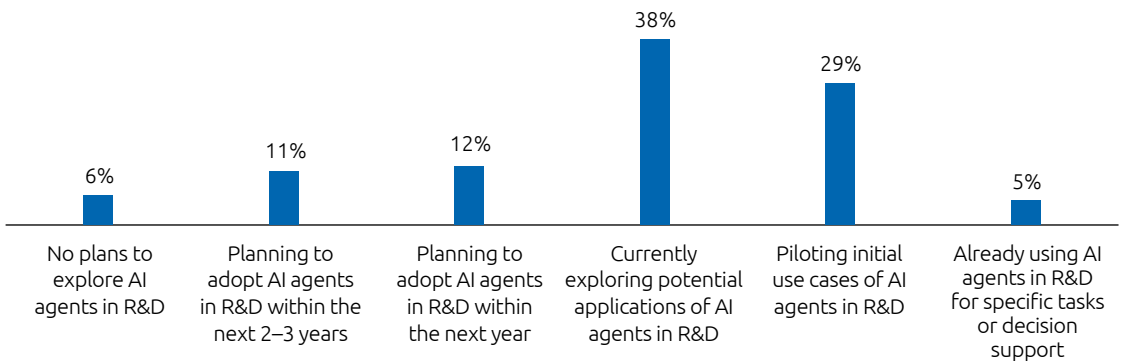
Diverse challenges, though, make finding value a work in progress. An executive from a healthcare manufacturer says, *"We are currently deploying internally developed agents in a secure cloud environment … and not using store-bought AI agents due to security and change management concerns."* A digital and data science executive at a US-based biotech company adds that such agents are *"definitely on our radar, [but] it is early days, and we are still evaluating where agentic AI could add real value beyond what chatbots offer. One idea … is automating the generation of SDTM (Study Data Tabulation Model) datasets from raw clinical data."* Sheetal Chawla, Executive Vice President and Head Life Sciences North America, Capgemini, advocates that governing AI agents is mission-critical: *"As AI agents evolve beyond pilots into real-world application, capable of sensing, learning, and acting across complex R&D workflows, the conversation must shift from feasibility to responsibility. Governance, transparency, and trust are essential. Leading organizations will embed AI agents into their scientific core while maintaining rigorous oversight and a clear sense of purpose."*

"As AI agents evolve beyond pilots into real-world application, capable of sensing, learning, and acting across complex R&D workflows, the conversation must shift from feasibility to responsibility. Governance, transparency, and trust are essential. Leading organizations will embed AI agents into their scientific core while maintaining rigorous oversight and a clear sense of purpose."

Sheetal Chawla
Executive Vice President and Head Life Sciences
North America

Figure 10.
Approximately a third of organizations (34%) are piloting or already using AI agents in R&D

Percentage of organizations by stage of AI agent implementation



Source: Capgemini Research Institute, Impact of AI on R&D productivity survey, August–September 2025, N=500 pharmaceutical and biotechnology executives.

only 6%

of organizations do not have plans to explore the use of AI agents in R&D

Those organizations actively adopting AI are seeing productivity improvements across R&D

As noted earlier, organizations have begun implementing AI in every phase of the R&D value chain, a trend set to continue. This activity involves exploration of diverse use cases to unlock new efficiencies and accelerate innovation. A senior executive from a biopharmaceutical company says, *"I anticipate that AI will substantially decrease the time required from target identification to patient delivery. Additionally, AI is expected to automate manual tasks, facilitate increased in-house operations while reducing reliance on external resources, lower error rates, and enable earlier and more accurate decision-making. This will all result in improved patient outcomes."*

Specific examples abound. AstraZeneca is deploying AI and data science to boost R&D productivity significantly, including supporting over 240 global trials and launching multiple pilots aimed at streamlining processes.[27] Similarly, Novartis has implemented AI across more than 100 use cases company-wide, driving innovation in R&D to accelerate the development of novel therapies and drugs.[28] Meanwhile, Sanofi's large language model, CodonBERT, trained on 10 million mRNA sequences, helped the company to reduced mRNA design time by 50%. This savings in turn accelerates development of mRNA vaccines and therapies.[29]

Indeed, many organizations are using AI in ways that help with different R&D phases simultaneously. For example, Gilead is deploying Gen AI to accelerate drug discovery for complex targets, which it expects will also cut months off the regulatory target assessment timeline.[30]

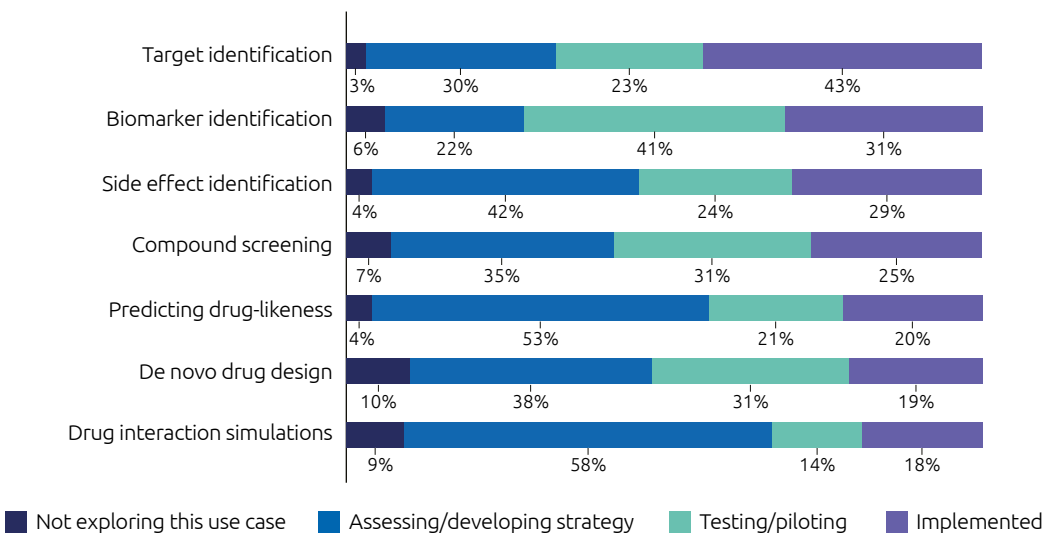
In the following sections, we detail a few of the most prominent use cases implemented today at each step of the R&D value chain.

Drug discovery

In this field, 43% of surveyed organizations use AI in target identification (finding the specific molecular target of a disease or condition), making it the technology's most common drug discovery use. A further 23% are piloting its application for this purpose (see Figure 11). To give just one example, Sanofi is using AI to identify key targets for both HIV and cancer. It is then applying the technology to create single, complex molecules with multiple antibodies which simultaneously act on three of these targets in the pathways of one or more diseases.[31]

Figure 11.
Over four in 10 organizations have implemented AI for target identification in drug discovery

Percentage of organizations by AI use case implementation stage in drug discovery



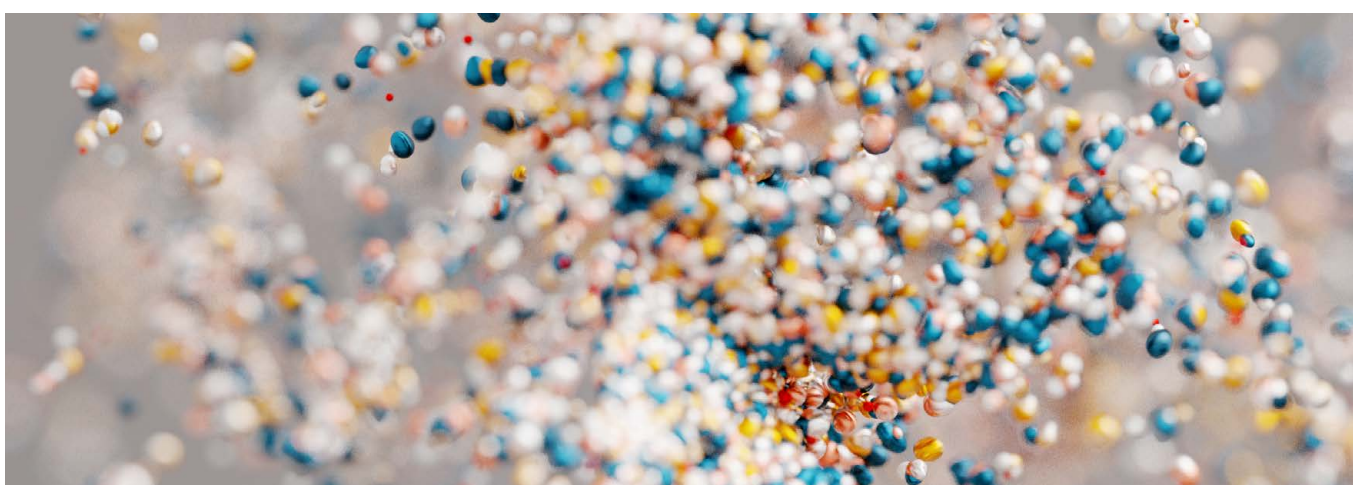
Source: Capgemini Research Institute, Impact of AI on R&D productivity survey, August–September 2025, N=500 pharmaceutical and biotechnology executives.

Our survey reveals that important benefits from AI's use in drug discovery are already becoming apparent.

AI drives real value

Target identification	**28% time savings on average**
Biomarker identification	**22% time savings on average**
Compound screening	**20% time savings on average**

- Of the 214 organizations that have implemented AI for target identification, 32% report a resultant productivity growth. The time needed for the process, compared to before adoption, has dropped 28%, or more than three months per year. For example, if it took 12 months pre-AI to identify targets, after using AI, the timeline shortened to 8.6 months. Merck, a Germany-based science and technology company, has gone dramatically further. It reduced chemical identification time from six months to just six hours using its AI-powered R&D assistant.[32]
- Of the 123 organizations that have implemented AI for compound screening, half see better productivity improvement. The average time saved is 20% of that needed before AI. For example, if it took six months pre-AI to conduct compound screening, after using AI, the timeline shortened to 4.8 months, saving 2.4 months. Bristol Myers Squibb's (BMS) AI-enabled predict-first strategy shows what this looks like in practice. BMS now forecasts success for most small molecules before synthesis, up from just 5% in 2021. The results are significantly improved speed and quality across their programs.[33]
- Of the 154 organizations that have implemented AI for biomarker identification, 25% have already realized better productivity improvement. Here, the average percentage time saved is 22%. For example, if it took 24 months pre-AI to identify biomarkers, after using AI, the timeline shortened to 18.7 months, saving over five months.



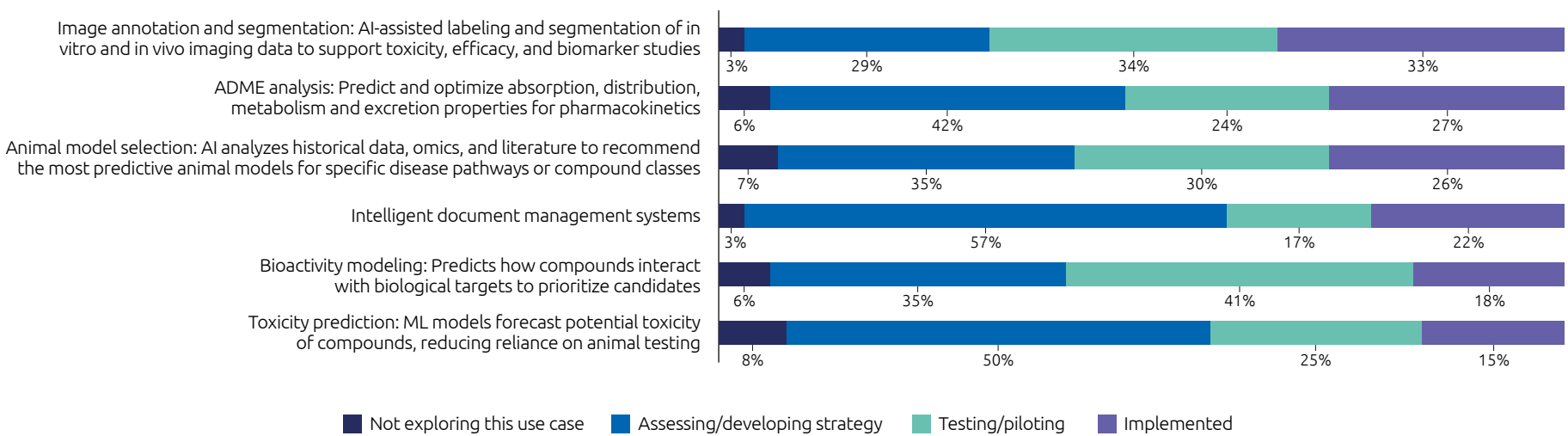
Preclinical testing

Executives report slower rollout of AI across preclinical testing than in drug discovery. Nevertheless, a third have already implemented it for image annotation and segmentation. The near future will see more activity, with large numbers engaged in piloting AI use cases across preclinical testing, including four in 10 organizations doing so for bioactivity modeling (i.e., predicting how compounds interact with biological targets) (see Figure 12).

Figure 12.

A third organizations have implemented AI to assist with image annotation and segmentation within preclinical testing

Percentage of organizations by AI use case implementation stage in preclinical testing



Source: Capgemini Research Institute, Impact of AI on R&D productivity survey, August–September 2025, N=500 pharmaceutical and biotechnology executives.

Clinical trials

A little over a quarter of executives report that their organizations are using AI to help automate clinical trial processes, detect adverse events, and predict treatment responses. Again, these figures reflect the first stages of wider, industry-wide adoption. For example, 40% are piloting AI to predict endpoints and dosing regimens, with 42% doing so for selecting trial sites (see Figure 13).

BMS (Bristol Myers Squibb) shows the possible benefits. The company is streamlining clinical trials and enhancing patient outcomes by applying AI/ML to generate disease insights, patient profiles, and predictive models. This information enables smarter trial design, endpoint optimization, and subgroup targeting.[34] According to the company's former SVP of Global Biometrics and Data Sciences, replacing 25% of standard-of-care patients with AI modeling can cut recruitment costs and shorten trial timelines by 10–15%.[35] As with any new technology, how companies use AI in trials will depend on inventiveness. A digital and data science executive at a US-based biotech company says that *"One promising use case is forecasting … whether clinical trial sites will meet recruitment targets using real-world and operational data. If a site falls short, we identify alternative centers to pick up the slack, accelerating recruitment timelines."*

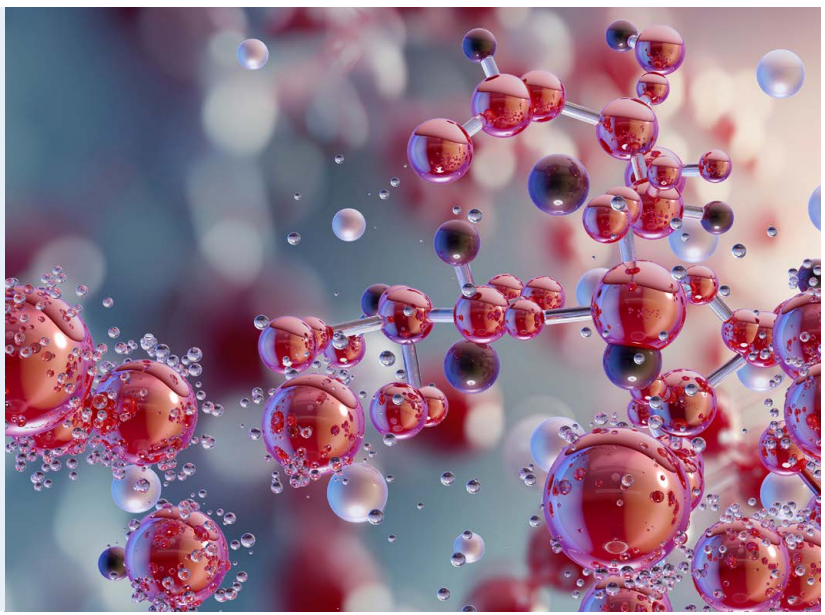
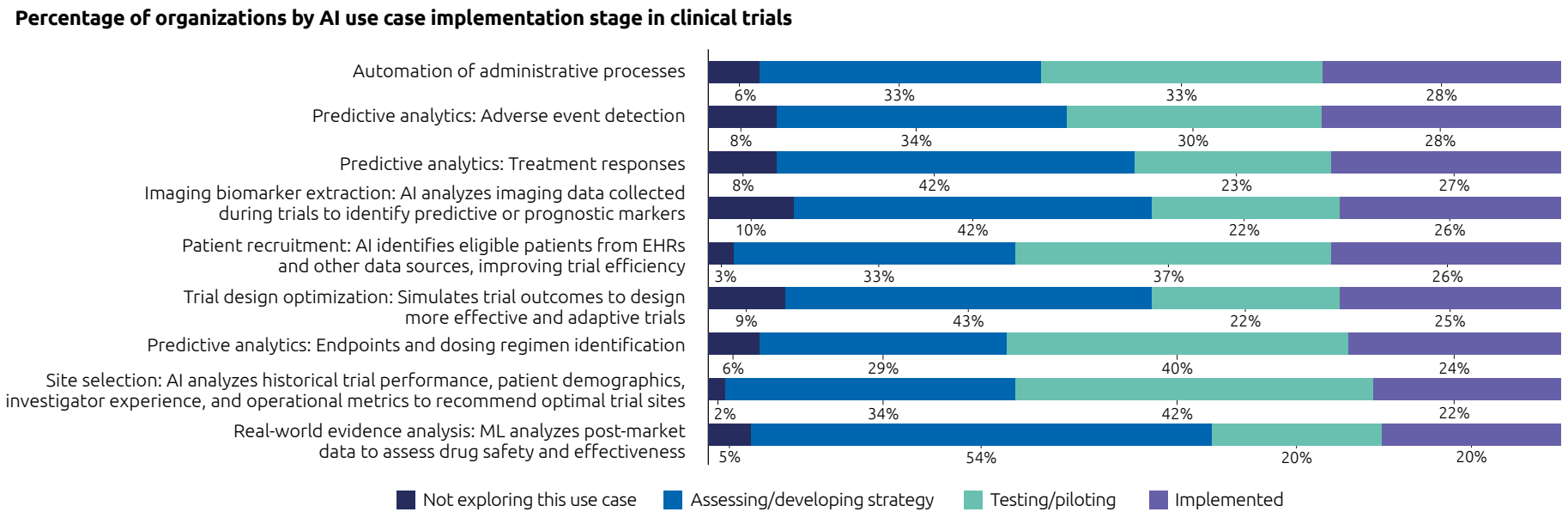


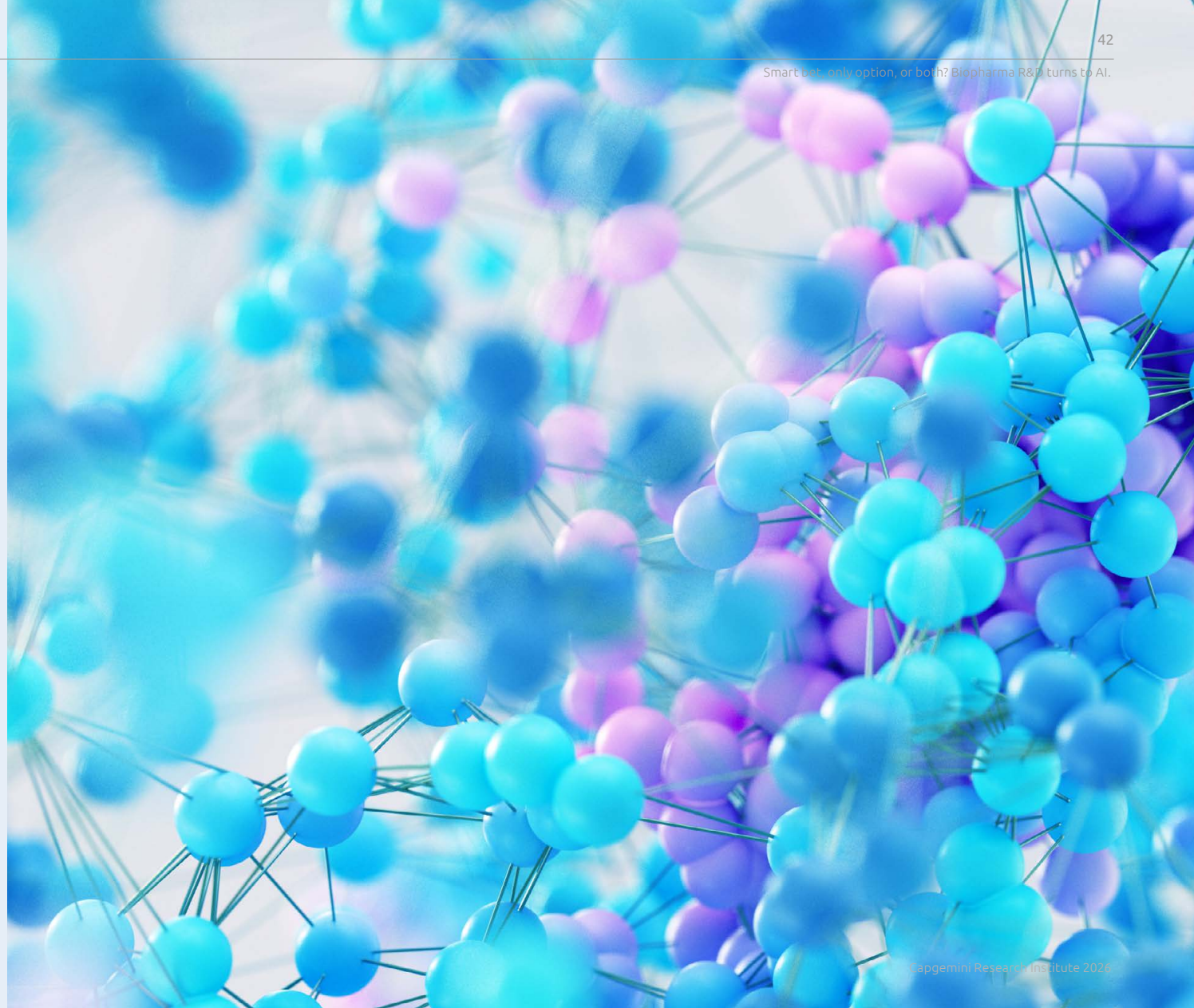
Figure 13.
Nearly three in 10 organizations have implemented AI to automate clinical trial processes and predict adverse events



Source: Capgemini Research Institute, Impact of AI on R&D productivity survey, August–September 2025, N=500 pharmaceutical and biotechnology executives.

CMC/clinical manufacturing

The most commonly implemented AI use case within CMC (chemistry, manufacturing, and controls) and/or clinical manufacturing is predictive maintenance (38%). Early-stage activity is also common in other areas: over a third are piloting AI for supply chain forecasting (37%) and for multivariate analysis for validation (36%) (see Figure 14). If these numbers seem low, that is only in comparison to AI adoption in other R&D phases. As the data in the figure show, over half of companies have implemented or are piloting use cases in five different areas of clinical manufacturing.



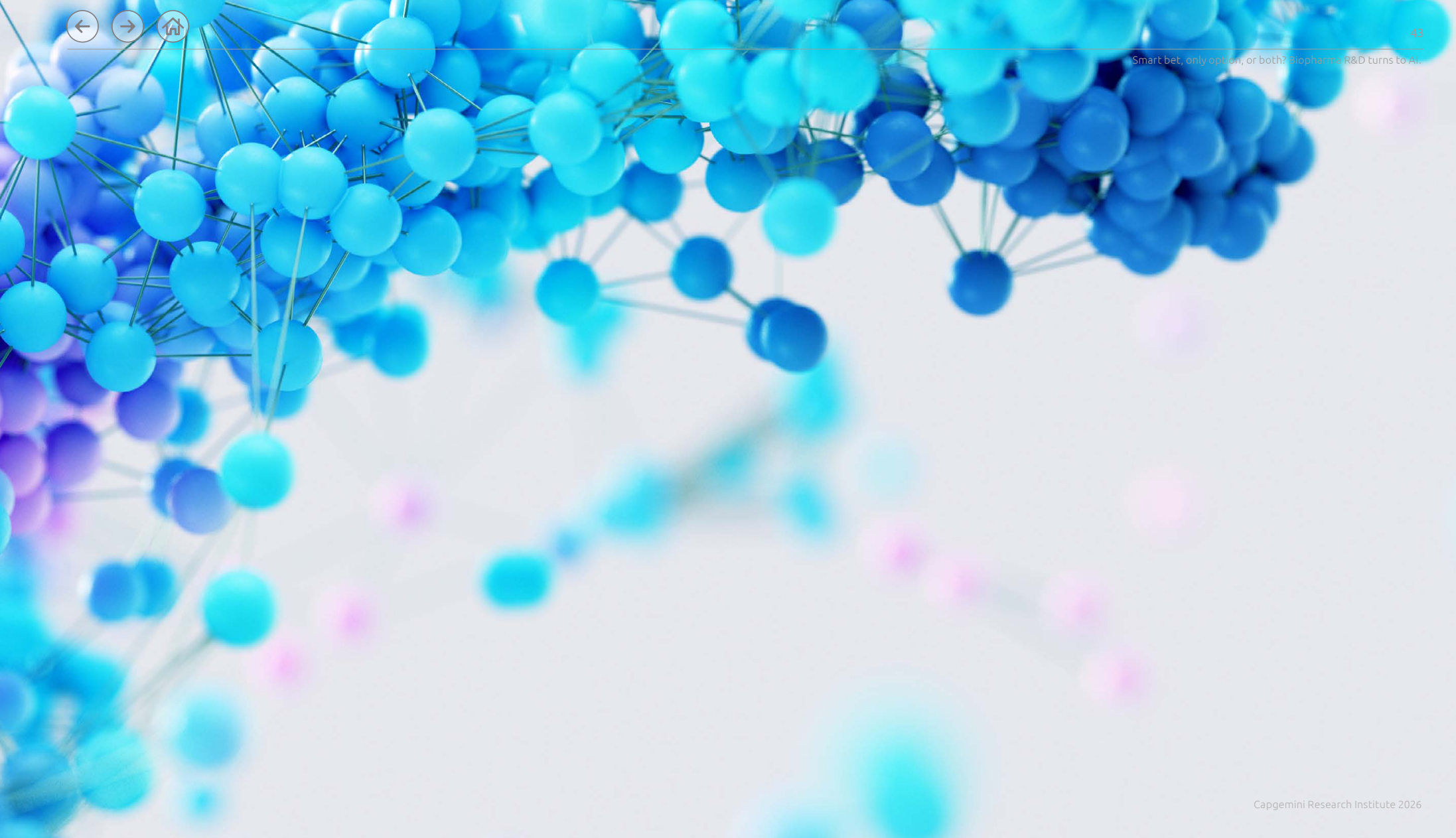
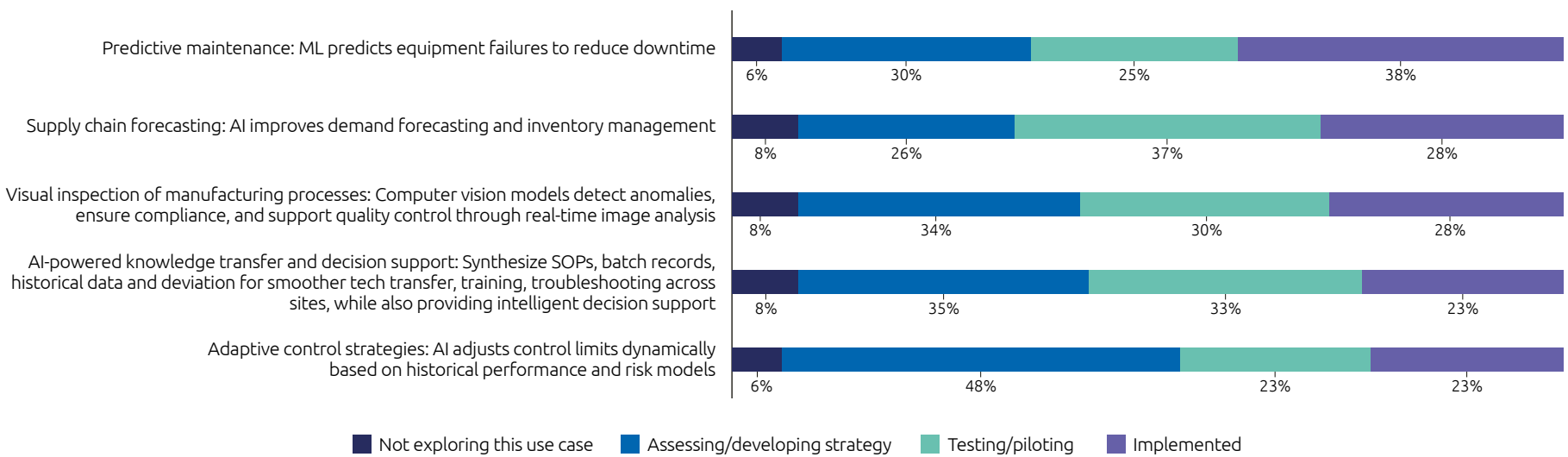


Figure 14 (Part 1).

Nearly four in 10 organizations have implemented AI for predictive maintenance in clinical manufacturing

Percentage of organizations by AI use case implementation stage in CMC/clinical manufacturing



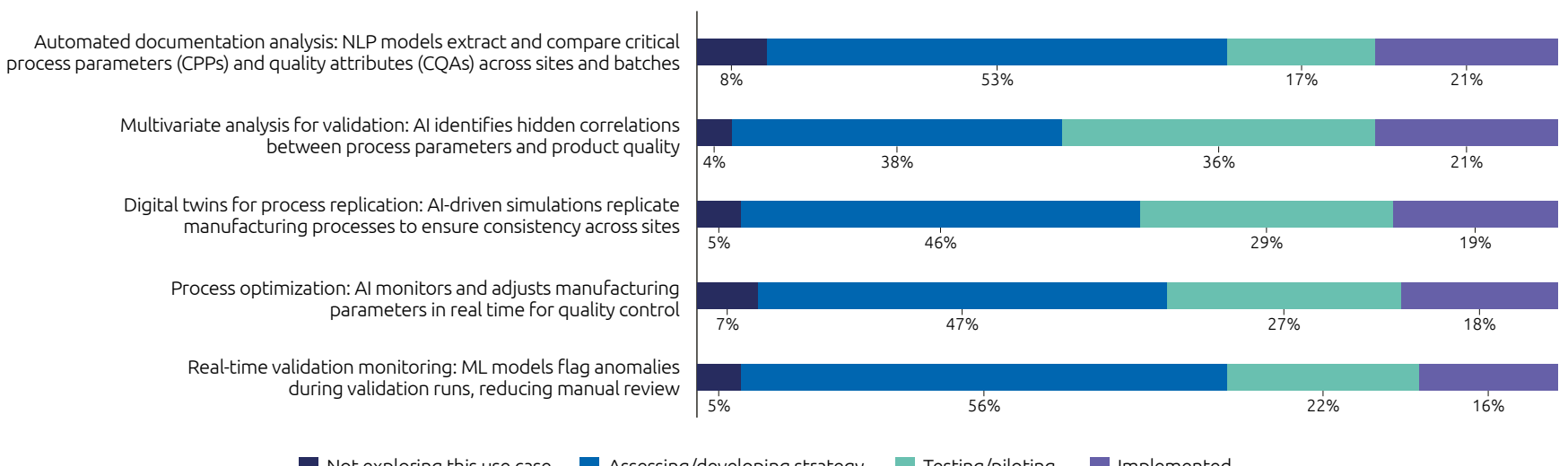
Source: Capgemini Research Institute, Impact of AI on R&D productivity survey, August–September 2025, N=500 pharmaceutical and biotechnology executives.

Continued on next page

Figure 14 (Part 2).

Nearly four in 10 organizations have implemented AI for predictive maintenance in clinical manufacturing

Percentage of organizations by AI use case implementation stage in CMC/clinical manufacturing



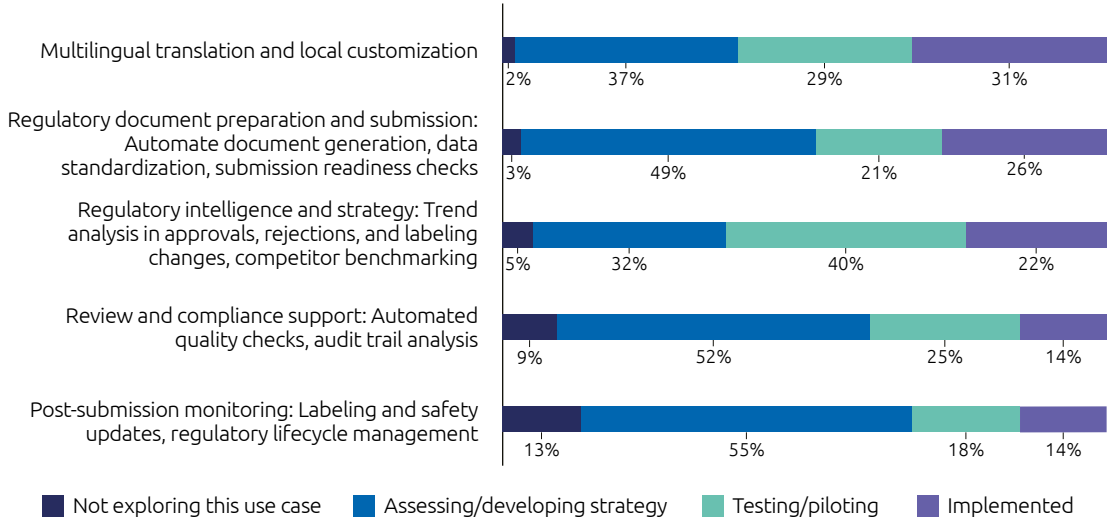
Source: Capgemini Research Institute, Impact of AI on R&D productivity survey, August–September 2025, N=500 pharmaceutical and biotechnology executives.

Regulatory submission/approval

So far, implementation of AI use cases in regulatory matters has focused largely on administrative processes. Of those surveyed, 31% say that their organizations already deploy the technology to support multilingual translation and local customization. Similarly, 26% use it to help with document preparation and submission. Looking ahead, though, a shift toward strategic support is underway. Forty percent of organizations are piloting the use of AI for regulatory intelligence and strategy (see Figure 15).

Figure 15.
Three in 10 organizations have implemented AI to assist with translation and customization in regulatory submission and approval processes

Percentage of organizations by AI use case implementation stage in regulatory submission/approval

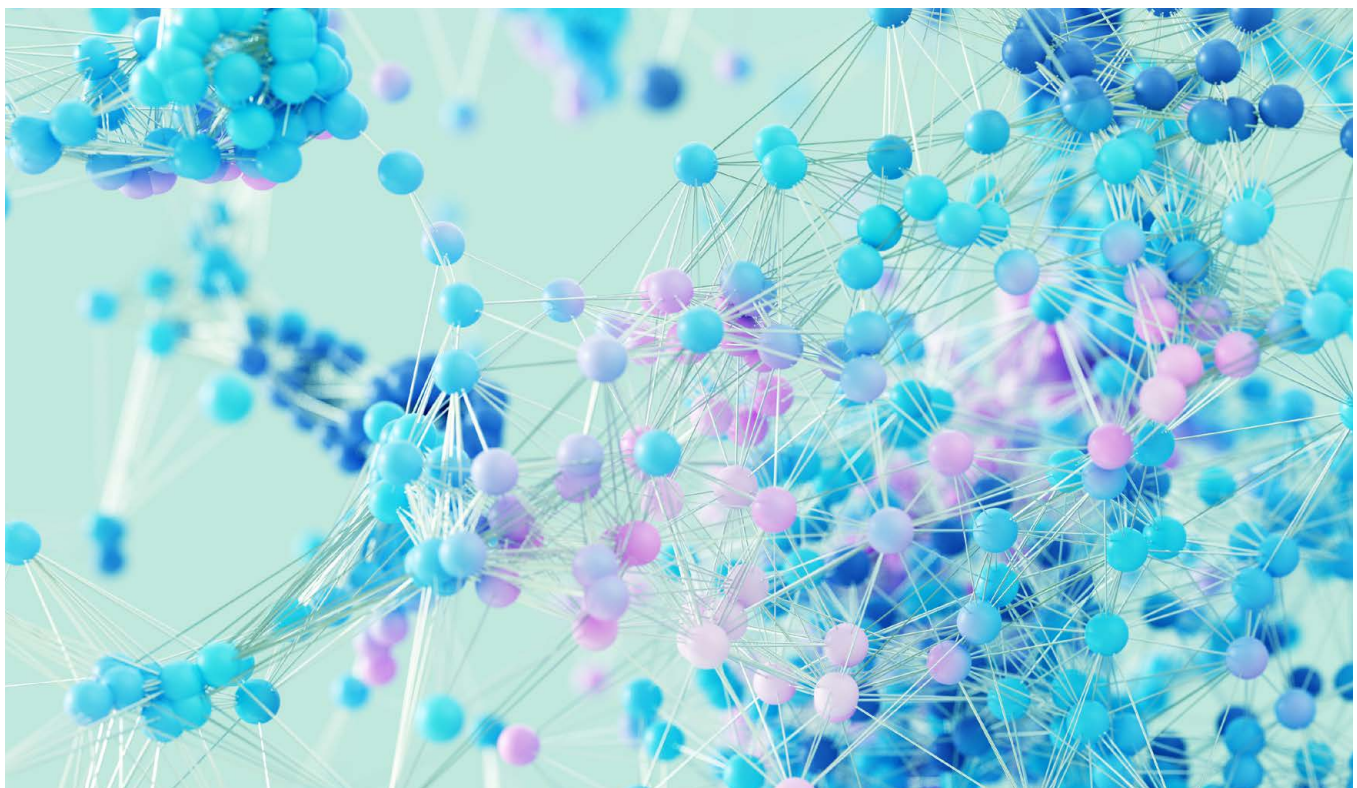


Source: Capgemini Research Institute, Impact of AI on R&D productivity survey, August–September 2025, N=500 pharmaceutical and biotechnology executives.

The value of even these administrative applications should not be underestimated. Of the 129 organizations that have implemented AI for preparing and submitting regulatory documents, 37% are already realizing productivity improvements. The average cut in the time needed for this process is 19%. For example, if it took 12 months pre-AI to complete regulatory documents, after using AI, the timeline shortened to 9.7 months, saving over two months. Eli Lilly, for example, with an external partner, implemented an automated process to draft patient narratives for clinical study reports using natural language generation. In one year, this saved 10,000 hours of writing and reviewing time, allowing teams to focus on more complex, scientific work.[36]

Over a third of biopharma companies have seen productivity improvements from using AI to prepare for regulatory submission;

19% time savings on average.



Insights from a senior biopharma leader at a global pharmaceutical company

Q. What is your company's approach to AI?

We are embedding AI across the company in a smart, purpose-driven way. AI is transforming how we innovate in R&D, optimize business processes and operations, and engage with patients. We have a two-way approach: we form strategic partnerships with leading AI companies and also build internal platforms, talent, and tools. This combination accelerates innovation, allows us to tailor solutions to our needs, and ensures that the expertise we gain is embedded within our company.

Q. What AI use cases are being implemented in R&D?

We are leveraging AI throughout the R&D process. In the pre-clinical phase, AI helps us better understand disease biology and identify promising drug candidates; in the clinical phase, to help target populations and to design intervention studies; and in the development of digital therapeutics and devices to enable continuous monitoring.

Q. How are you preparing your people for AI?

Our people are at the heart of our AI transformation. We invest substantially in upskilling our workforce, ensuring all employees are equipped to use AI in their daily work. Initiatives like the rollout of M365 Copilot and dedicated training programs help build an AI-enabled, future-ready workforce. Human oversight remains essential; our experts are empowered to oversee and interpret AI outputs, ensuring responsible and effective use.

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Source: Capgemini Research Institute interview, September 8, 2025.

04 Barriers to biopharma realizing AI's potential

While executives almost universally foresaw the application of AI across R&D at their organizations, our research highlights a disparity between such expectations and capacity to implement the technology.

Data accessibility and integration are key weaknesses

Our research asked about preparedness across 11 different data elements needed to support AI's use in R&D. For eight of these, fewer than half of respondents believe that their organizations are adequately prepared (see Figure 16).

Those where a majority say they are prepared are, not surprisingly, basic building blocks for AI:

- Data foundations (i.e., having the infrastructure such as data lakes, vector databases, metadata tagging, compute power to support scalable AI applications in R&D)
- Data governance (i.e., ensuring clear policies and oversight for data stewardship, lineage, compliance such as Good [x] Practice [GxP] and HIPAA, and ethical use in AI)
- Data security and compliance (i.e., having robust controls to ensure data integrity, confidentiality, and traceability in line with Good Manufacturing Practice [GMP], GxP, and other regulatory standards for AI-driven R&D).

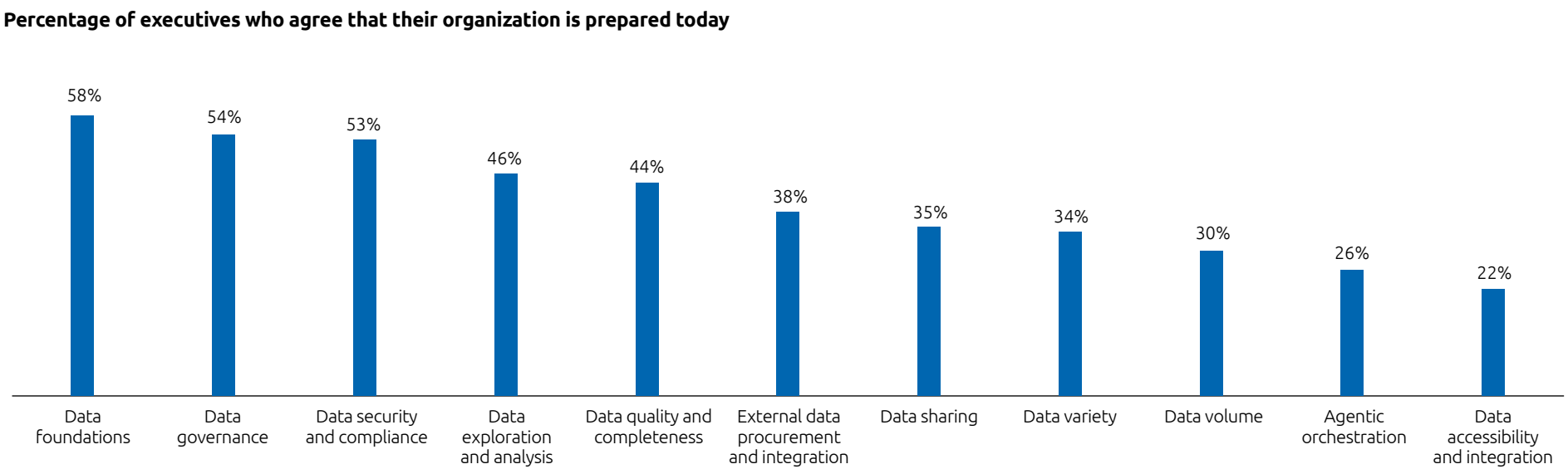
Although most companies seem to have these pieces in place, it remains worrying that, even in such fundamental areas, more than four in 10 executives acknowledge that their organizations are not prepared.

While data quality, volume, and variety are issues for over half of companies, the most widespread issue is data accessibility and integration, where only 22% describe their organization as currently prepared. An executive from a healthcare manufacturer explains that *"a unified data approach is essential for scaling AI, but asset and data source diversity remain significant hurdles, especially for contract manufacturing organizations. Our company's data is often client-owned so we are primarily concerned with how AI is used internally for GMP (Good Manufacturing Practice) decision-making and data sharing."*

Biopharma organizations understand the pressing need to address these weaknesses. Most expect to make extensive investments to rectify deficiencies over the next one to three years. Of surveyed executives, 73% name improved data accessibility and integration as the top priority to support AI-driven R&D. Next comes a strong focus on data security and compliance (65%).

Eli Lilly, to cite one example, is making a significant investment in large-scale, high-quality data accessibility through Lilly TuneLab, an AI platform developed with global tech and AI/ML experts. TuneLab provides biotech firms with access to drug discovery models trained on over $1 billion in proprietary research data, helping unlock scientific insights, enable smarter early decisions, and improve success rates.[37] AstraZeneca, meanwhile, is putting money into stronger data foundations, using AI to drive insights across R&D and enhance IT infrastructure for tracking new solutions. The company is building in-house data products, partnering with external vendors, and has created a cross-value chain to identify key data assets and improvement areas.[38]

Figure 16.
Most organizations are underprepared on data accessibility and integration

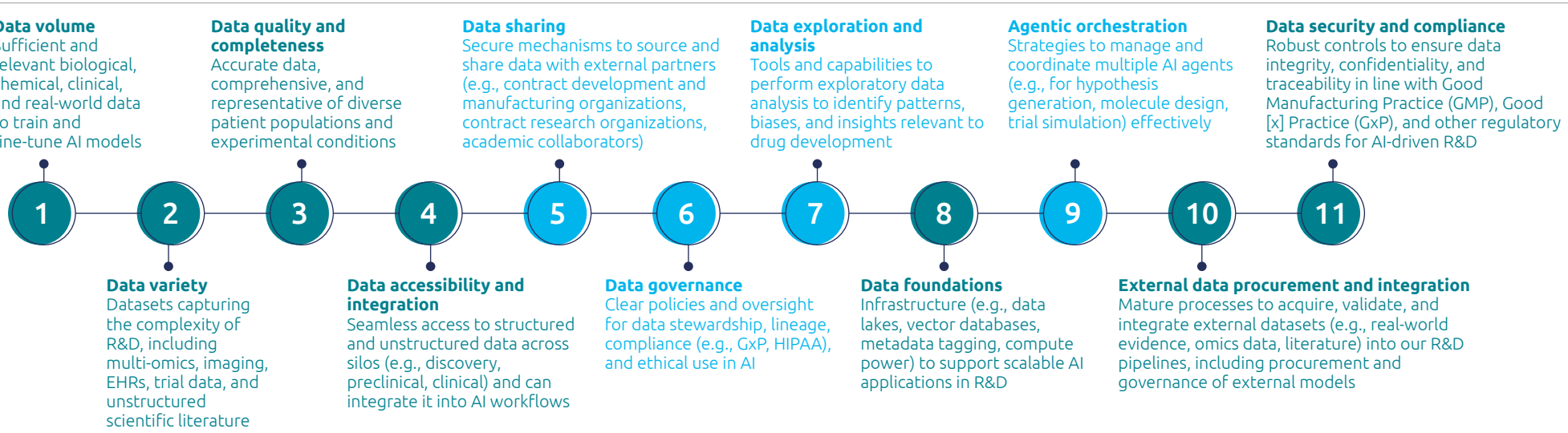


Source: Capgemini Research Institute, Impact of AI on R&D productivity survey, August–September 2025, N=500 pharmaceutical and biotechnology executives.

The industry is at a critical juncture; however, most biopharma organizations are failing to build comprehensive data capabilities

To fully harness AI's potential in R&D, biopharma organizations must be data-ready. Yet, our survey reveals that most organizations lag in critical dimensions of data readiness. Figure 17 highlights the key dimensions essential for unlocking AI's potential in biopharma.

Figure 17.
Critical dimensions essential for unlocking AI's full potential in biopharma



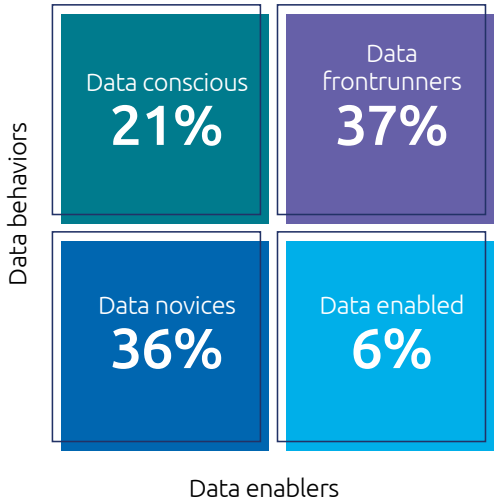
Source: Capgemini Research Institute analysis.

We organized the critical data dimensions into two pillars: 1) data enablers and 2) data behaviors, and assessed the maturity of biopharma organizations in enabling AI in R&D. Our analysis reveals that 37% of organizations qualify as data frontrunners (see Figure 18), actively investing across both pillars and positioning themselves to lead with accelerated innovation cycles, enhanced productivity, and significant cost efficiencies. In contrast, 63% of organizations are lagging on one or both pillars, underscoring an urgent need to strengthen overall data readiness, including technology, tools, governance, skills, and cultural adoption.

63%

of organizations are lagging on one or both pillars of critical data dimensions

Figure 18.
The majority of biopharma organizations need to enhance data capabilities



*The cutoffs for the four quadrants were established based on the average scores for the two axes: data enablers and data behaviors. Frontrunners are those who score above average on both axes.
Source: Capgemini Research Institute, Impact of AI on R&D productivity survey, August–September 2025, N=500 pharmaceutical and biotechnology executives.

Key characteristics of cohorts

Cohort	Description
Data novices	Organizations in this cohort are at an early stage with minimal maturity, and face significant limitations in both technical and cultural dimensions. Their enablers are weak, characterized by limited data availability, fragmented infrastructure, poor integration, and immature compliance processes. Behavioral aspects are equally underdeveloped, with minimal governance, restricted data sharing, and basic analytical capabilities. Consequently, these organizations are only engaged in exploratory efforts with few formalized practices, leaving them far from realizing the potential of AI-driven innovation.
Data enabled	Organizations in this cohort are strong in enablers but evolving in behaviors, and have established a modern technical foundation, including advanced infrastructure, cloud adoption, comprehensive data catalogs, robust security measures, and seamless integration. However, their behavioral aspects such as governance frameworks and data-driven culture are still developing, with limited orchestration and analytics practices in place. As a result, these organizations are technically prepared for AI workflows but require cultural maturity to fully capitalize on their capabilities.
Data conscious	Organizations in this cohort have strong behaviors but limited enablers, exhibiting a solid foundation in governance, ethical compliance, and secure data sharing, with exploratory analytics tools beginning to emerge. However, their technical backbone such as infrastructure, system integration, and external data processes remains in the early stages of development. As a result, these organizations are laying the groundwork for AI adoption but lack the depth and scalability needed to fully realize its potential.
Data frontrunners	Organizations in this cohort are leading across all dimensions, demonstrating both strong enablers and behaviors. On the enabler side, they possess rich, diverse, and high-quality data, seamless integration across systems, advanced infrastructure, and robust security and compliance frameworks, complemented by well-defined external data processes. Their behaviors reflect a culture of robust governance, secure data sharing, exploratory analytics, and effective orchestration of AI agents. Together, these capabilities enable scalable AI-driven R&D and foster continuous innovation, positioning such organizations at the forefront of biopharma transformation.

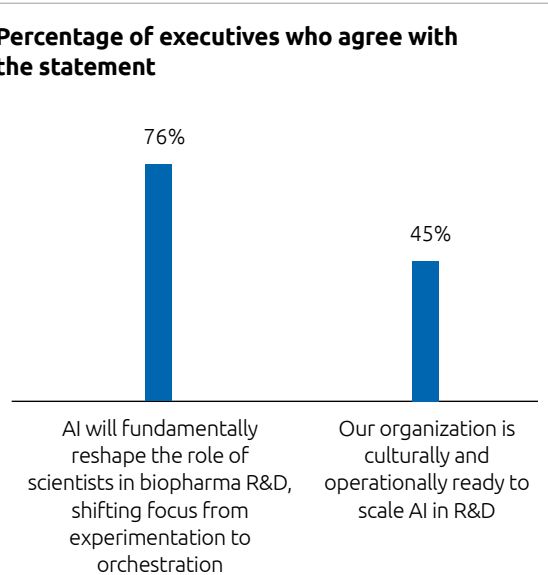
Few organizations are operationally ready to scale AI

A significant majority of executives (76%) believe that AI will reshape the roles of scientists in R&D; however, under half (45%) agree that their organization is culturally and operationally ready to scale AI in R&D (see Figure 19). Bigger companies appear to be taking the lead: 62% of respondents at companies with $20 billion or more in revenue say that their organizations are ready to scale the technology.

45%

of respondents agree that their organization is culturally and operationally ready to scale AI in R&D

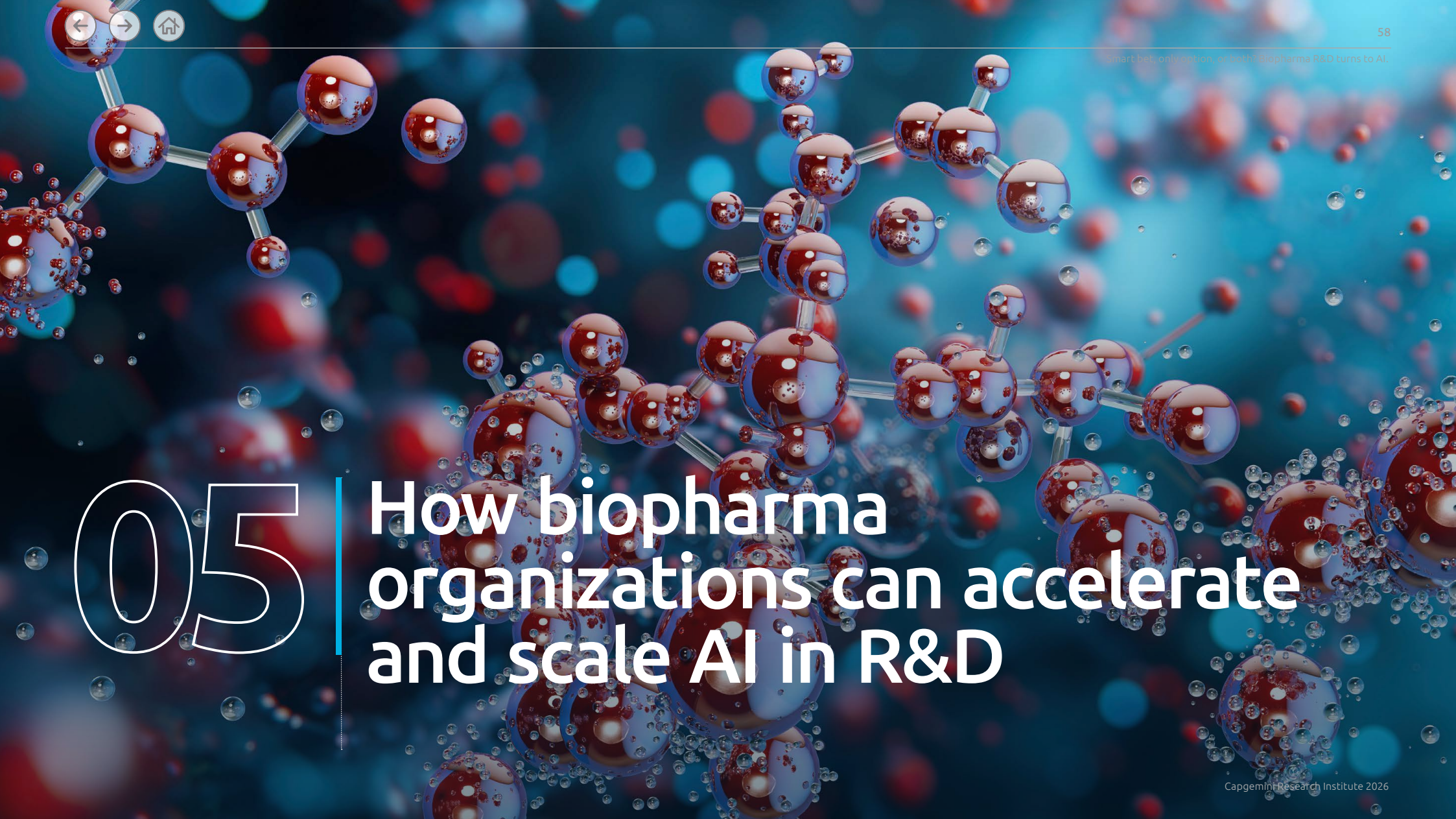
Figure 19.
Fewer than half of organizations agree they are ready to scale AI in R&D



Source: Capgemini Research Institute, Impact of AI on R&D productivity survey, August–September 2025, N=500 pharmaceutical and biotechnology executives.

Getting culture right is crucial because AI requires people to make it work properly – a point sometimes lost amid talk of technological advances. Ron Weathermon, Head of Medical Affairs Strategy at Teva, explains, *"There is an ongoing need for human oversight in drug development. While AI can accelerate data modeling and patient journey mapping, human input remains essential for understanding patient needs and validating models."*

AstraZeneca's change management approach has been to partner with different groups of employees and seek top-down support. The company holds "mini-SCOPEs," knowledge sharing sessions to showcase different use cases and technologies. Learning modules and accreditation are also offered to employees at the gold, silver, and bronze levels to encourage them to continuously upskill on AI.[39]



05 How biopharma organizations can accelerate and scale AI in R&D

Based on the results of our primary research, key practices that distinguish data frontrunners, and our experience working on the ground in partnership with biopharma organizations, we share five key recommendations to help accelerate the adoption and scaling of AI. Broadly speaking, organizations must think beyond short-term use cases and consider how AI is enabling and reimagining the entire industry in the longer term.

1 Ensure top-down support with senior leadership buy-in

Many interviewees stressed the importance of a clear signal from senior leaders about the high priority they give to using AI to improve every aspect of R&D. In fact, nearly half (47%) of biopharma data frontrunners believe their organization will not be able to discover new therapies without the use of AI within the next five years, compared to 35% of data novices. To achieve meaningful results, leadership must provide specific guidance, realistic timelines, and sustained support to cross-functional teams working in this area. Senior executives should also foster a culture that embraces experimentation, collaboration, and continuous learning. Several interviewed experts see support from the top as essential for success in deploying and scaling AI. A senior executive from a biopharmaceutical company says, *"Our AI strategy has advanced quickly thanks to support from the board and leadership. Strong top-down leadership and centralized decision-making are crucial for speeding up AI adoption."*

A senior executive from a global pharmaceutical company, *"Scaling AI typically starts with experimentation and requires top-down support for investment and process redesign."*

Those in top corporate roles can drive AI adoption better if frontline employees keep them informed. Teams, by clearly communicating how AI can drive innovation, improve productivity, and enhance competitiveness, can shift leadership focus from immediate profitability to sustained value creation. Ways to do so include presentations on topics such as use cases, pilot outcomes, and industry benchmarks that demonstrate tangible impact. Encouraging open dialogue and sharing insights from cross-functional teams helps build trust and alignment.

2 Assess organizational risk profile and define clear goals

A comprehensive risk profile for AI adoption should move beyond technical risks and encompass ethical, regulatory, and strategic considerations throughout the entire R&D value chain. A risk position should be established based on the unique culture of the organization. That culture shapes the risk position by influencing a company's willingness to take risks, its ability to identify and respond to threats, and its overall approach to risk management. For example, a culture built on transparency and accountability fosters better decision-making, adaptability, and proactive risk management. A risk-averse culture, or even a high-risk culture, can lead to overlooking risks or taking on too much, with all the possible attendant damage.

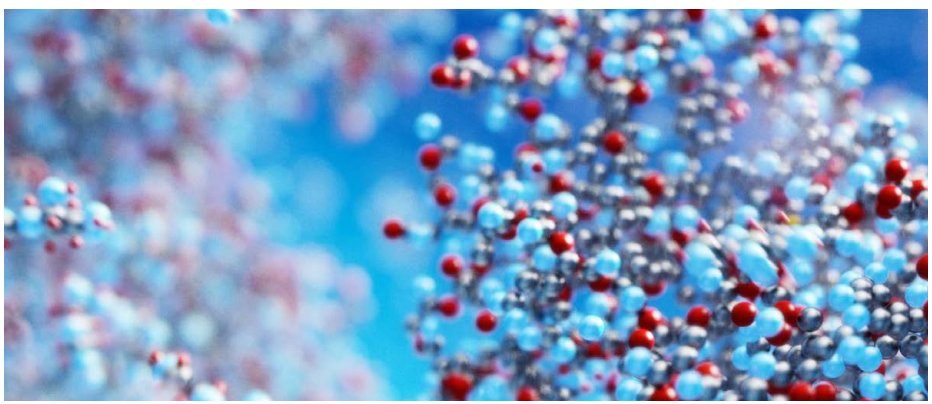
Our research reveals that only 15% of biopharma data frontrunners believe the risk of implementing AI outweighs its current benefits to their R&D pipeline, compared to over a third (34%) of data novices. A potential explanation could be that biopharma data frontrunners perceive AI risks as manageable because they have the infrastructure, governance, and cultural readiness to mitigate them – while data novices see those same risks as barriers due to poor data foundations and limited organizational preparedness. This is further evidenced in our finding that 70% of data frontrunners have established ethical guidelines specifically tailored to the use of AI in R&D, compared to 49% of data novices.

To realize the full potential of AI, organizations must develop a culture of innovation and cross-functional collaboration which, according to Ron Weathermon of Teva, *"encourages experimentation and learning from failure."* Setting and defining clear, culturally aligned goals is also critical. For example,

perhaps a more risk-averse culture will focus on AI use cases considered "quick wins" such as summarizing study results, drafting protocols, or extracting key findings from research papers. A more risk-tolerant culture may focus on innovative, higher investment, higher-value use cases such as designing entirely new molecular entities. Ron Weathermon of Teva recommends that *"Organizations start with small, validated AI interventions and scale gradually, not rapid, large-scale implementations without clear objectives and validation."* Executives should also appreciate that AI can help lower risk levels if deployed properly. A senior executive from a global pharmaceutical company advises that AI can *"identify outliers and harmonize processes."*

70%

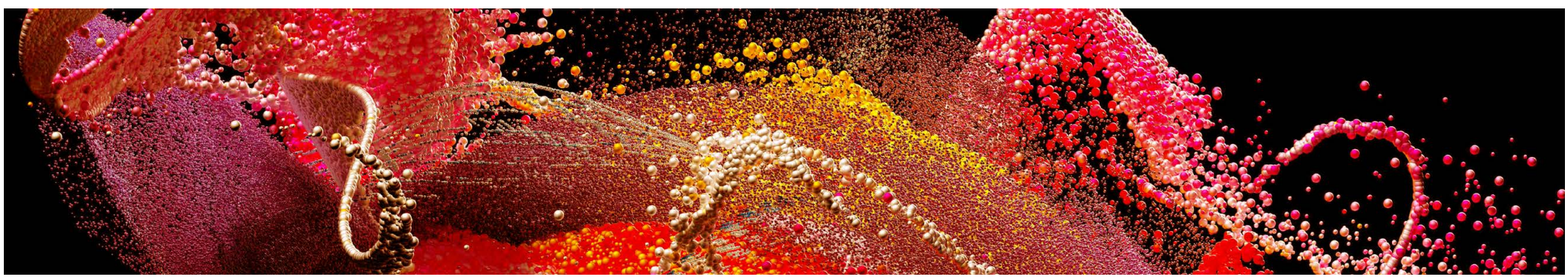
of data frontrunners have established ethical guidelines specifically tailored to the use of AI in R&D



3 Balance building core AI capabilities with strategic partnerships

Biopharma organizations should build AI and data platforms internally in order to establish the foundation, as well as to own the infrastructure and knowledge needed to gain long-term strategic advantage from AI. Necessary assets relevant here typically include unified data lakes that integrate omics, clinical, and real-world data; in-house engineering teams focused on data engineering; model validation, and clinical integration; as well as AI governance and ethics frameworks to ensure compliance and trust.

Alexandre Malouvier of ICON plc believes that doing certain activities in house is non-negotiable: *"Organizations must establish a centralized AI governance structure, ensure ethical, explainable, and responsible AI use, and maintain oversight to prevent unauthorized AI deployments."* That said, organizations can partner with others for acceleration and specialization. Possible areas are working with AI-native firms for generative chemistry and molecule design or clinical trial optimization and patient stratification. Such collaboration gives access to specialized technology and expertise faster than a company could develop them internally.



4 Build a data- and digital-savvy workforce

Biopharma organizations need diverse and specialized skill sets across the R&D value chain, from clinical scientists and researchers to talent skilled in medical and regulatory affairs. In all these domains, critical skills for R&D talent include:

- Core technical and data science skills (e.g., ML/DL, data engineering, computational modeling, statistics)
- AI application skills (e.g., use case framing, model deployment, automation and robotics, LLMs)
- Data privacy and IP management
- Model transparency/explainability
- Ethical AI (e.g., awareness of bias, reproducibility, sustainability)
- Interdisciplinary collaboration and communication (e.g., across scientists, engineers, and data specialists)
- Change leadership/mindset
- Storytelling (e.g., communicating AI insights to non-technical audiences)
- Systems thinking (e.g., understanding how AI fits into the broader R&D ecosystem)
- Curiosity and experimentation (e.g., eagerness to test, learn, and iterate rapidly).

Interestingly, a slightly higher share of biopharma data frontrunners (59%) require their R&D staff to complete training in AI ethics, with a focus on pharmaceutical applications, compared to data novices (51%).

To succeed, an executive from a healthcare manufacturer believes companies need *"people who bridge science and digital domains. Team members who can translate between scientific/process and digital/data domains are incredibly valuable. There is an expectation that the proportion of data architects, engineers, and digital specialists will increase relative to traditional roles."*

As AI takes on more routine, manual tasks, biopharma talent can focus on higher-value, creative roles. A senior executive from a global pharmaceutical company says, *"AI will elevate scientists' decision-making by automating routine tasks, allowing experts to focus on complex deviations and oversight. Emerging skill requirements include prompting skills and expertise in building and curating data models as increasingly important, alongside collaboration between technical experts and experienced scientists."*

59%

share of data frontrunners who require their R&D staff to complete training in AI ethics

5 Advocate for organizational data readiness and industry data standards

To unlock the full potential of AI in biopharma R&D, organizations must address two critical areas: internal data preparedness and industry-wide data standardization.

Ensuring organizations are "data-prepared" internally is critical to realizing the potential of AI. Our research reveals that biopharma data frontrunners are further along in their AI in R&D journeys than data novices. Nearly a quarter (24%) of data frontrunners are actively executing on their strategy and roadmap for AI in R&D, and 58% are finalizing their AI in R&D strategy and are preparing for implementation. This compares to only 1% of data novices who are finalizing their strategy, and no data novices are at the most mature stage of implementing their AI in R&D roadmaps.

AI thrives on high-quality, well-structured, and interoperable data. Without robust foundations, even advanced models will underperform. Biopharma R&D generates vast volumes of heterogeneous data – clinical, genomic, imaging – often siloed across systems. Data readiness requires:

- Quality and integrity: rigorous processes for cleaning, validating, and curating data
- Interoperability: architectures that enable integration across internal platforms and external partners
- Rich metadata: contextual tagging for accurate AI interpretation
- Scalable infrastructure: cloud or hybrid environments for large-scale data ingestion and processing
- Governance and compliance: frameworks to meet regulatory requirements and maintain trust.

Equally important is industry-wide data standardization. There is no single standard that covers all of biopharma R&D today. Instead, multiple well-established, domain-specific standards exist, some mature and widely adopted with others still emerging. Shared standards, though, would allow information to flow seamlessly between organizations, CROs, regulators, and AI partners. Thus, by advocating for and contributing to the development of unified data

"Team members who can translate between scientific/process and digital/data domains are incredibly valuable. There is an expectation that the proportion of data architects, engineers, and digital specialists will increase relative to traditional roles."

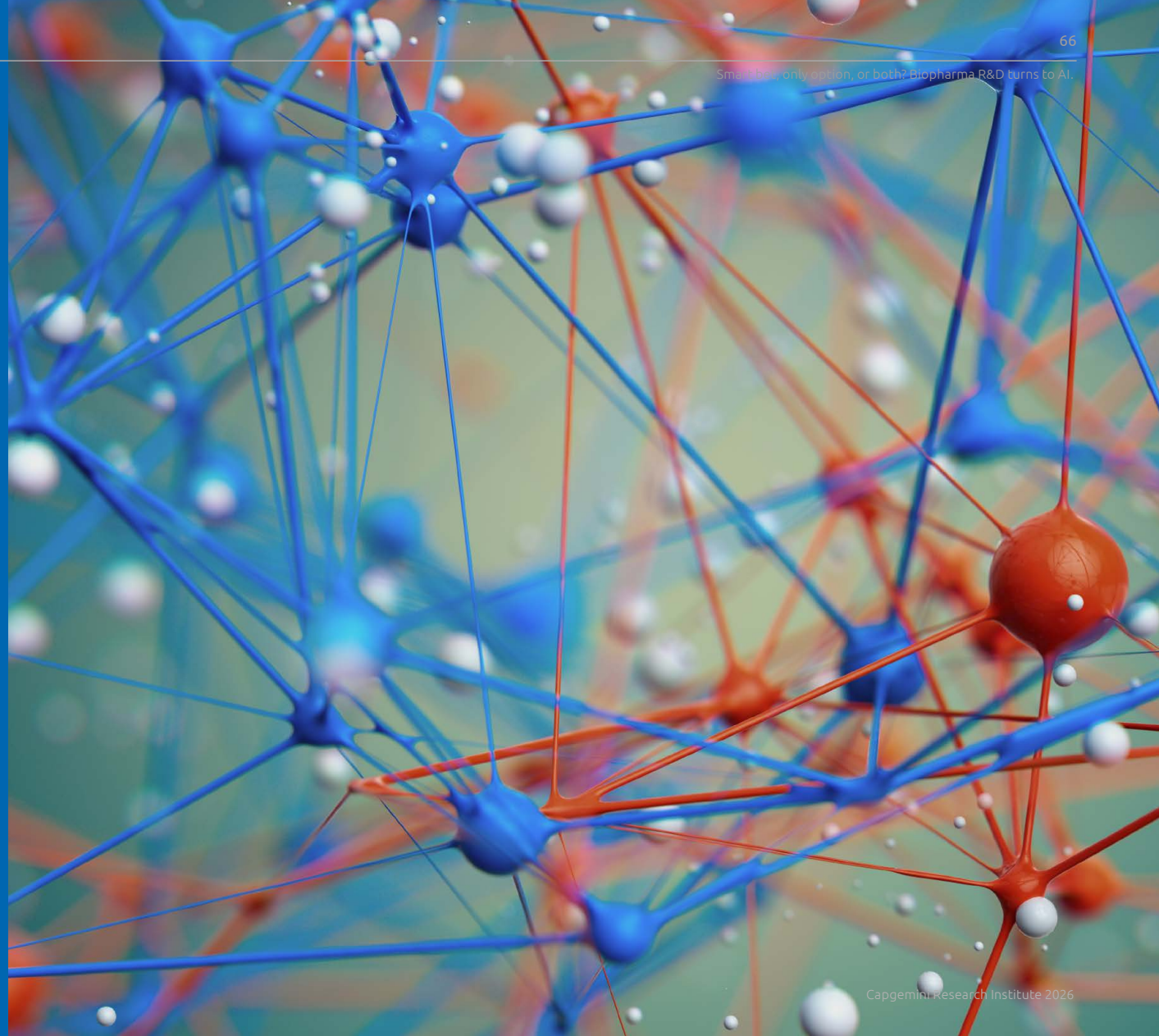
An executive from a healthcare manufacturer.

standards, organizations can accelerate AI adoption, reduce duplication of effort, and improve the quality and consistency of insights generated. Establishing common ground in data governance will also enhance trust, transparency, and scalability of AI across the industry. As the global head of medical strategy at a Swiss pharmaceutical company puts it, *"There is a critical need for industry-wide collaboration for AI to successfully transform R&D and shorten cycle times."* An executive from a healthcare manufacturer describes the long-term possibilities: *"Digitalized tech transfer, where it is highly automated, with bots handling tasks currently performed manually by scientists, transforming the CRO business model. Achieving industry-wide data standards, such as a commonly adopted data lake strategy, is essential for realizing AI's full potential."*

Organizations that prioritize both internal data readiness and industry collaboration on standards will accelerate AI deployment, unlock predictive and prescriptive insights, and transform R&D efficiency – ultimately reducing cycle times and improving patient outcomes.

Conclusion

The biopharma industry is undergoing a profound transformation. AI is rapidly emerging as the cornerstone of innovation across the R&D value chain, and in the longer term will drive reinvention and reimagining of the entire industry. It is enabling biopharma organizations to address long-standing, increasingly unsustainable challenges such as productivity declines, slower speed to market, and development inefficiencies. However, realizing AI's full potential will require more than technological adoption; the technology demands a strategic foundation built on robust data infrastructure, operational readiness, and cultural alignment. This shift will not happen overnight, as many organizations are still building the necessary capabilities. Senior leadership commitment, clear goal setting, and a balanced approach to internal development and external partnerships will be critical. As biopharma organizations mature, AI will evolve from a supportive tool to a strategic partner, helping to steer the next generation of R&D breakthroughs and positioning early adopters to lead in AI-driven transformation.



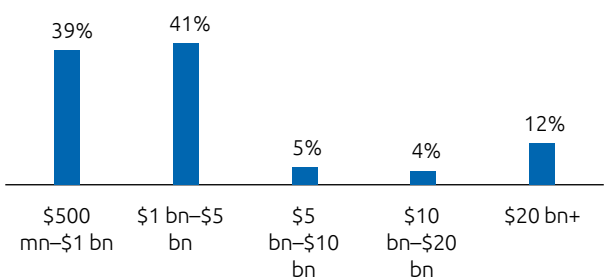
Research methodology

This publication draws on a multifaceted research program designed to shed light on the strategy and maturity of biopharma organizations in adopting AI in R&D. It included a specially commissioned survey of 500 executives from 250 organizations headquartered across nine leading markets in Asia-Pacific (26%), Europe (30%), and the United States (44%). Over 60% of respondents work for companies with annual revenue greater than $1 billion, with the remainder having revenues between $500 million and $1 billion. Over half (56%) of organizations are in the pharmaceutical sector, 26% are biotechnology companies, with the rest involved in both parts. Nearly half (46%) of executives are in a role that is clinical- and digital/technology-oriented. The survey took place in August and September 2025.

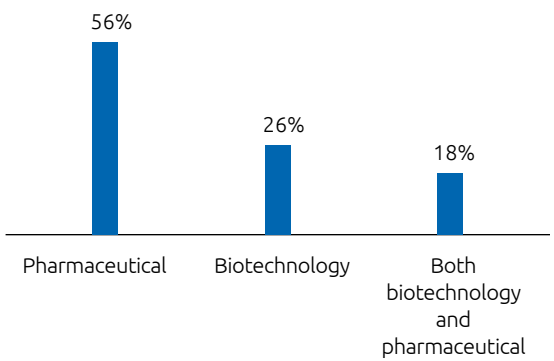
The survey also benefits from interviews with 15 senior executives at leading biopharma organizations, as well as extensive desk research.

The study findings reflect the views of the interviewees and of the respondents to our online questionnaire for this research and are aimed at providing directional guidance. Please contact one of the Capgemini experts listed at the end of the report to discuss specific implications.

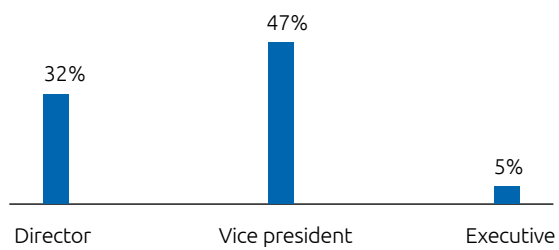
Percentage of biopharma executives by their organizations' annual revenue



Percentage of biopharma executives by subsector

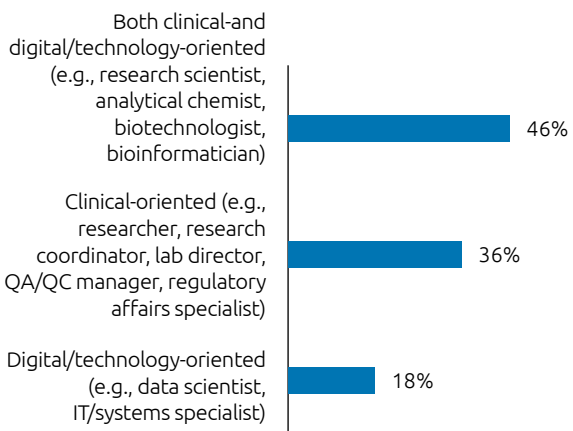


Percentage of biopharma executives by job title

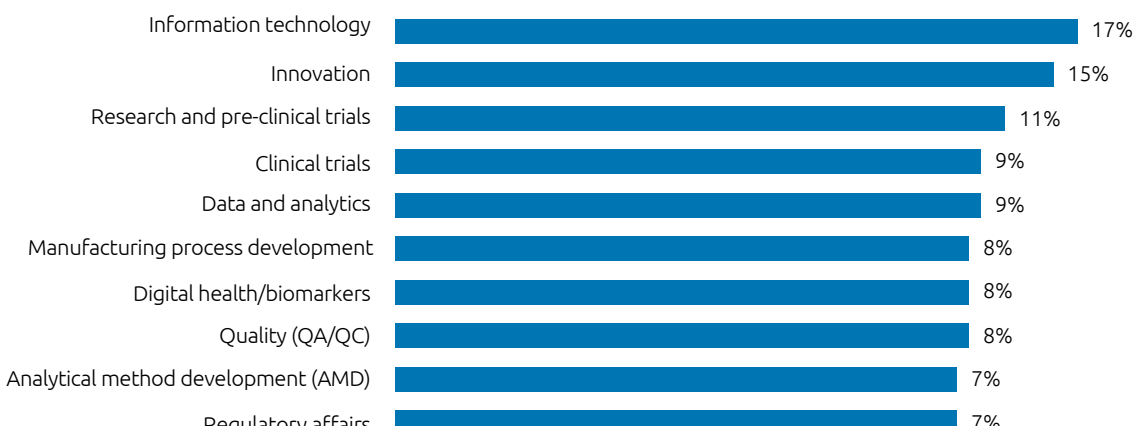


Source: Capgemini Research Institute, Impact of AI on R&D productivity survey, August–September 2025, N=500 pharmaceutical and biotechnology executives.

Percentage of biopharma executives by primary role

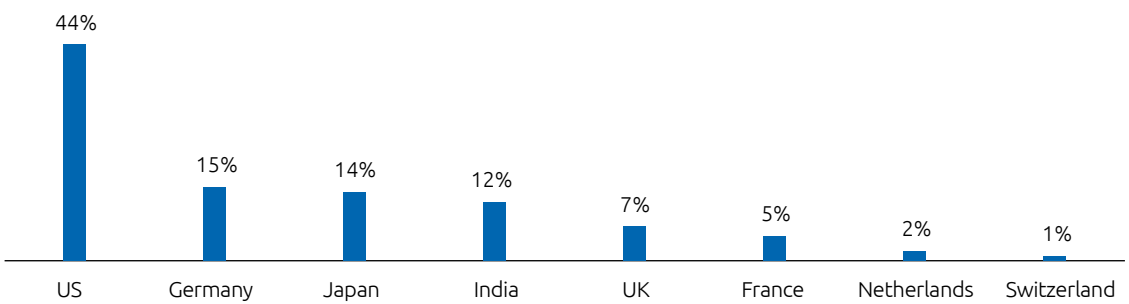


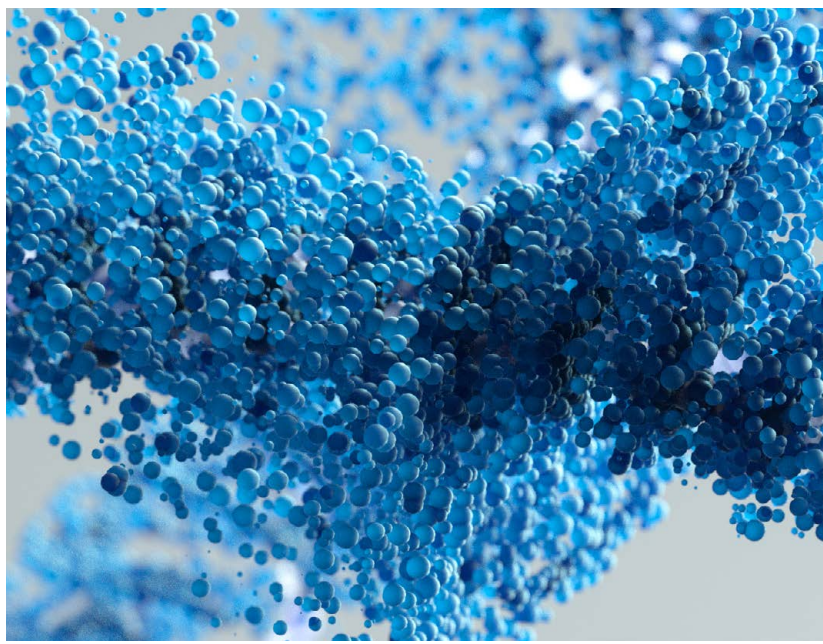
Percentage of biopharma executives by function



Source: Capgemini Research Institute, Impact of AI on R&D productivity survey, August–September 2025, N=500 pharmaceutical and biotechnology executives.

Percentage of biopharma executives by their organizations' country of headquarters





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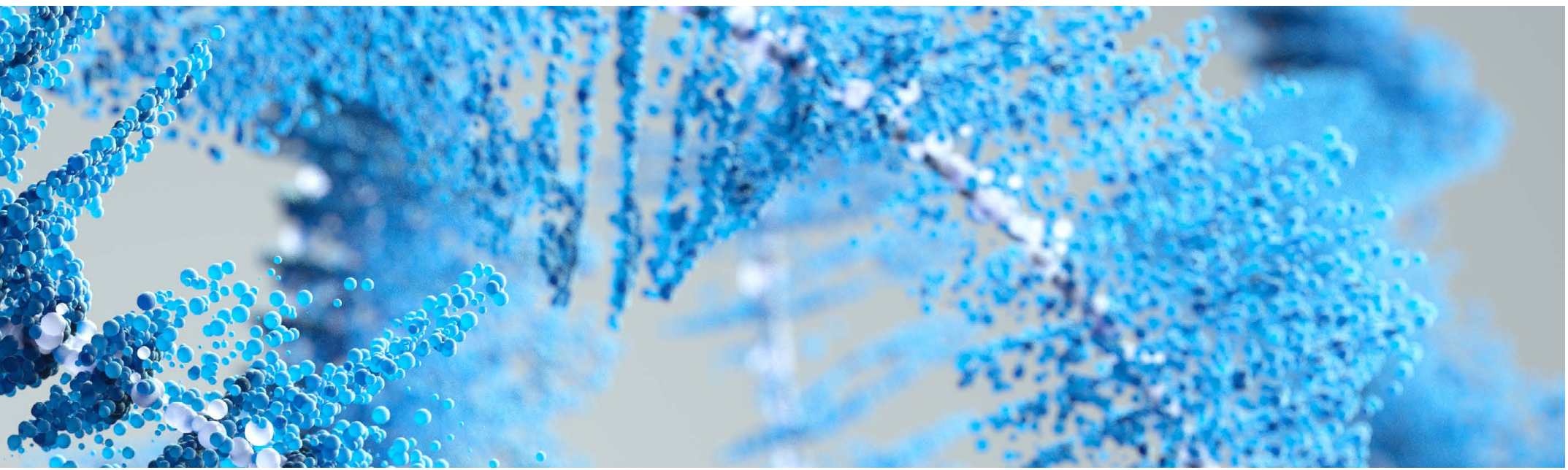

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Meet the experts

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With more than 15 years of industry experience, Thorsten is responsible for globally setting and executing Capgemini's strategy in life sciences as well as working with key clients on their business transformation toward leveraging data, artificial intelligence, and technology at scale. He has always been driven by the goal to achieve better care for more patients more quickly around the globe.

Combining his longstanding work experience in professional services and in the pharma industry, Thorsten brings together his deep understanding of industry, business strategy, and hands-on execution to drive tangible value generation across the life science value chain. He drives value at enterprise level and within specific focus areas including clinical development and marketing and sales. Prior to Capgemini, he held various senior positions at Novartis. As Senior Vice President of Digital Transformation and Innovation, he led the digital function, developed and implemented high-risk, high-return strategic innovation initiatives, and was responsible for business development and partnerships in the digital space.

Brian Eden
Vice President, Global Life Sciences, Capgemini
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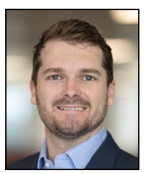
Brian has three decades of operations transformation, management consulting, and leadership experience. He has developed and led global Lean and Digital programs, consistently recruiting and developing a diverse array of talent, and has led global business integrations, executed a range of process and product programs, and directly supervised operations of technical processes.

Brian's experience extends to government, public and private sectors, and to the pharmaceutical, medical device, energy, consumer products, and food processing industries. He is a Certified Master Black Belt, Change Management Expert, Lean Expert, GE trained executive, Veteran US Naval officer, and certified Nuclear Engineer



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Justin is an experienced leader at the intersection of computational and biological sciences, focused on applying emerging technologies to life sciences R&D. With over 12 years of experience, he has successfully led cross-disciplinary teams, driving value through product management, generative AI strategies, and AI-powered drug development.

Justin's recent work includes projects on mRNA vaccine data, electronic lab notebooks, and portfolio management for early-stage R&D. Recognized among the top 100 solution architects at a leading AI advisory firm, Justin combines deep expertise with a collaborative approach to solving complex R&D challenges. Passionate about using technology for real-world impact, he is dedicated to helping life sciences organizations optimize their innovation processes and improve patient outcomes.

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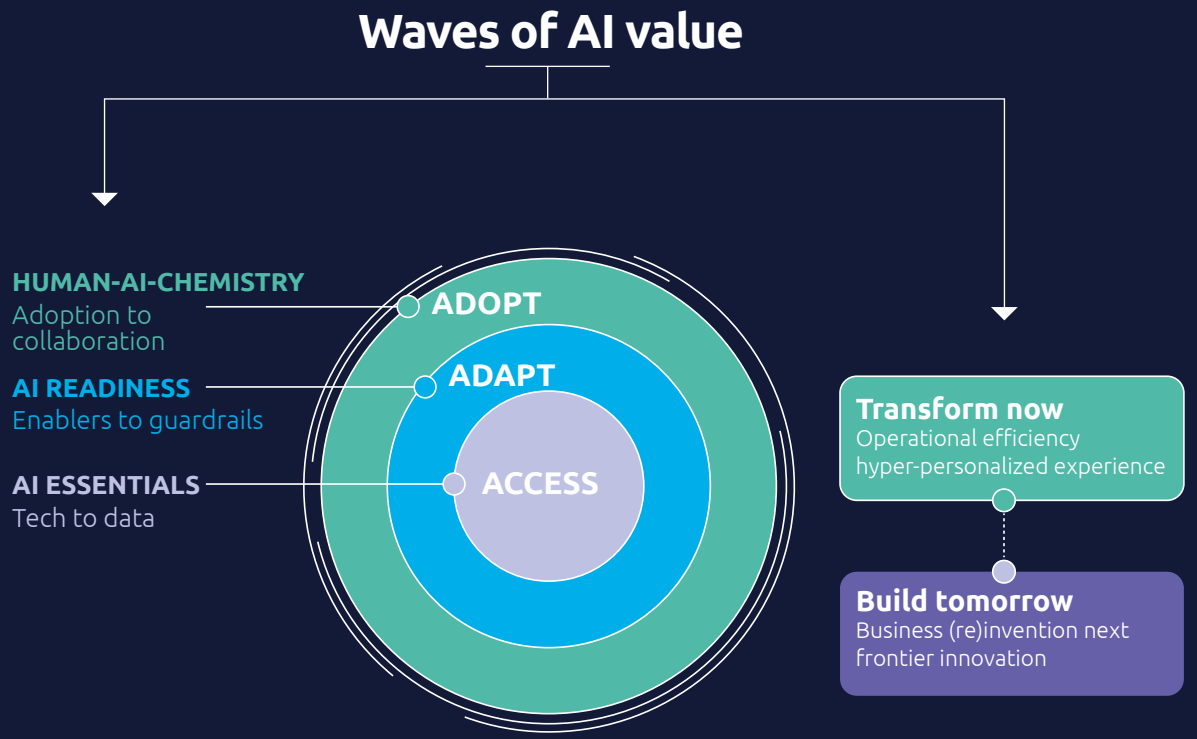
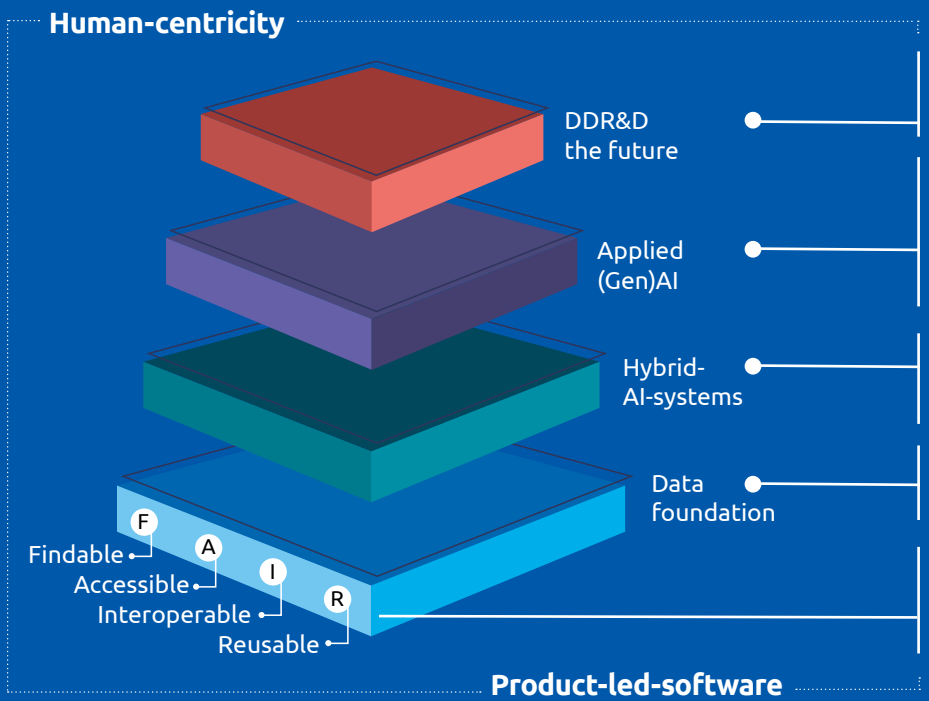
The Resonance AI framework by Capgemini

The Resonance AI framework by Capgemini provides a sequential approach to the conceptualization, structuring, and implementation of successful AI-driven transformation. It helps business leaders realize AI's potential and achieve market leadership regardless of the industry. Anchored in transformation strategy, the framework helps integrate operations and culture while accelerating AI value creation – to both transform today and build for tomorrow.



Delivering AI at scale for life sciences

What it takes to do truly data-driven R&D of the future



Application of mathematical modelling, quantum computing and machine learning to simulate complex molecular interactions with unprecedented accuracy, providing insights that classical technologies cannot achieve improving speed to market and probability of candidate success

Specialized GenAI toolsets that would augment scientific teams by being:

- **Knowledge-based:** understanding the scientific context
- **Specialized reasoning:** generates new formulations and even suggest how to produce them
- **Verified:** leverages scientific knowledge models to validate outputs against norms and standards

Combining different types of **AI** and **non-AI technologies** to create tools that empower research teams to use data to develop new drugs and therapies, improve clinical trials and bring them to market in a fast and sustainable manner.

Your data foundation covers People, **Processes and Technology**. It supports building a common understanding that data is a business asset and defining a structured framework to support research goals where good data practices permeate the entire organization.

Product-led software drives business model innovation by leveraging existing assets - human energy and data - to unlock new capabilities. It transforms experience into products through a data-first, digital native approach, augmented by digital (GenAI) coworkers to accelerate feedback loops and ensure continuous value delivery.

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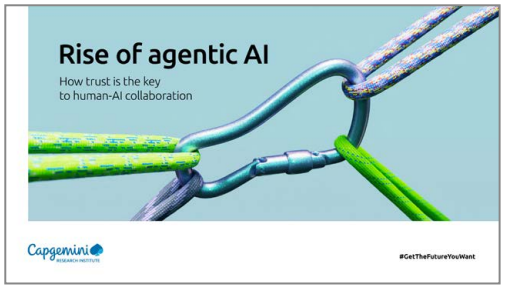
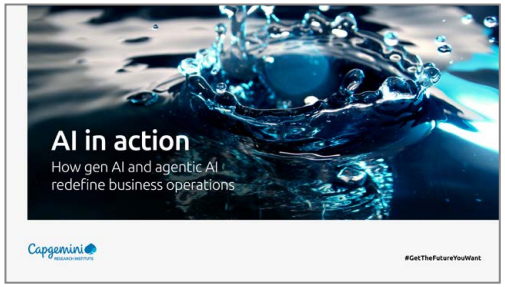


Rise of agentic AI



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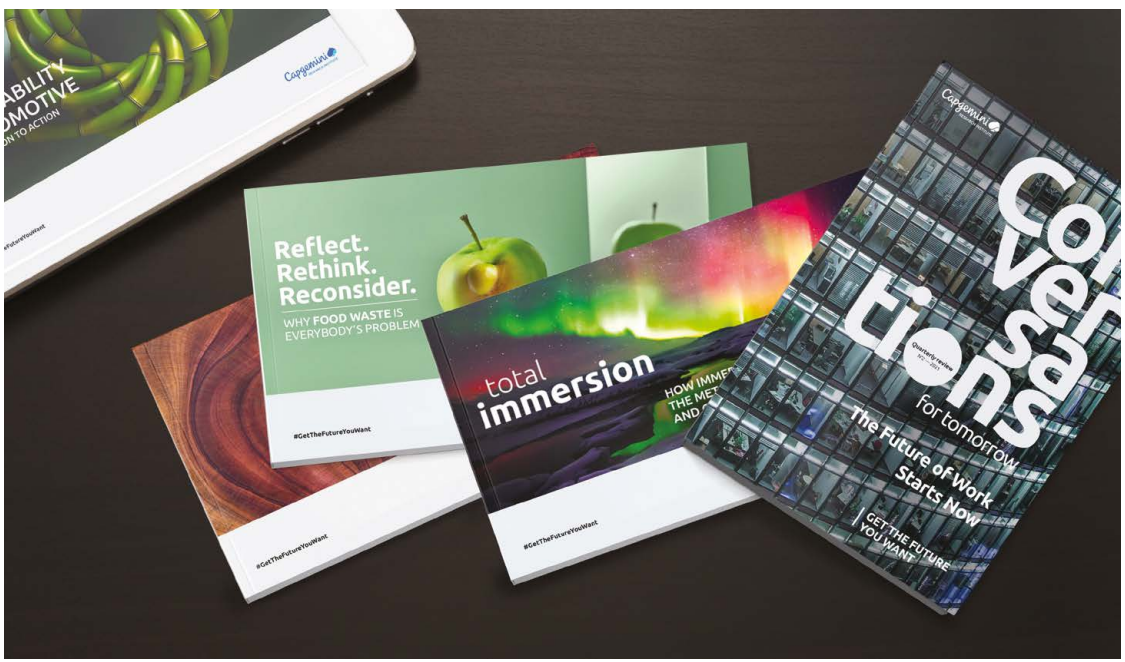

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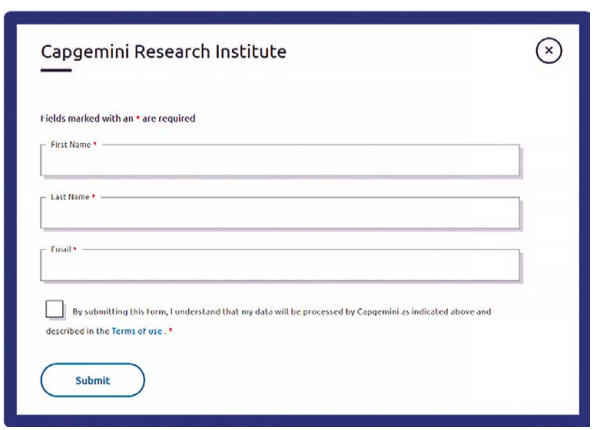

Notes

About Capgemini

Capgemini is an AI-powered global business and technology transformation partner, delivering tangible business value. We imagine the future of organizations and make it real with AI, technology and people. With our strong heritage of nearly 60 years, we are a responsible and diverse group of 420,000 team members in more than 50 countries. We deliver end-to-end services and solutions with our deep industry expertise and strong partner ecosystem, leveraging our capabilities across strategy, technology, design, engineering and business operations. The Group reported 2024 global revenues of €22.1 billion.

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