



Executive
Perspectives

The Future of Biopharma with E2E AI Transformation

Biopharma

December 2025



Introduction

We meet often with CEOs to discuss AI—a topic that is both captivating *and* rapidly changing. After working with over 2,000 clients in the past 2+ years, we are **sharing our most recent learning in a new series designed to help CEOs navigate AI**. With most sectors going through major shifts, the focus in 2025 is on how to leverage AI to **fully transform organizations** and create **new sources of competitive advantage**.

In this edition, we discuss the future of Biopharma and the role AI will play in turbocharging growth. We address key questions on the minds of Biopharma executives:

- How can AI reshape competitiveness in Biopharma?
- What does it mean to operate as an AI-first enterprise end-to-end?
- How are leading players creating value with AI today?
- What pragmatic steps should I take to scale impact?

This document is a guide for Biopharma executives to cut through the hype around AI and understand what creates value now and in the future.

In this BCG Executive Perspective, we articulate the vision and value of the future of Biopharma with AI



Executive summary | The future of Biopharma with E2E AI transformation

WHY now is the right time to act

- **Market pressures require transformations across R&D, ops, and commercial;** rising R&D costs and longer timelines are unsustainable; AI has already shown it can cut discovery from 4 - 5 years to 8 months and accelerate trials by 20%
- **AI is now a proven enterprise enabler;** beyond pilots, scaled use is driving +23% yield improvements in manufacturing
- Leaders who move decisively will **unlock outsized P&L impact** and redefine competitive advantage; AI adoption in Biopharma has potential to generate **10-15% revenue uplift**

WHAT leading Biopharma companies are doing to create value leveraging AI

- AI leaders are investing across the value chain to deploy, reshape, and invent, maximizing near-term impact while building long-term advantage, including:
 - **R&D** – AI-driven molecule design, in-silico trials, automated regulatory drafting and submission, workflow orchestration
 - **Operations and supply chain** – Yield optimization, AI-powered planning in maintenance and forecasts, quality assurance, automated contracts
 - **Commercial** – Health care provider (HCP) targeting, field force copilots, omnichannel personalization, content generation, agentic MLR review, value and pricing optimization, AI-driven resource allocation
- Leaders are embedding AI into workflows to unlock productivity, reduce cycle times, and create new revenue streams

HOW to start the journey to become an AI-first enterprise

- **AI leaders avoid spreading efforts across pilots;** instead, they anchor on high-value lighthouse solutions, rigorously track outcomes, and promote proven impact to drive scale
- They build enterprise foundations early, with **C-suite sponsorship, long-term investment, and AI-ready data**, tech, and talent to enable scale
- They institutionalize **AI as the default business-as-usual**, embedding governance, explainability, and ROI tracking as they expand proven solutions across the enterprise

Note five essential takeaways for Biopharma leaders

Executives should see how AI is already creating novel impact, why mastering AI secures lasting advantage in Biopharma's redefined future, and what it takes to scale



There is still value to capture from improving everyday processes, but greater opportunity lies in **redesigning and reimaging processes with AI** and autonomous systems **such as agentic AI**



Commit capital at scale, back 3-5 enterprise AI bets with board-level support to capture revenue growth and efficiency gains, not just fragmented pilot results



Make impact measurable versus aspirational, anchor AI adoption in tangible financial levers, such as trial speed, yields, and sales, while also advancing patient welfare and outcomes



Treat data as core infrastructure, enforce ownership and governance for compliant scaling, and be deliberate on tech: buy based on speed and availability, build for true differentiation



Mobilize scarce AI talent with clear ownership and governance, win talent through a mission-driven EVP, structure teams strategically, and assign C-suite accountability

AI is reshaping the E2E Biopharma value chain and delivering real-world impact

Select examples of proven AI applications across Biopharma value chain with real-world value delivered

Agentic.ai powered field copilots led to **20-30% better FTE efficiency**

Commercial



R&D

AI-assisted drug molecule design shortened average discovery process by **20-45%**; AI-augmented clinical trial design accelerated trial execution by **10-20%**

Predictive modeling to reallocate capital to growth resulted in **40-50% higher financial forecast accuracy**

Corp SG&A



Ops and supply chain

AI-assisted yield optimization **improved batch output by 15-30%**, increasing profitability for impacted products



AI has already proven its ability to help companies **move faster, boost productivity, cut costs, and unlock new revenue growth** – strengthening their competitive advantage

Tomorrow's AI in Biopharma will look like today's most advanced innovators, but broader, smarter, and scaled across the industry

Current state

Vision in 5 years...

The future beyond...

R&D



GenAI pilots dominating as companies **automate manual tasks**; startups pushing ahead with **fully digital discovery**



AI-first R&D becoming standard, in-silico trials, auto-generated protocols, and **accelerated clinical execution**



Discovery pipelines AI-led end-to-end, from compound to trial, with humans guiding strategic oversight of in-silico and digital trials

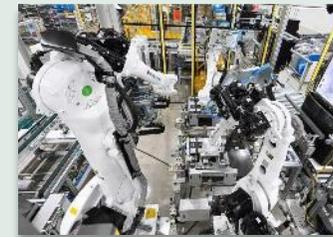
Ops



Preliminary pilots and early automation in supply/manufacturing, including predictive maintenance, demand planning, and **quality and yield optimization**



Digital twin/agent AI usage maturing, enabling **real-time decisions**, including supply and manufacturing optimization



Self-learning, adaptive agent AI, and **robotic-powered supply chains** balancing **improved demand** responsiveness with **optimized manufacturing** and quality performance

Commercial



Initial testing of AI for field and omnichannel orchestration support, **GenAI content generation** and resource/finance analytics



AI agents scaling **omnichannel orchestration enterprise-wide**, driving consistent, data-led HCP/patient outreach



Hyper-personalized engagement and autonomous, **agent AI** **webs tailoring every touchpoint** across channels/stakeholders

AI adoption unlocks significant financial upside across the value chain

Core driver types



Time: Accelerates speed to market or speed of execution



Quality: Improves effectiveness and outcomes



Scale: Expands reach or capacity without proportional cost



Cost: Reduces direct expenses or prevents revenue leakage (e.g., lower trial spending, efficiency gains, fewer rebates lost)

Revenue

Cost

Total AI value	Function	Revenue and value drivers	Cost drivers
	R&D	<ul style="list-style-type: none"> Time: Faster discovery and trial execution → earlier market entry and revenue Quality: Optimized trial design → greater approval success, more launches Scale: AI-first discovery enabling more research programs in parallel → broader pipeline and revenue opportunities 	<ul style="list-style-type: none"> Streamlined trial design lowers endpoints, samples, and costs AI-optimized site selection improves recruitment efficiency, avoiding spending on low-yield locations Predictive AI discovery models cut lab assays and experiments
Commercial	<ul style="list-style-type: none"> Time: Faster campaign launches and omnichannel execution → quicker uptake of new products Quality: Personalized HCP/patient engagement → higher conversion and stronger adherence → sustained revenue per customer Scale: Broader HCP reach and dynamic targeting → larger treated patient base 	<ul style="list-style-type: none"> Automated content creation lowers agency/production spending Optimized call planning increases rep efficiency Claims and rebate leakage detection prevents lost revenue 	
Ops and supply chain	<ul style="list-style-type: none"> Time: Smarter planning → faster product availability and sales realization Quality: Quality assurance focused on speed to release → fewer delays and reduced stockout risk Scale: Expanded supply chain capacity and flexibility → consistent product availability and revenue protection 	<ul style="list-style-type: none"> Predictive maintenance cuts downtime costs Yield optimization improves batch economics Inventory reduction lowers holding costs 	
Corp SG&A	<ul style="list-style-type: none"> Quality: More accurate forecasting → better resource allocation to growth areas Scale: Managing more contracts and launches without extra headcount → enables topline growth at scale 	<ul style="list-style-type: none"> Autonomous audits reduce finance/legal overhead Predictive modeling streamlines budgeting HR/IT copilots cut manual workload costs 	

These drivers are interconnected: time, quality, scale, and cost gains reinforce each other, creating outsized impact when combined

Currently, the greatest value unlock lies in R&D and commercial, where solution maturity and adoption are most advanced

		Revenue		Cost		
		Function	Total revenue growth from AI	Sample impact drivers	Function cost base savings from AI	Sample impact drivers
Total AI value	R&D		5-15%	<ul style="list-style-type: none"> AI-driven patient matching to accelerate trial enrollment Predictive trial design, increasing launch success rate Generative models for target/compound discovery, e.g., 20-45% shorter drug discovery process 	20-30%	<ul style="list-style-type: none"> AI-optimized trial site selection to decrease recruitment cost AI-augmented clinical trial design to accelerate execution; e.g., 10-20% faster trial execution Predictive modeling to cut lab costs
	Commercial		5-10%	<ul style="list-style-type: none"> Next-best experience engines and hyper-personalized promos/marketing, e.g., 5x increase in channel engagement Dynamic pricing optimization for payer contracts 	20-30%	<ul style="list-style-type: none"> Automated content creation for reps AI-optimized call planning, increasing sales rep efficiency; e.g., 30% promotion efficiency increase ML/NLP-powered claims and rebate leakage detection
	Ops and supply chain		Up to 5%	<ul style="list-style-type: none"> AI demand sensing and planning Adaptive production scheduling for faster fulfillment, e.g., 10% reduction in cycle time AI-assisted yield optimization, 15-30% improved batch output 	15-30%	<ul style="list-style-type: none"> Equipment downtime from predictive maintenance; decrease in warehouse costs 15-30% inventory reduction from AI management AI models analyzing process variables to boost yield and cut per-batch costs
	Corp SG&A		Up to 1%	<ul style="list-style-type: none"> AI-enabled regulatory review to accelerate approvals and launch timing Predictive modeling to reallocate capital to growth, e.g., 40-50% higher financial forecast accuracy 	15-25%	<ul style="list-style-type: none"> Automated contract review and redlining Autonomous audit and fraud detection Agentic AI HR/IT assistants to cut support costs, e.g., 90% reduction in HR professionals performing manual work

Source: BCG client experience

Accelerating evolution of AI is rapidly expanding applications in Biopharma

	 Machine learning	 Deep learning	 Generative AI/LLMs	 Agentic AI	 Future of AI
Definition	1980s-2010s Learns from structured + unstructured data to predict outcomes and uncover patterns	2010s-present Neural networks that are trained on massive datasets; can recognize, classify, and summarize across knowledge sources	2020s-present Foundation models that generate new content, summarize, reason, and adapt across workflows	Emerging today AI systems that plan, act, and adapt autonomously across workflows, orchestrate multiple tools beyond content generation	Future Agentic web networks of AI agents across data and organizations
Sample use cases utilizing specific technology	<ul style="list-style-type: none"> • Predicting patient subpopulations and disease prevalence • Predictive maintenance models to anticipate equipment failures • Sales force calls / next-best experience 	<ul style="list-style-type: none"> • Deep learning analyzing sensor data to boost batch yield • Adverse event predictors, flagging safety risks from EHRs and genomics • Omics analysis of disease pathways and biomarkers 	<ul style="list-style-type: none"> • Clinical trial protocols, APQRs¹, and regulatory submissions • Hyper-personalized commercial materials • AI-assisted quality assurance documentation 	<ul style="list-style-type: none"> • Virtual reps/agents engaging HCPs/patients with compliant, context-aware messaging • Adaptive protocol generation during in-silico trial simulations • AI agents reallocating production across sites 	<hr/> Physical AI running lab, manufacturing, and clinical tasks autonomously <hr/> Quantum computing unlocking massive solution spaces in hours , accelerating discovery, ops, and design through advanced data exploration

AI's evolution is accelerating exponentially; effective adoption now is the only way to keep pace

1. Annual product quality review (APQR) for pharmaceutical companies; yearly review of commercialized products

AI leaders are focusing on three strategic plays to maximize value capture

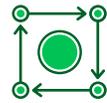


DEPLOY

Strategies that adopt AI tools to streamline day-to-day work, foster productivity, and free up capacity for high-value work

Automation of routine but critical tasks (e.g., automated meeting summaries, code assist for scientists, smart scheduling) for hiring new employees and minimizing daily operating friction

Less mature companies focus mainly on **Deploy** solutions, while more mature companies emphasize **Reshape and Invent**



RESHAPE

AI-enabled transformations that redesign end-to-end workflows and processes to reimagine how functions operate

Transformation of work beyond productivity (e.g., omnichannel orchestration, automated submissions of regulatory updates/trial data, quality assurance)



INVENT

AI-native offerings that elevate customer value proposition and create new processes or business models

Breakthrough innovation and reinvention of the Biopharma model through GenAI (e.g., conversational AI for HCP, synthetic patient cohorts, manufacturing product development) **and revenue** opportunities

Following slides expand on existing and future opportunities in each type

End-to-end transformation across all three plays



Combines multiple AI initiatives for an end-to-end transformation



Scales from functional transformation to company-wide transformation

Deploy | This play is anchored on everyday efficiency and productivity improvement, which can free capacity for broader AI change

What is DEPLOY?



Deploy cases adopt off-the-shelf AI tools to **streamline everyday work**, free up capacity, and **prove that AI can work in daily practice** across an organization

Enabling buy and tech | DEPLOY tools

Shell
Spark
Cognition

ChatGPT
Enterprise

Microsoft
Copilot

AkerBP
Cognite

Slb Delfi

Google
Gemini

When companies pursue Deploy, the most popular uses are workflows in **knowledge management** (82%) and **code development** (64%)

R&D

- Automated trial meeting notes
- Document search support across trials
- Literature review summaries on Copilot
- Email drafting
- Code review for bioinformatics

Ops

- Electronic batch record summaries and scheduling
- Compliance date tracking for FDA submissions
- Workforce scheduling support
- Invoice reconciliation

Commercial

- HCP call summaries
- Marketing first draft content
- Inbox management
- Slide and brief drafting for HR
- Calendar/HCP management for rep scheduling

Solutions within **DEPLOY** seen today

The future of **DEPLOY**

Deploy is not static — copilot usage that starts as task support evolves into enterprise-wide assistants

The future of Deploy is not just about automating tasks but about embedding AI into daily workflows, **turning meeting notes, scheduling, and documentation into structured data assets that feed larger-scale AI solutions** such as analytics, regulatory submissions, and trial optimization

Source: BCG Deploy, Reshape, Invent Survey 2023. Note: Representative AI tools spanning copilots and industrial platforms — e.g., Microsoft Copilot and Google Gemini for productivity, ChatGPT Enterprise for enterprise-scale generative AI, Shell SparkCognition and AkerBP Cognite for energy/operations AI, SLB Delfi for digital subsurface workflows, and Gemini for multi-modal reasoning

Reshape | Majority of today's mature AI work is in Reshape – core area for current and future value unlock across Biopharma

What is RESHAPE?



Reshape solutions redesign end-to-end workflows and processes to fundamentally change how Biopharma operates. This is **the core battleground for competitive advantage and requires leadership choices on which processes to transform**

Research & development

Research & discovery

- Autonomous lab workflows (design and support wet lab)
- Digital twin of discovery pipeline (molecule sim.)
- Workflow orchestration for discovery pipelines
- Hypothesis creation and target validation
- AI-assisted literature and data mining

Trial design & execution

- Synthetic control arms and trial twins
- Adaptive trials (reallocation in real time)
- Predictive patient / site selection
- ☆ GenAI-drafted regulatory submissions
- Digital trial orchestration (site feasibility)

50-80% faster drug development

2x revenue increase from first launch vs. subsequent

50% savings in drug discovery

Ops

Manufacturing

- Regulatory in loop QA/QC (real-time approval)
- E2E orchestration of batch execution and tech support
- AI-enabled data aggregation and batch record drafting
- AI-assisted root cause detection & deviation triage
- ☆ Manufacturing digital twins (yield optimization)

Supply chain

- End-to-end adaptive logistics analytics
- Dynamic inventory positioning
- End-to-end supply planning and demand forecasting
- AI-enabled integrated business planning & scenarios
- Automated supplier negotiations and contracts

10% cut in cycle time

15-20% inventory decrease

12% reduction in capex through AI-augmented manufacturing

Commercial

Customer engagement

- Field force copilots for HCP engagement
- ☆ Adaptive next-best-experience models
- Omnichannel orchestration
- Digital twins for launch and patient identification
- Personalized patient engagement journeys

Commercial operations

- AI-powered, dynamic resource allocation
- Predictive gross-to-net optimization
- Intelligent and live channel and commercial mix
- Agentic MLR review and automation
- Generative content engines (e.g., promotional material)

2x speed to market through Gen-AI driven marketing transformation

5x increase in channel engagement

5-10% sales uplift from omnichannel AI tools;

Maturity

Example value

Reshape deep dive #1 | Reshape manual clinical trial documentation workflows with AI agents

Why it matters

Clinical trial documentation inefficiencies risk time-to-market, trial cost efficiency, and regulatory compliance

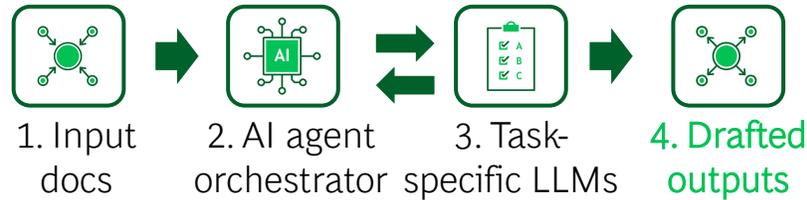
1000s of reports annually, requiring **100s–1000s of manual FTE hours**

Strict governance + interdependencies → **frequent bottlenecks**

Delays = higher costs, later submissions, slower patient access

Action and application of AI

AI agents were deployed to redesign end-to-end trial documentation workflows, not just draft text; they serve as independent orchestrators once prompted



1. AI helps **input and process massive volumes** of unstructured trial documents
2. **Orchestrators break workflows into subtasks and route them to LLMs**, which ensures process is parallelized and faster
3. **Once routed, orchestrators also assign the right AI expert/LLM per subtask** (drafting, formatting, consistency checks)
4. **Agent orchestrators integrate all subtasks into coherent, regulatory documents**, cutting cycle time and accelerating trial readiness

Impact

AI agents turn months-long documentation into parallel, scalable subtasks that are quickly checked and compiled

40-60% efficiency gain

3-4x faster coverage of clinical docs

+80-95% accuracy in document quality from AI orchestration

\$150M savings per trial; 6 months earlier revenue

Key takeaways

Leaders are reshaping manual, high-value processes with enterprise-ready GenAI platforms or custom-built technologies

Success is enabled by **centralized access** to regulatory documents, **infrastructure** for AI agent workflows, and **business owners across clinical, regulatory, and data teams**

Reshape deep dive #2 | AI-powered yield optimization increases batch output and revenue

Why it matters

Manufacturing yield is one of the biggest levers for Biopharma profitability; every % improvement translates directly into more reliable supply for patients

Declining batch yields can create supply shortages, jeopardizing patient access and market share

Manual yield investigations are slow and limited given the **large set of potential drivers and underlying data**

Cost and margin pressures make **yield gains critical**

Action and application of AI

Facing declining yields and supply risks, the company applied machine learning to 300+ process and sensor variables; AI ran virtual experiments to uncover key drivers and delivered **actionable recommendations without requiring process re-validation**

FROM 

Limited analysis of a handful of parameters at a time



TO 

ML analyzing hundreds of process and sensor inputs in parallel

Engineers **manually investigating** after yield drops are noticed



AI continuously monitoring 300+ variables, flagging potential yield risks early

Trial-and-error experiments on floor



AI running virtual "what if" simulations to test before implementation

Broad, generic adjustments with uncertain impact



10+ targeted, data-backed recommendations optimized for yield improv.

Impact

Advanced analytics transformed yield management from **manual, reactive troubleshooting to continuous and data-driven**

+23% mean yield improvement across batches

~\$30M incremental annual revenue

Greater batch-to-batch reliability → **fewer supply disruptions**

Key takeaways

Prioritize AI in manufacturing; **yield is a fast, low-risk lever**

Move from reactive to proactive; AI spots risks and fixes early

Scale learning across sites; once models are trained, the same approach can be replicated enterprise-wide

Reshape deep dive #3 | AI-powered next-best experiences reshape field teams for greater commercial impact and access

Why it matters

Field teams struggle with inefficient targeting, generic messaging, resulting in missed opportunities to support patients and drive commercial performance

Traditional approaches lack personalization; field teams may waste time calling the wrong HCPs or giving the wrong message

Siloed coordination between sales, field access, and other functions, **combined with fragmented data,** creates a **disjointed HCP experience**

Action and application of AI

AI-powered platform redesigned HCP targeting by integrating and analyzing 360 HCP data and automating outreach suggestions



Integrated all relevant data (e.g., insurance, prescribing history, patient access issues) and compiled key metrics



AI processing data and building personalized engagement strategy for field teams



Field teams' action on recommendations, with enhanced visibility into past HCP interactions across sales, medical, and access



Continuous AI-driven enhancement based on user feedback and maintenance of platform

Impact

HCPs receive better support, patients get access faster, and product revenue grows

+10-15%

HCP coverage - more doctors reached

+5-15%

productivity gains – better routing

+5-10%

sales uplift

Key takeaways

Beyond automation, AI reshapes ways of working between functions and strengthens feedback loops

Embedding AI in decision making drives **consistent gains in engagement and coverage**, improving as data continuously feeds back

Success depends on a **unified data platform and strong cross-functional preparedness**

Invent | Select companies are inventing with AI, ushering in new innovation and taking the lead in shaping the future

What is INVENT?



Invent develops AI-native offerings that elevate customer value proposition and **create new business models, revenue opportunities, or processes**

Invent has highest barriers to entry, requiring high investment across internal **tools, talent, technology, and drive to differentiate**

Recursion Pharmaceuticals

Success with INVENT Lab-less Discovery Model

- **Made heavy upfront bets in infrastructure** (robotics, high-throughput imaging) to generate proprietary biological data at scale
- **Positioned AI as the core discovery engine**, not an add-on tool
- **Built a defensible data moat** with billions of cellular images, fueling proprietary models and sustained differentiation

Invent strategies use AI to create new revenue plays, the most disruptive horizon

Invent is not incremental workflow design, or pilots or tools within existing processes

Invent is AI-native business models, fully virtual/synthetic environments, independent autonomous orchestrators

R&D

- **AI-designed molecules and drug discovery:** Insilico Medicine, AI-designed small molecules now in Phase II; Exscientia, multiple AI-designed molecules in clinical trials
- ★ **Labless discovery and autonomous R&D:** Recursion Pharmaceuticals, high-throughput lab automation + AI to explore chemicals
- **Synthetic patient cohorts/virtual trials:** BenevolentAI and Medidata, building AI-based synthetic control arms to replace placebos

Ops

- **End-to-end digital twins for supply (emerging):** Major Biopharma companies piloting AI-powered digital twin supply models for mRNA platforms

Commercial

- **Conversational AI for HCPs:** Novartis has built AI-native conversational platforms for HCPs to ask medical/scientific questions in real-time with compliant answers beyond bots
- ★ **Full AI-driven omnichannel orchestration:** New orchestration model where AI is the central orchestrator and interface
- **Virtual patient support:** Generative agents

★ *Deep dive following*

Invent deep dive #1 | Reimagine AI and robotics-driven drug discovery workflow

Why it matters

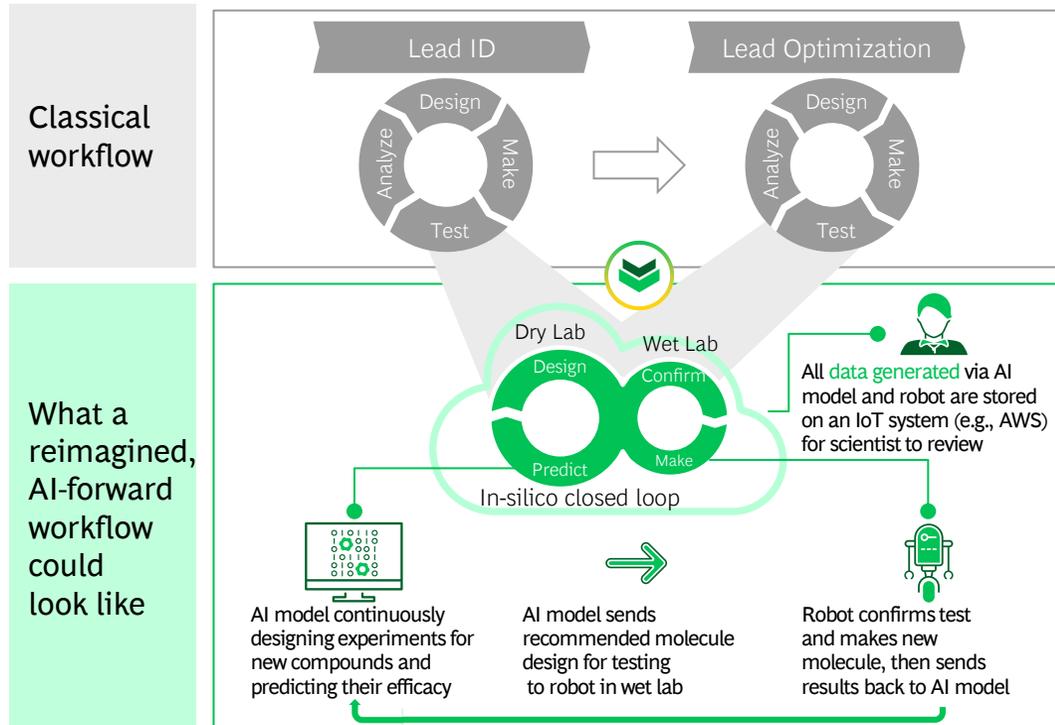
Traditional drug discovery is slow, iterative, and resource intensive with years of design-make-test-analyze (DMTA)

Compounds fail during lead identification and optimization → **time and money wasted on failed molecules**

Process is slow and linear; each DMTA cycle can take weeks or months, **limiting how many ideas can be tested**

Source: BCG analysis

Action and application of AI



What a reimaged, AI-forward workflow could look like

Impact

40-50% minimum cycle time acceleration

Higher hit rates for promising molecules, reduced manual burden that scales beyond human capacity

How it works (AI workflow)

AI designs experiments: Continuously proposes new compounds and predicts likely efficacy, **fully closed in-silico loop**

Robotics runs the tests: Automates high-throughput synthesis and screening

AI learns from results: Each cycle feeds data back, sharpening predictions in real time

All data integrated: Central platform captures outputs for scientist oversight

Recursion Pharmaceuticals executes millions of these AI-driven cycles weekly

Pairing AI with automation/robotics can be necessary for full Invent execution; AI predictions alone may be insufficient without **fast execution loops**

Invent deep dive #2 | Fully AI-powered omnichannel orchestration and HCP virtual agent support

Targeting



AI prioritizes which teams should **engage HCPs** and **when**, **optimizing for ROI** of each engagement

Messaging



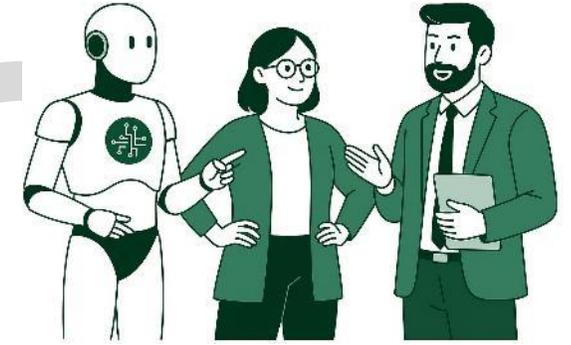
AI uses **holistic HCP data** to create **hyper-personalized content at scale**, controlling for content and tone to **maximize impact** of each message

Engagement



HCP interactions are powered by **AI-generated insights** and **virtual agents** available to provide support **before, during, and after the call**

Follow-up



After every engagement, **AI helps** in creating necessary next steps from connecting **HCP with other teams** (e.g., **MSLs**) to **setting up next visit**

← Each stage has feedback loops implemented, improving AI support in other stages in near real time →

Expected impact

+20-50%

Better FTE efficiency (i.e., admin time savings across email, CRM, etc.)

+5-10%

HCP satisfaction and experience improvement

+3-5%

Increase in prescribers

+5-15%

Share performance improvement

+5-15%

Revenue uplift

Here's what AI-first companies do differently to succeed in AI transformation

AI-first is not about chasing tools – it's about building the structural capabilities and proving them in day-to-day workflows



Double down on fewer, bigger bets

AI leaders **explore fewer AI opportunities** on average (8.4 vs 4.8 avg. solutions per function), prioritize critical Reshape and Invent solutions (80% vs 55% total investment toward these) vs. Deploy



Back AI with long-term capital commitment

AI leaders have a **higher share of revenue invested** (10.6% vs 3.4%) in digital and AI efforts. AI-first companies have ongoing capital commitments



Build elite AI teams with scarce skills

AI leaders have **larger teams** (5.3% vs 2.2% of total FTEs) **dedicated to digital and AI work, which are elite teams with specialized skillsets and are compensated accordingly**



Upskill broadly and empower BUs to own AI

AI leaders provide **more upskilling** to their employees (14.1% vs 9.5% FTEs gone through upskilling), BUs to have **autonomy to deploy AI solutions**



AI as the default, not the afterthought

AI leaders start with AI solutions by default, exploring **how AI can solve the problem before turning to traditional approaches**, embedding AI across every workflow

Demonstrating the AI-first mindset: ask how AI can solve it first

Traditional AI use

Starts with physical lab experiments, layers on analytics after

Builds supply and production schedules manually, fixes inefficiencies reactively

Creates campaigns and sales materials manually, then measures impact later

AI-first use

Starts with AI-driven compound design and in-silico simulation

Starts with AI-led demand forecasting and planning, **AI dynamically adjusting** to avoid disruption

Starts with AI-generated drafts and personalization, with **humans refining for impact**



Key takeaway: AI-first companies put AI at the center of problem-solving; they don't retrofit it after the fact. Success is enabled by holistic transformation and investment across data, tech, and people and processes

The 10-20-70 principle guides where to focus efforts for scaling AI

10% Data Analytics foundation

Data quality, richness, and refresh frequency

Ensure timely, high-coverage, and granular data



Data integration across domains

Connect enterprise datasets (e.g., patient, access, HCP, financial) to enable richer analysis and insights



Data management and governance

Manage data according to needs of business (e.g., quality, privacy, access, protection)

20% Technology Tools and infrastructure

Data and analytics platforms and tools

Modern and scalable end-to-end data and analytics infrastructure/architecture with business-friendly tools



AI-powered modeling and automation

Deploy advanced AI capabilities to unlock greater value, enabling predictive modeling, automated insights, and faster decision making

70% People and processes Programmatic scaling enablers

Strategy and prioritization

Align analytics solutions with business strategy; prioritize by impact and feasibility



Talent management and enablement

Define data & analytics roles, learning pathways, and communities



Ways of working

Define new ways of working to accelerate value creation from data and analytics

Ecosystems

Vendors/partnerships to drive innovation and scale



Change management

Leadership-driven adoption in divisions, transition of roles and skills



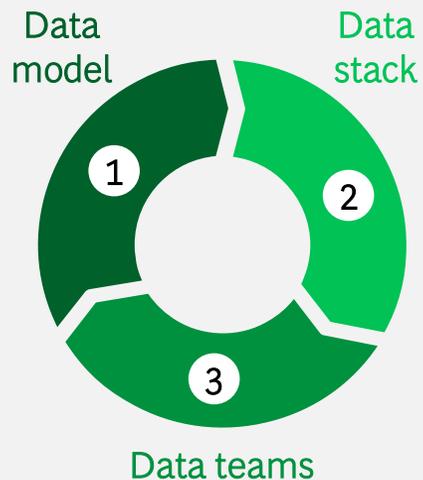
Responsible use of data and AI

Algorithm-based and human judgment, explainability and interpretability, bias removal



Key takeaway: To successfully implement AI at scale, organizations must address all critical enablers to build a solid enterprise foundation

Data | Without AI-ready data, nothing scales



1 Comprehensive data model

- **External and internal data** is scalable, well documented, organized, and **refreshed frequently**
- **Data acquisition is strategic**, with key data partnerships established to address most data needs (e.g., IQVIA, MMIT, Definitive)
- Integrated across BUs for enterprise-wide view

2 Scalable and modern data stack

- Data is moved from individual applications to a **centralized storage** (e.g., Snowflake, Databricks) to streamline data consumption
- Deployed on **scalable, secure, compliant, and reliable** cloud **infrastructure** with **clear single source of truth** (e.g., AWS)
- **Automated data quality management** software (e.g., Informatica)

3 Data-fluent teams

- **Business units empowered with skills** (e.g., querying, analysis, visualization) and access to ensure ongoing data use in daily decisions
- **Business units own and steward their data**, tech teams enrich
- **Decision-making culture is data-driven**, with best practices, playbooks, and templates shared across functions to standardize robust analysis

Bringing this to life – example: data-driven HCP engagement has many requirements

- 1 **Well-connected integration** across demographics, script volume, payer coverage, past sales engagements, claim-level utilization details, and patient support program interaction data
- 2 **Must mine thousands of data records daily** to surface relevant insights
- 3 **Users must be equipped with intuitive platforms** (e.g., CRM integration, dashboards)
- 4 **Continuous monitoring and enhancements** are essential to ensure the capability scales and adapts with the business

! Key takeaway: Data must be treated as a critical enterprise asset; investing in quality, governance, and management is essential for AI to scale in Biopharma

Technology | Build versus buy custom to your needs; build differentiates, buy enables speed

Key principles of build vs. buy

Optimize for long-term ROI

Focus on long-term ROI, not just upfront spending

Prioritize quality where it matters

Buy for good-enough; build for differentiation

Consider timeframes

Buy when speed-to-value is critical; build when timelines allow

Anticipate maintenance needs from the start

Build when you can sustain and evolve the solution

Pick the right battles

Only build if it fits your scale, skills, and strategic focus; buy is strong choice for commoditized, mature solutions

! Key takeaway: There is no one-size-fits-all approach – each solution should be evaluated across build vs. buy dimension

Source: BCG client experience

Typical solution distribution (non-exhaustive)



People and processes | Win scarce talent with mission-driven EVP and hybrid org model

AI talent is critical, but Biopharma needs a unique approach



Biopharma ≠ Big Tech

Biopharma companies will have smaller brand pull than tech giants given less mature data/tech culture and lack of ability to scale AI teams at same pace



As a result, Biopharma companies must develop a highly attractive and credible employee value proposition (EVP) to attract and retain in-demand top talent:

- **Mission-driven** (health impact, curing disease)
- **Access to unique datasets** (clinical, R&D, patient)
- **Hybrid opportunities** (science + AI at the frontier)
- **Increasing investment** in AI/ML, ability to build platforms from bottom up



Today, companies can leverage several key strategies to build talent:

- **Hire Biopharma-context AI talent:** Data scientists with biology, chemistry, or health care backgrounds; highlight Biopharma-specific EVP
- **Contract external AI experts:** Bring in specialized firms/contractors for setup, platform building, and cutting-edge techniques
- **Upskill internal teams:** Train existing staff on AI solutions and tooling



Key takeaway: Don't try to out-hire Big Tech — win talent by offering a mission-driven EVP and structuring teams strategically

Source: BCG analysis

Impact comes from structuring AI talent right

Several options for org and operating-model design:

- 1 Centralized AI hub** (e.g., new team setup or within tech/data and analytics teams):
 - **Coherent standards, deep central expertise**
 - Risk of disconnect from BUs
 - Works well for organizations in **early AI maturity piloting several solutions**
- 2 Distributed talent** (dedicated/partially committed talent embedded in BUs)
 - **Closer to domain problems**, higher ownership
 - Risk of fragmentation, inconsistent standards
 - Suitable for **mid-mature organizations with strong AI literacy across functions**
- 3 Hybrid hub-and-spoke** (central excellence center + embedded liaisons)
 - **Balance of expertise and domain closeness**, strong standard setting with execution
 - Requires strong governance, **suitable for higher-maturity organizations scaling impact**

Maturity

Roadmap for success | Follow these guiding principles across all stages of maturity

General guidelines, non-exhaustive		AI Maturity of Organization			
	Stagnating	Emerging	Scaling	Future built	
Criteria	Taking minimal to no AI action, lacking foundational capabilities, journey yet to be activated	Developed foundational capabilities and started initial designing, struggling to scale and create value	Developed AI strategy and advanced capabilities, scaling them effectively across organization	Forefront of AI innovation, systematically building cutting-edge AI capabilities while generating substantial value	
Biopharma investment: % of revenue invested in digital and AI efforts	< 3%	~3-5%	~5-7%	>7%	
Milestones illustrative # of pilots, functional involvement. ROI	<ul style="list-style-type: none"> Numerous bottom-up, decentralized pilots Fragmented pilots with unclear ownership, with limited business or tech/data support Cost impact minimal; focus on experimentation and everyday uses 	<ul style="list-style-type: none"> Narrowing down to ~3-5 prioritized pilots, 1-2 lighthouse cases showing early ROI Expansion beyond IT; BUs engaged Early signs of efficiency (~5% productivity improvements in target processes) 	<ul style="list-style-type: none"> Lighthouse cases become scaling initiatives across functions, AI embedded in at least 2-3 core platforms Cross-functional collaboration Tangible ROI (5-10% reduction in costs, accelerated cycle times in R&D/clinical) 	<ul style="list-style-type: none"> Value-proven programs with AI as business-as-usual, scaling to full enterprise adoption AI-first mindset across enterprise, sustained impact (10-20% efficiency gains), new-model value creation 	
Data/tech / people and process	<ul style="list-style-type: none"> Low-medium data satisfaction, little AI-data governance 	<ul style="list-style-type: none"> Medium-high satisfaction with data and AI talent 	<ul style="list-style-type: none"> Medium-high satisfaction with data and AI talent; early AI governance 	<ul style="list-style-type: none"> High satisfaction with data and talent, BUs lead governed initiatives with AI in daily workflows 	
Principles to next stage	<ul style="list-style-type: none"> Identify 3-5 solutions with scale potential Prioritize focus over breadth Establish basic governance and data foundations 	<ul style="list-style-type: none"> Start building repeatable AI platforms Decide where to partner vs. build internal IP Encourage investment; communicate impact internally 	<ul style="list-style-type: none"> Begin to embed a cross-functional AI-first operating model across the company Expand proven solutions across functions 	<ul style="list-style-type: none"> Evolve talent model with chief AI officer, AI-native roles Continuously measure long-term P&L, patient outcomes, and industry impact from AI 	

Self-check | Is my organization on the path to effective AI transformation?

Leadership and strategy *(set the direction)*

- AI is a **strategic priority** communicated to the organization
- I have a **named AI sponsor** (C-level or board-level)
- AI progress is a **standing agenda item** in leadership meetings

Funding and investment *(back it with resources)*

- Our leadership has a **standard way to request AI funding** that **communicates ROI**
- I have approved **budget for AI-ready data, talent, and pilots**
- There is a defined **3-year AI investment envelope** (% of revenue)

Data readiness *(lay the foundation)*

- Named data owners/stewards** exist in R&D, clinical, ops, and commercial
- We have an **active program** cleaning, governing, and integrating data
- Our **critical data is AI-ready** (accessible, compliant, and enriched with AI-driven structuring/labeling as needed)

Solutions and business value *(prove impact early)*

- We have **identified areas where AI can create tangible value** for our organization
- We have **3–5 lighthouse solutions** with clear ROI and outcomes
- Each solution has a **business sponsor** with P&L accountability
- We measure **both business ROI and patient/clinical outcomes from AI cases**
- We **commit to scaling proven pilots** to build credibility, momentum, sustain investment

People and ways of working *(enable adoption)*

- Our leadership team is undergoing **AI fluency training**
- We have **cross-functional AI teams** (business + data + science)
- There is a **change management plan** to address trust, compliance, and regulation
- We have an **AI talent plan**, including ability to attract, retain, and motivate talent

Governance and responsible AI *(scale with trust)*

- Wins from AI pilots are **communicated visibly** across the organization
- We have an **AI governance council** (ethics, compliance, regulatory).
- We operate under a **responsible AI framework** (safety, explainability, bias)
- I receive a **quarterly AI impact report** tied to business and patient outcomes

Near-terms checks: What can you start tomorrow?

Watch-outs | Avoid these common pitfalls in AI transformation



Executives should **recognize the common pitfalls that derail AI transformation**, why they persist in Biopharma, and what it takes to avoid them for impact at scale

Chasing novelty over value: Teams pursue flashy solutions without anchoring on high-value problems, wasting capital and leadership attention

Skipping early data readiness: AI models are built on generic or poor-quality data, or ownership is fragmented across R&D, ops, and commercial

Running pilots in isolation: Solutions stay stuck as proofs-of-concept, disconnected from core workflows, systems, and automation; insights don't move to action

Underestimating scale and compliance: One-off pilots don't build reusable platforms; regulatory and change management gaps stall enterprise rollout

Treating AI as IT spending: AI gets siloed under tech budgets instead of tied to business KPIs, with reluctance to end failing pilots, wasting resources on low-ROI projects

BCG Experts | Key contacts for Biopharma AI transformations



Priya Chandran
New Jersey



Ashkan Afkhami
Brooklyn



Ganga Kannan
New York



Val Panier
Boston



Ben Shuttleworth
London



John Gooch
London



Ivan D'Avanzo
Miami



Camille Engel
New Jersey



Siwei He
Atlanta



Chris Meier
London



Nigel Markey
London



Dhruv Jayanth
New Jersey



Victor Delannoy
Paris



Frank Cordes
London



Jan Ittner
Munich



Chloe Caparros
Paris



Andres Garro
Miami



Paari Rajendran
San Francisco



Dominique Cina
Miami



Marcus Erhardt
Munich



Miriam Fritsche
Munich



Simon Sprague
London



Pepe Rodriguez
New Jersey



James Morton
London



BCG