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Reinventing life sciences in the age of generative AI

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Where could reinvention take your business?

What if your company could develop novel medicines for previously undruggable targets and address currently untreatable illnesses?

What if your company could dramatically compress R&D timelines and reduce the cost of developing a medicine from billions to millions of dollars?

What if your company could rapidly optimize manufacturing recipes and facilitate agile, resilient and sustainable end-to-end supply chains of new modalities for better competitive advantage?

What if your company could dynamically anticipate market shocks and black-swan events and respond with minimal disruptions to patients?

What if you could use everything you know about all of your customers — from patients to providers to payers — to truly meet them where they are with speed and efficiency?

Organizations are achieving exactly these kinds of breakthroughs by using intelligent technologies such as classical and generative artificial intelligence (AI) reinventing themselves.

In 2023, we presented Total Enterprise Reinvention for Biopharma, a strategy of changing every part of a business, adopting change at scale and generating innovation, resilience and value. When companies engage in Total Enterprise Reinvention, we wrote, they commit to creating a strong digital core on which they can essentially turn “change” into a capability, such that any transformative effort in any area of the business builds on and contributes to other efforts. The result — demonstrated by the few leading companies we identified as “Reinventors” — is sustainable, accelerated and efficient growth.

At that time, we forecast that companies embracing the transformative power of technology, data and AI to drive reinvention would be ahead of the curve in the next decade and beyond. This year, the growing impact of disruptive technologies such as generative AI has made it even clearer that continuous reinvention is becoming the default strategy for the world's leading organizations.

In fact, our research found that the competitive edge belongs to Reinventors, who not only define the new performance frontier for their industries but also enjoy the largest financial benefits. In this report, we present our recommended approach to continuous reinvention in the era of generative AI: The Why, What and How.

The Why

AI is supercharging science and reinventing business — this isn’t your typical technology upgrade.

The What

AI is revolutionizing the value chain, offering strategic opportunities to generate significant value if workflows and processes are consistently reinvented end to end.

The How

Five C-suite imperatives will help you reinvent your business and pull ahead of the pack.

About the research

We took a comprehensive approach to study the topic of Total Enterprise Reinvention. This report is based on:

- A **multi-year survey** of over 3,000 executives across 19 industries and 10 countries. Respondents were asked about their organization's approach to business transformation and reinvention strategy, as well as about their specific programs and success factors. The surveys were conducted in November 2022 and October to November 2023. In this report, we provide comparisons between the two, focusing on new insights gained from the most recent responses.
- **The annual Pulse of Change Index** that quantifies the level of change affecting businesses globally, caused by six major factors: technology, talent, economic, geopolitical, climate and consumer and social. The index provides context supporting the need for reinvention.
- Our annual life sciences **CEO Imperatives Research**, which identifies critical disruptions and key priorities based on qualitative interviews with the CEOs of the top 40 life sciences companies by revenue. We validate these trends in our **annual CEO roundtable**, where industry CEOs gather to discuss the industry's most pressing issues and promising opportunities. The CEO roundtable was held at the 2024 meeting of the **World Economic Forum** in Davos, where we gathered industry C-suite leaders to discuss the impact of classical and generative AI on the life sciences industry.
- **Collaboration with our innovation strategy experts and subject matter advisors** to ideate, shape and push the boundaries of our thinking on reinvention in the age of generative AI. We then tested our approach with multiple clients.

Supercharging science with intelligent technologies:

This is not your typical technology upgrade

The biopharma industry is on the brink of a groundbreaking revolution, propelled by the remarkable potential of intelligent technologies such as classical and generative AI and next generation computing. These technology advancements promise to deliver breakthrough treatments and life-changing medicines at an unparalleled pace, addressing the industry's most pressing challenges head-on.

Consider these challenges at a high level:

- **Lengthy and costly drug development:**
  The average time to bring a new medicine to market is 10–12 years, with costs exceeding $2.6 billion. Approximately 90% of drug candidates fail during discovery and development, and R&D productivity has remained stagnant over the past decade.[1]

- **Increasing complexity in manufacturing and commercialization:**
  As scientific progress leads to new modalities and personalized treatments, the complexity of manufacturing and commercializing these therapies increases. Many new modalities are launched with unsustainable supply chains that require years or even decades to optimize.

- **Low growth due to patent expirations as well as government and private market pressures:**
  The top 20 biopharma companies (with some exceptions) are experiencing a low-growth period, with an average revenue CAGR of 4% over the next five years.[2] This anemic growth is attributed to factors such as patent expirations, pricing pressures from governments (e.g., Inflation Reduction Act in the US) and private market forces leading to net price decreases.

- **High cost of capital:**
  The persistent high cost of capital is compelling CFOs to explore ways to enhance profitability. In addition, it puts pressure on leaders to invest in programs that can generate returns faster.

Intelligent technologies are set to transform every aspect of the life sciences industry, from drug discovery, clinical development and patient care to manufacturing and the reliable supply of complex medicines. This shift promises to usher in an era of unprecedented innovation and efficiency and will drive better outcomes for patients.

But this opportunity hinges on a critical caveat: Unlike previous technology transformations, a purposeful shift to intelligent technologies requires companies to embrace and deeply embed a culture of continuous reinvention across the enterprise.

According to our research, life sciences is one of the top two industries most actively pursuing reinvention, the other being software and platforms.[3] Our annual CEO priorities research confirms that harnessing intelligent technologies for business transformation is the top priority for CEOs in 2024. This marks the first time in a decade that technology has been identified as a standalone priority, underscoring its pivotal role in addressing the industry's challenges.[4]

AI is revolutionizing the pharmaceutical value chain

To start, consider the effect intelligent technologies are already having along the biopharma value chain:

- More than 50 drug candidates discovered with AI are now progressing through clinical pipelines. Molecules are being designed at a fraction of the time previously required, and for several targets once considered undruggable.[5]
- The analysis of historical data, literature, real-world evidence and simulations of multiple trial scenarios all enable companies to optimize clinical trial protocols and resource allocation. This ultimately shortens trial duration and reduces costs.
- Companies are leveraging advanced analytics of complex chemistry and biology in recipes to achieve up to a 90% decrease in waste production and energy and water consumption, while improving consistency and speed in the manufacturing of life-saving drugs.[6]
- Intelligent technologies are helping leaders better allocate capital for manufacturing, supply chain and commercialization. Historical sales data, prescription patterns, epidemiology and target population information improve forecasting. This can inform commercial and medical team positioning as well as the timing and location of new manufacturing sites.

These are just a few examples of how intelligent technologies are driving meaningful and positive changes in the biopharma industry. A more comprehensive view of the "strategic bets" across the biopharma value chain is shown in Figure 1. These strategic bets confer a significant competitive advantage at each step of the value chain. In the following section, we explore each possibility in turn.

Figure 1

Illustrative strategic bets in biopharmaceutical value chain

Value chain	Pre-discovery	Discovery research	Preclinical & translational	Clinical, Regulatory, Safety	Process development, manufacturing, quality & supply chain	Commercialization	Enterprise functions
Strategic bets	Basic research into disease biology	Novel target discovery & new approaches to structural biology	Prediction & optimization of PKPD/ADME properties	Optimize trial & protocol design with simulation	Accelerated & accurate product launch	Predictive brand & portfolio strategy	Dynamic portfolio management and corporate strategy
	Basic research into treatment modalities	Accelerated target validation through optimized pharmacology	Discovery, refinement & development of novel biomarkers	Site enablement and optimization	Predictive manufacturing process robustness	Dynamic access optimization	Proactive risk management and crisis mitigation
	Basic research into safety and efficacy in humans	Modality selection & optimization	Expanding biobanking to leverage emerging technology for multi-omics	Clinical data management	Autonomous demand sensing & SC orchestration	Real-time content supply chain & review	Enhanced corporate brand and reputation
	Systems approach to disease and target modeling	Design & synthesis of clinic-ready molecules	Integrating internal & external clinical data into early discovery & translational science	Regulatory submissions	Predictive asset maintenance	Hyper personalized engagement	Strategic location planning
		Optimize developability & manufacturability		Real-time data analysis and safety monitoring	Optimized quality & real-time batch release	Democratized insights & recommendations	Strategic E2E employee value planning
		Optimize discovery portfolio for PTRS		CMC regulatory filing	Improved customer and patient experience		Optimized knowledge management & learning
				Recipe development, scaling & optimization	Resilient, sustainable, agile supply networks for all modalities		
					Accelerated post-approval process & product optimization		

Source: Accenture 2024.

Research and Development
(Pre-discovery, discovery research, pre-clinical & translational, clinical, regulatory, safety)

The future of R&D hinges on using intelligent technologies to dramatically improve cycle times, success rates and efficiency. By accelerating discovery through *in silico* methods and using AI for tasks ranging from molecule generation, optimization of lead compounds, biomarker discovery and patient stratification, companies can enhance their clinical success rates and expedite the entire R&D process. AI's ability to predict off-target effects, optimize drug safety profiles and incorporate digital tools for remote monitoring and patient retention presents a significant leap towards increasing investigational new drug approval rates and reducing trial durations.

However, the industry struggles with fragmentation across different functional areas of the value chain, resulting in numerous handoffs, non-standard application of technology solutions and persistent data silos. To overcome these inefficiencies, there is a critical need to establish a common language for effective collaboration among scientists, engineers and marketers.

By optimizing processes and responding more adeptly to market demands, companies can make full use of their organizational capabilities. Take the recent repurposing of diabetes drugs for obesity treatment. Companies used extensive safety data collected over a decade for one disease and efficiently used market signals to enhance drug development for a different disease. Such strategic shifts promise to mitigate high attrition rates and reduce lengthy, costly processes currently burdening the industry.

Process Development, Manufacturing, Quality

After a drug has been discovered and moved into clinical trials, companies should develop a consistent and scalable recipe to support supply as quickly as possible. However, R&D efforts are surfacing increasingly specific and complex drugs that require increasingly complicated, biology-based recipes. Faster clinical trials mean less time for recipe development teams to optimize these complex recipes and scale them to the appropriate level. Intelligent technologies will help move some of this recipe development from slow and repetitive wet lab experimentation to the *in silico* space, ensuring that:

- Drugs progress through clinical trials to commercial production without being hindered by recipe development and scaling issues.
- Companies can demonstrate a deep understanding and control over complex drug production through a combination of scientific data and AI, expediting regulatory filing and approval.
- Recipe tech transfer and knowledge management between sites in the supply chain (internal sites or external contract manufacturers) will be accelerated and less subject to the risk of unexpected quality issues, ensuring supply chain "resilience by design."
- All markets rapidly adopt significant post-approval recipe improvements, like new automation or process sensing tech.

Supply Chain

Classical and generative AI give companies the opportunity to redesign their supply chain and operations end-to-end, enhancing resilience, agility and sustainability. When combined with both internal and third-party data, AI can give companies a unified view of demand. This allows them to not only understand but control the supply-side complexity of novel treatments. AI can also generate scenarios and automate responses to many potential disruptions. This approach helps improve production processes for maximum yield and highest quality.

Traditionally, companies complete the design of their supply chain and operations in silos long before the product enters the commercial supply chain. Decisions during development — regarding manufacturing recipes (bill of materials, equipment), formulation, packaging, release, shipping methods, CMC filing strategy and choice of supply nodes — can have extremely long-term impacts on commercial supply chain agility, sustainability and resilience.

Even in the actual manufacturing of the product, complexity increases depending on how many sites are involved in the process and how well they stay harmonized with each other and their colleagues in R&D who are developing new drugs that will move to those nodes over time. Each site manages its own production process, equipment, asset management, quality control, operations technology (and sometimes IT) system landscape and continuous improvement programs at individual nodes. Local site level continuous improvements or corrective and preventative actions can lead to divergent evolutions of the recipes for a product.

This in turn can lead to complex post-approval change controls that must be managed by regulatory affairs for all markets as well as a complex proliferation of product variants that must be managed by supply chain planners. With a coordinated, connected data fabric and improved standardization, all parties — from commercial supply chain to recipe-development teams — can work together more effectively. Such integration also better enables AI tools to support collaboration, oversight and enterprise-wide continuous improvement. Without such coordination, fragmentation occurs and opportunities are missed.

Commercialization

AI is transforming commercialization, offering significant improvements across access strategies, marketing and customer engagement.

For example, AI significantly bolsters access strategies by using advanced data for deal modeling and enhanced payer contract negotiations. Generative AI can help simulate complex payer negotiations and streamline decision-making processes. Integrating disparate data sources facilitates contract performance monitoring. Using AI can enhance oversight and minimize rebate leakage, improving revenue.

In marketing, ongoing advancements powered by AI will accelerate original and derivative content creation including images, copy and animation. These technologies can facilitate dynamic marketing material assembly within regulatory constraints. Early applications of generative AI to medical loss ratio processes are already bolstering human reviewers' work without taking them out of the loop.

Generative AI is also transforming customer engagement. Using personal large language models like assistants better prepares field teams for customer interactions. These "assistants" access data, provide insights, simulate conversations and analyze customer contexts for more productive engagement. The era of the "bionic rep" is here.

Figure 2

Opportunities are evident in each area of the value chain. Based on our research and client experience, these strategic bets represent considerable potential value if the workflows and processes are reinvented end-to-end.

The size of the opportunity if the workflows and processes are reinvented end-to-end.

Pre-discovery & discovery research

Accelerate timelines by almost 3 years per successful drug

Discover better drug candidates (e.g., for undruggable targets)

↑ **$0.3 - 1.5B**
Revenue upside per successful drug

↓ **$600 - 800M**
Costs per successful drug

Preclinical, translational, clinical, regulatory & safety

Accelerate timelines by 1.5 years per successful drug

↑ **$0.2 - 0.8B**
Revenue upside per successful drug

↑ **$300 - 400M**
Costs per successful drug

Product development, manufacturing, quality & supply chain

Lower supply chain risk and get critical medicines into the hands of patients faster

↑ **1-3%**
Revenue uplift (product availability)

↓ **3 to 5%**
Production & Fulfillment costs

↓ **10 to 15%**
Working capital reduction (inventory)

Commercialization

Optimize patient and customer engagement to accelerate time to peak sales while effectively managing costs

↑ **10 - 30%**
Acceleration in time to peak sales

↓ **10 to 15%**
Commercial costs

↑ **20 to 25%**
Script conversion and adherence

Enterprise functions

Lower costs and increase efficiency

↓ **30% +**
Corporate function cost

Source: Accenture Research, 2024. See methodology section.

The full potential lies in connection. Leaders need to think in terms of value streams.

The transformative power of intelligent technologies such as generative AI on individual parts of the biopharma value chain are undeniable. However, while those effects are exciting in and of themselves, leaders will need to bridge functional silos to reap the full benefits of these technologies.

Fundamentally, generative AI empowers by democratizing access to information, accelerating its flow throughout the organization. Adopting generative AI thus presents an opportunity to foster better collaboration and ultimately deliver value across the entire value chain — where the impact on the whole is greater than the sum of its parts.

Understanding that opportunity is critical. Yet many life sciences C-suite executives in our recent pulse survey[7] remain focused on individual use cases rather than end-to-end processes and capabilities. Consider how:

2/3
know which areas they want to prioritize but do not have an implementation plan

2/3
have outlined potential impacts of generative AI but say that further analysis is required to fully articulate business value

It's time to think in terms of value streams — such as accelerating time to clinic or accelerating time to market — rather than small pilot projects. (We will cover this idea in more detail in the section titled "lead with value").

It's time to capture the benefits of connecting deep functional areas of expertise. All functions should align their reinvention efforts to these cross-functional value streams to ensure that their reinvention is comprehensive and delivers value to patients, the entire enterprise and the healthcare system.

It's time to develop end-to-end capabilities. This means rethinking many processes and integrating intelligent technologies into all aspects of the workflows of that capability. It also means developing the skills needed to use AI effectively.

Five C-suite imperatives to help reinvent your business

Five C-suite imperatives

Over the past several months, Accenture has engaged in numerous discussions with clients regarding the impact of generative AI. We have also undertaken more than 1,000 generative AI-focused projects, many in collaboration with leading biopharmaceutical companies. Drawing from these experiences and our analysis of industry leaders, we have identified five key imperatives for CEOs who are committed to capitalizing on the opportunities presented by intelligent technologies.

01/
Lead with value

02/
Reinvent talent and ways of working

03/
Understand and develop an AI-enabled secure digital core

04/
Close the gap on responsible AI

05/
Drive and support continuous reinvention

01/

Lead with value

Rather than focusing solely on technology, companies should prioritize efforts to understand how intelligent technologies can fundamentally redefine processes and capabilities. Leading with value means not only seeking cost saving opportunities but also driving systematic acceleration, innovation and growth. By taking a strategic view, companies can move away from low-value proofs-of-concept and embrace the full potential of intelligent technologies.

To be able to do that, biopharma companies must focus on five large investment areas to create value at scale. We call these investment areas “value streams.”

Fundamentally, these value streams represent the company's objectives and are inherently cross-functional. For instance, making medicines more accessible requires early discussions during clinical trial design, among clinical, market access and manufacturing teams. These discussions should cover cost of goods sold implications, potential manufacturing challenges and impacts on reimbursement. Finally, enhancing patient access to therapy necessitates collaborative efforts from manufacturing, supply chain and commercial teams.

The integration of value streams across different biopharmaceutical functions is illustrated in Figure 3.

Accelerating time to clinic

Select and validate novel targets and deliver human-ready molecules to the clinic at twice the speed and half the cost by using *in silico* methods, reducing wet-lab experiments and using AI for predicting off target effects, thereby optimizing differentiated efficacy and reducing safety liabilities.

Accelerating time to market

Design and execute patient-centric trials and efficient, well-controlled and well-understood manufacturing processes that maximize efficacy, safety and consistent sustainable quality to drive differentiated regulatory approvals in a third less time.

Maximizing the value proposition of medicines

Prove the health and economic outcomes to maximize patient benefit and make the case for physicians to prescribe and for payers to cover the medicine globally.

Making medicines more accessible

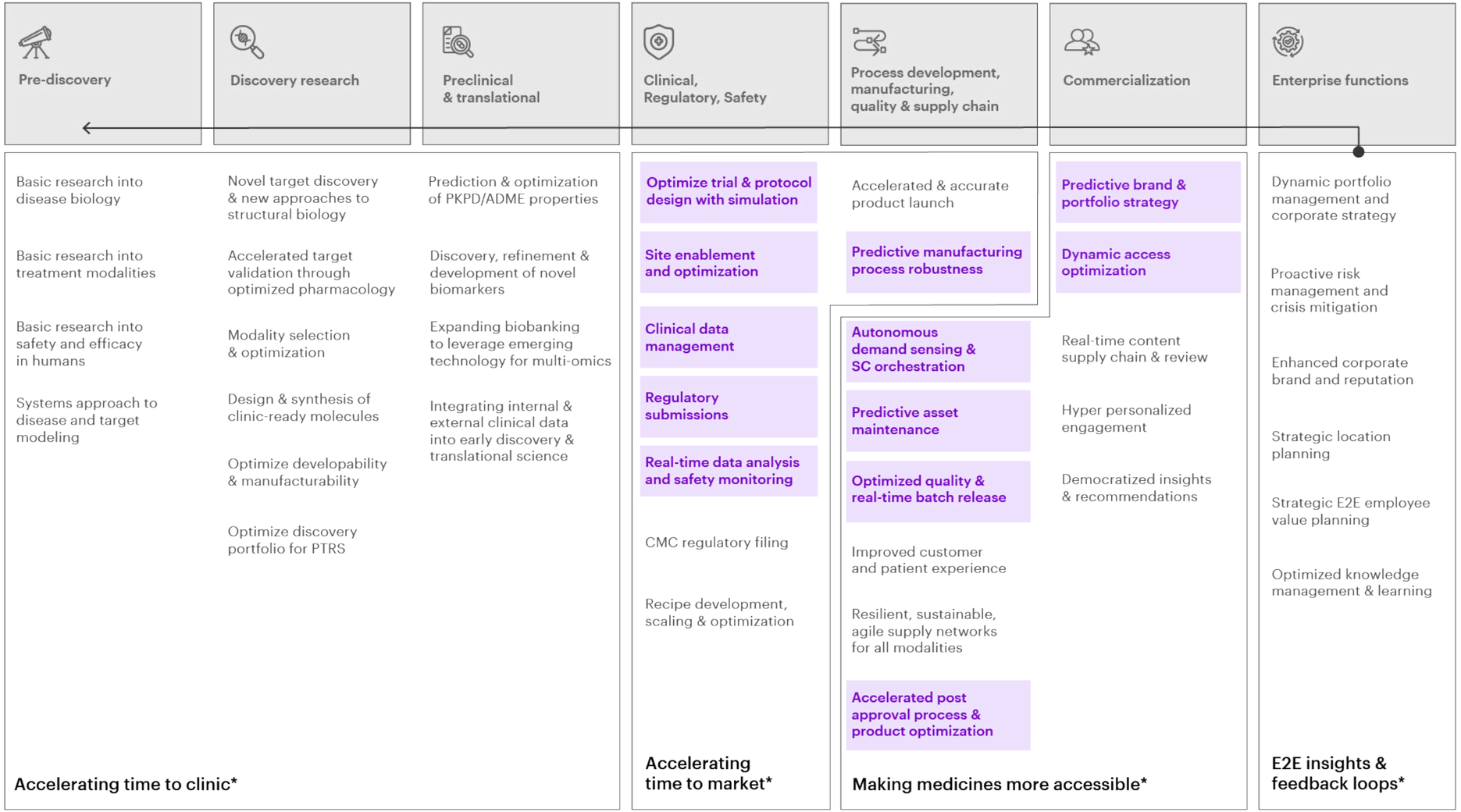
Improve physical access to and affordability of novel medicines to address unmet medical needs globally. One aspect of this includes supporting novel complex modalities (for example, cell and gene therapies, antibody drug conjugates and messenger RNA) by lowering cost of goods sold and capital investment in the supply chain while maximizing agility and quality. Another aspect includes an improved financial coverage and more affordable pricing to ensure more populations can afford therapy.

Establishing end-to-end insights and feedback loops

Share insights across the organization to enable faster information flow, better planning and reporting — and keep all stakeholders in the loop. Creating and sharing actionable insights across the value chain for the life of a molecule will allow teams to anticipate and solve for bottlenecks at every step through dynamic planning, portfolio prioritization, patient impact, capital allocation and reporting to investors.

Figure 3

Illustrative value streams in biopharmaceutival value chain:



* Value streams. Source: Accenture 2024.

Text shaded in purple denotes areas that contribute to maximizing the value proposition of medicines.

Lead with value: A modern approach to commercialization

As companies go through their reinvention journey, it is important for each function to measure progress against these value streams. Reinvention of each function will require redesign of end-to-end processes and workflows. For example, integrating generative AI redefines traditional commercial activities, transitioning them from a linear, siloed approach to an interconnected, dynamic workflow. Traditionally, sequential processes have stifled innovation and limited insight sharing, impeding operational agility. With the advent of generative AI, these boundaries are blurring, allowing for a compression and overlap of commercial functions, as well as the infusion of commercial insights into other functions like clinical trial design and supply chain planning, that accelerate product launches and growth.

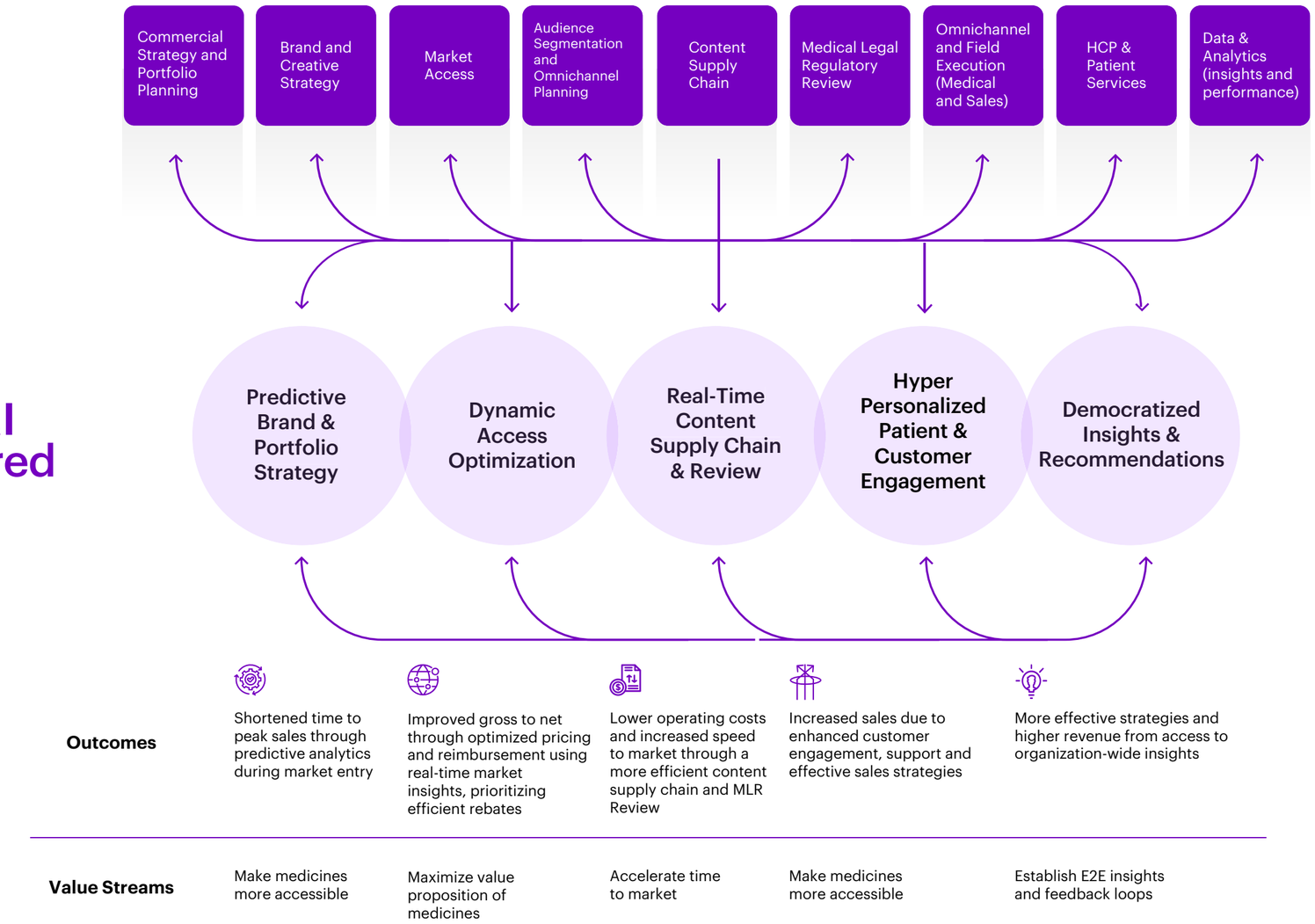
The potential benefits are two-fold: immediate enhancements to existing processes and strategic, transformative changes that fundamentally alter operational approaches. Ultimately, this shift allows commercial functions to contribute more to the value streams in biopharma, maximizing the value proposition of new medicines, accelerating time to market and making medicines more accessible.

Generative AI's influence is already tangible and is expected to have a transformative long-term impact. For example, brand and portfolio strategies are shifting from rigid, time-bound, top-down planning to continuous, agile, data-driven and bottom-up approaches. Tools powered by generative AI are enhancing early commercial planning by optimizing indication sequencing and endpoint selection in therapeutic areas like oncology and immunology. Similarly, contracting processes and payer negotiation simulations help inform brand and portfolio strategies early on. Furthermore, generative AI is redefining content creation workflows within the industry. The increased volume of content produced at a newly rapid pace is requiring a reevaluation of medical, legal and regulatory review processes.

This technological integration extends beyond the mere application of tools. It requires fundamentally reorganizing commercialization frameworks to embrace these new capabilities. The potential benefits include immediate enhancements to existing processes and strategic, transformative changes that fundamentally alter operational approaches. Success in this new era will depend on effectively leveraging generative AI to not only understand data but to act on it decisively, democratizing both data usage and actionable insights across the organization. This holistic change is poised to increase strategic effectiveness, shorten time to peak sales, improve gross to net, lower operating costs and increase in sales due to more relevant customer interactions that align closely with modern commercial expectations.

Figure 4

Illustrative example of the commercialization workflow, reinvented using intelligent technologies



Source: Accenture 2024.

02/

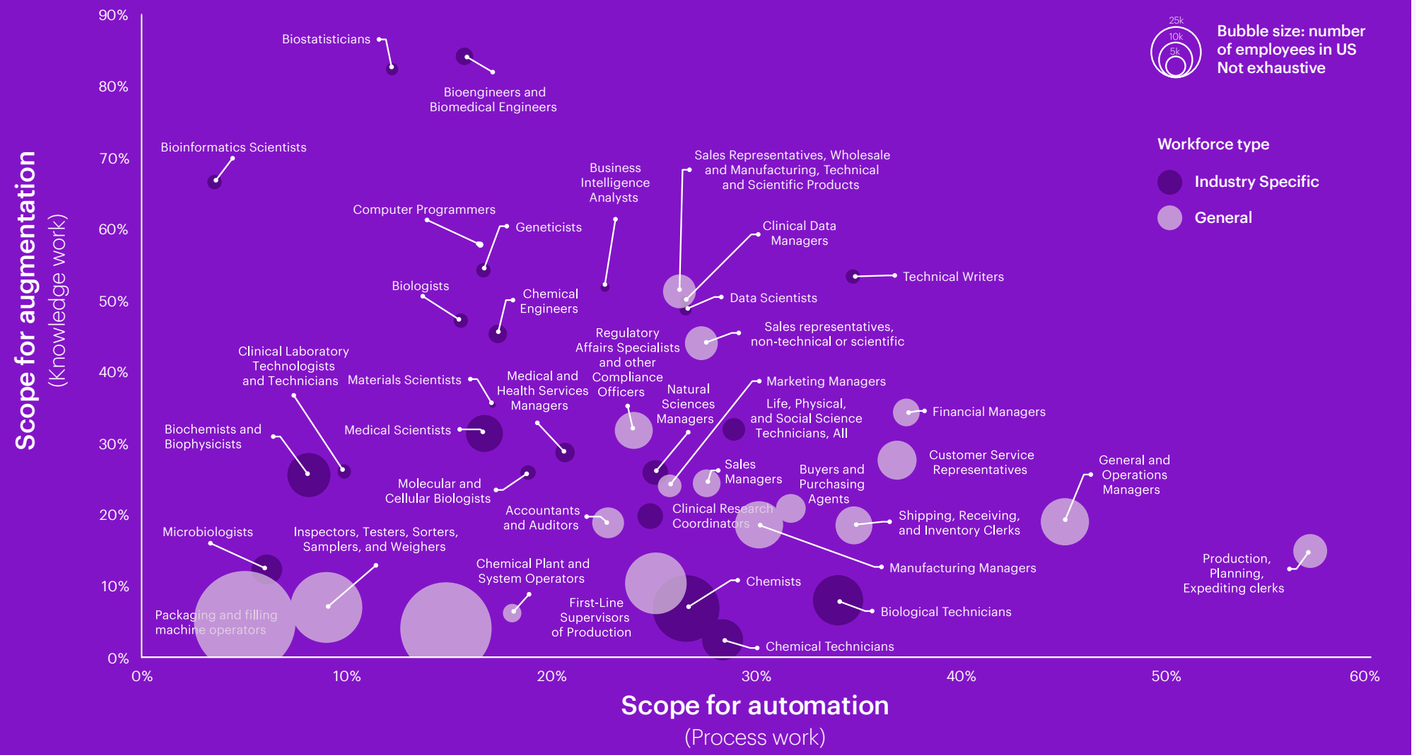
Reinvent talent and ways of working

AI will dramatically change how we live and work — it is going to have a major impact on talent, organization and culture. In fact, according to our analysis, approximately 40% of working hours will be impacted by generative AI in the biopharma industry[8], with certain roles more impacted than others (see Figure 5). We're looking at a monumental shift in the way work gets done, as well as extraordinary potential for companies in the life sciences space. Generative AI and other intelligent technologies can augment tasks and aid the workforce, driving extensive benefits that free people up to focus on higher value tasks. That can in turn lead to greater innovation and more life-changing discoveries, made available to more patients faster than ever before.

Figure 5

Exposure to generative AI

Percentage of working time by role



Source: Accenture Research analysis leveraging US BLS and O*Net.

Realizing value from intelligent technologies requires companies to reinvent work starting at an operational level across their organizations. According to our research, life sciences organizations are well above the benchmark in having comprehensive strategies in place to ensure positive worker outcomes and experiences with generative AI. They are three times as likely as the global sample to be providing generative AI training at scale. However, there is still a long way to go in making training accessible to those who want it.

Success requires a three-pronged approach:

1. **Shifting roles**. Companies need to reinvent work based on intelligent technologies. Rather than applying technology as a layer on top of the work, they must reimagine work across the enterprise.

2. **Shifts in tasks and skills**. Leading organizations are working to build an agile workforce by investing in skills mapping and integrating their data, so they have the predictive insights to ensure the right mix of skills to grow their people's capabilities and their business.

3. **Prepare the workforce**. 95% of workers in the life sciences industry want to learn new generative AI skills, but only 15% of organizations are reskilling at scale — a missed opportunity to invest in learning that can flow through the entire organization and bring people along on that journey.

~ 40%

of all working hours in life sciences will be impacted by generative AI[9]

~ 2/3

of life sciences Chief Executives do not have the skills or capabilities needed to lead reinvention[10]

About 50%

of life sciences companies have comprehensive strategies in place to ensure positive worker outcomes and experiences with generative AI[11]

95%

of workers in life sciences want to learn new generative AI skills, but only 15% of organizations are reskilling at scale[12]

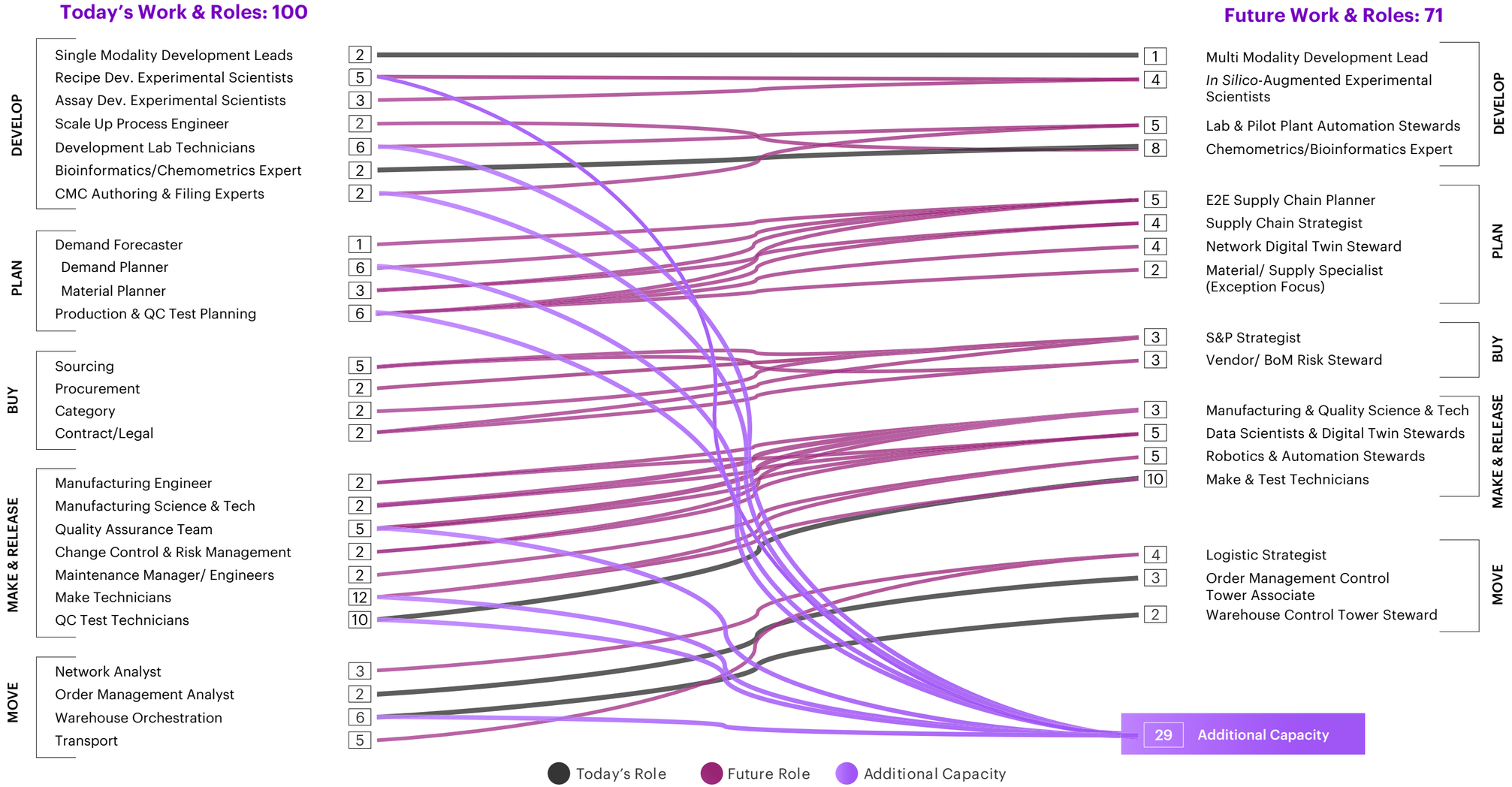
Shifting roles: The future of jobs in manufacturing, quality and supply chain

The teams that develop recipes and supply clinical trials, along with the people in commercial manufacturing and quality jobs in biopharma companies, offer good examples of how jobs can shift as generative AI tools are brought to bear. These positions have historically resided within the silos of R&D and commercial supply chain respectively, vertically focused and rarely collaborating on the end-to-end lifecycle of a drug and its recipe.

Classical and generative AI tools can change all of that. For example, we see the potential to consolidate the 100 roles representing a typical product development, manufacturing, quality and supply chain organization to 70 positions — freeing up additional capacity to focus on strategic priorities (see Figure 6).

Figure 6

Illustrative example of how work and roles can be reallocated in a generative AI future, freeing additional capacity in manufacturing, quality and supply chain



Source: Accenture 2024.

Shifts in tasks and skills: Manufacturing science and technology lead

Consider the role of manufacturing science and technology (MS&T) leads. These individuals are key in stabilizing the supply of the newest and most valuable products in a company's portfolio. They are senior scientific and engineering experts who control complex manufacturing recipes for complex drugs through their tacit knowledge and insights from data. They oversee R&D's handover of new recipes to large scale production facilities and spend most of their time troubleshooting problems that arise from recipe complexity and variability. Much of their time is spent hunting for historical data and generating new experimental data before they can determine the root cause of problems and next best actions.

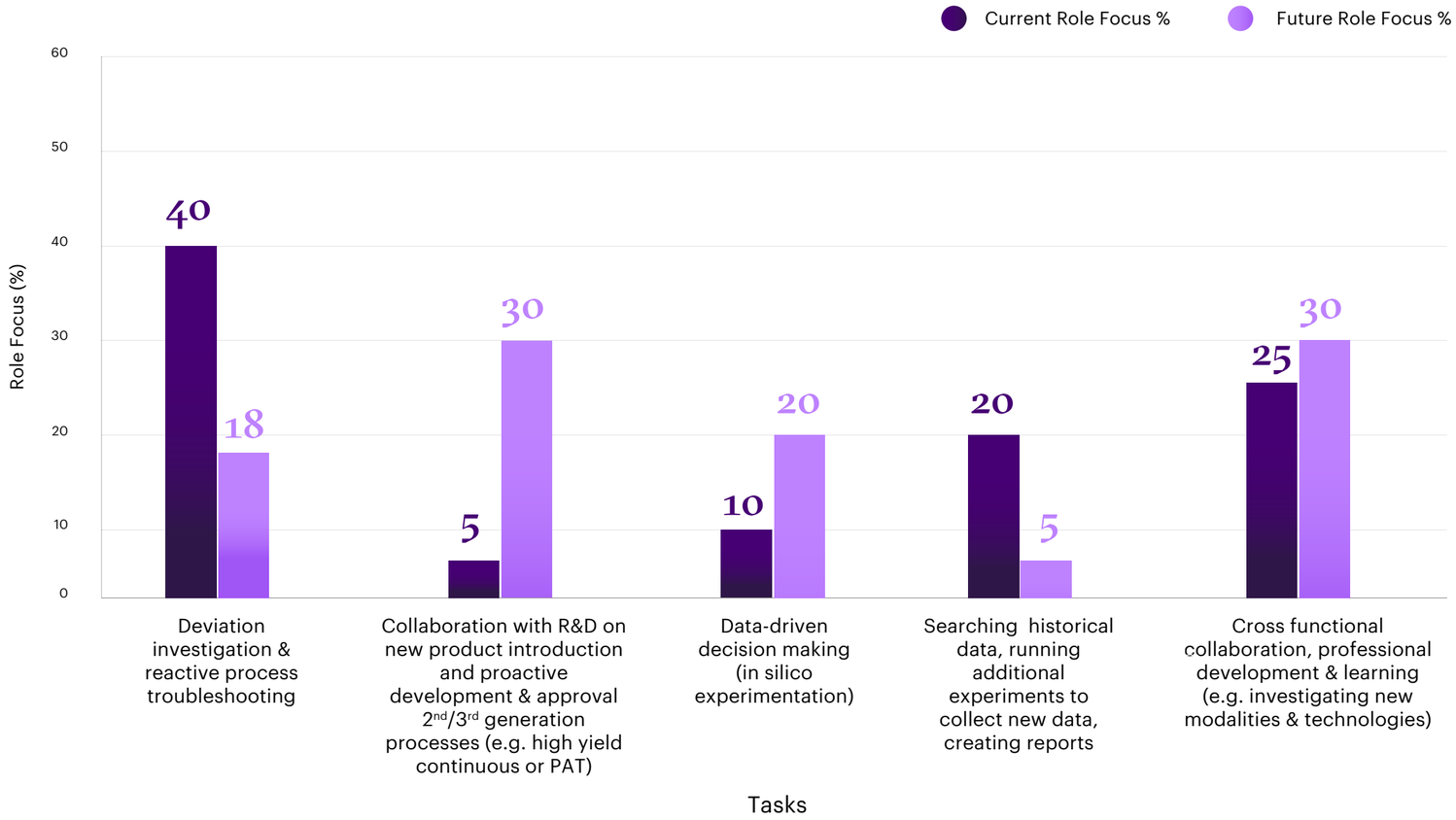
We see a future where these MS&T leaders are made far more productive and are enabled by classical and generative AI on a cohesive data fabric running from R&D (where the recipe was developed) to commercial supply (see Figure 7).

Troubleshooting and root cause analysis is required less frequently and is much faster and more precise and accurate when required. This reduction in the number of problems and time to resolution will have positive knock-on impacts for manufacturing, quality and supply chain planning.

This will also free the MS&T leads to spend more time on proactive improvements to manufacturing and quality processes. Armed with intelligent technologies, they can collaborate with R&D to rapidly & radically "reoptimize" the recipes of existing drugs (e.g. apply tech for continuous manufacturing) and help ensure that these changes are implemented quickly with rapid regulatory approval in all markets. They can also collaborate with R&D to make sure that recipes for new drugs (or new drug platforms such as RNA or gene therapy) coming through the pipeline are "optimal first time."

Figure 7

Illustrative change in role focus of an MS&T leader



Source: Accenture 2024.

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Understand and develop an AI-enabled secure digital core

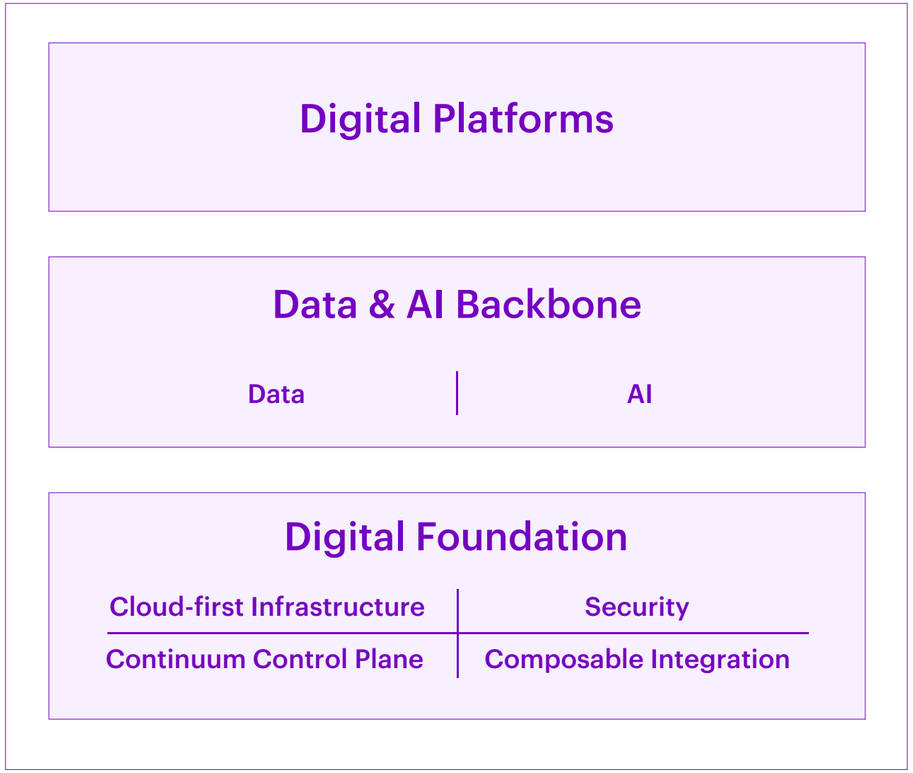
Accenture defines a digital core as the critical technological capability that can create and empower an organization's unique reinvention ambitions. Building this tailored digital core requires integrating three components: 1) advanced digital platforms, 2) seamless data and AI backbone and 3) a secure digital foundation using radical new engineering principles.

Advanced digital platforms: Biopharma companies rely on a complex web of disparate applications that cover everything from general functions such as performance management, human resources and legal to industry-specific needs in drug discovery, manufacturing and process development. On average, a typical biopharma company needs to manage over 100 different applications, often resulting in data redundancy, incurring technical debt and high costs. Standardization across this panoply of applications is partial, and the lack of an overall strategic vision limits the depth and quality of insights generated. In a modernized platforms ecosystem, applications should be rationalized into platforms that enable business imperatives, whether they be to accelerate growth, create next-generation experiences or optimize operations.

Figure 8

Demystifying the digital core

A digital core fit for continuous reinvention includes three distinct groups of technologies that constantly interact with each other.



Source: Accenture 2024.

Data & AI backbone: Investing in a modern data platform is necessary, but not sufficient to build a strong digital core. The data and AI backbone is crucial, providing the necessary data infrastructure and governance to support those platforms and leverage AI effectively.

While companies might have already migrated much of their data to the cloud, there is still a need to modernize the data estate and overcome the complexity of data silos. A company's data estate now includes not only internal data but external data, value chain knowledge and AI models both large and small. Governing this volume and diversity of data has become so complex that it exceeds the capabilities of steering committees and requires the support of advanced technology.

At a time when every technology player has "AI Inside," understanding product roadmaps — in both the short and long term — is imperative. Knowing the capabilities of your major technology partners is critical, but so is keeping up with how the broader generative AI landscape is shifting. Solutions that were architected six months ago are shifting dramatically as we see new capabilities shaping each day. The positive note is that with innovation, the cost, complexity and transparency of these solutions is improving significantly.

Agility is one of the most important capabilities organizations can pursue, making adopting a switchboard approach (see Figure 11) where the end users do not have to select different models and have the ability to work with various modalities and LLMs a workable alternative. This switchboard approach additionally allows organizations to dynamically change models in instances dictated by the use case or where a model may have an impact on responsible AI.

A digital foundation is a comprehensive framework that underpins the technological capabilities and operational agility of an organization. It includes four key components designed to create a robust, flexible and secure infrastructure. Firstly, composable integration provides a holistic integration strategy that is fit-for-purpose and adaptable to future technologies, ensuring it remains intentional and flexible. Next, cloud-first infrastructure emphasizes elasticity and services that span public, private and edge environments, making them configurable, consumable and automatable. Third, a continuum control plane simplifies the management of a hybrid, multi-cloud estate by offering end-to-end engineering and operations visibility. Last but not least, security is another critical element, featuring AI-driven, intelligence-led measures that are built in and continuously evolving to defend against and respond to threats. This security extends across IT and Operational Technology systems, including third-party interactions, ensuring a comprehensive defense strategy. Together, these components form a digital foundation that supports modern business needs with agility, security and scalability.

Data & AI Backbone: R&D Example

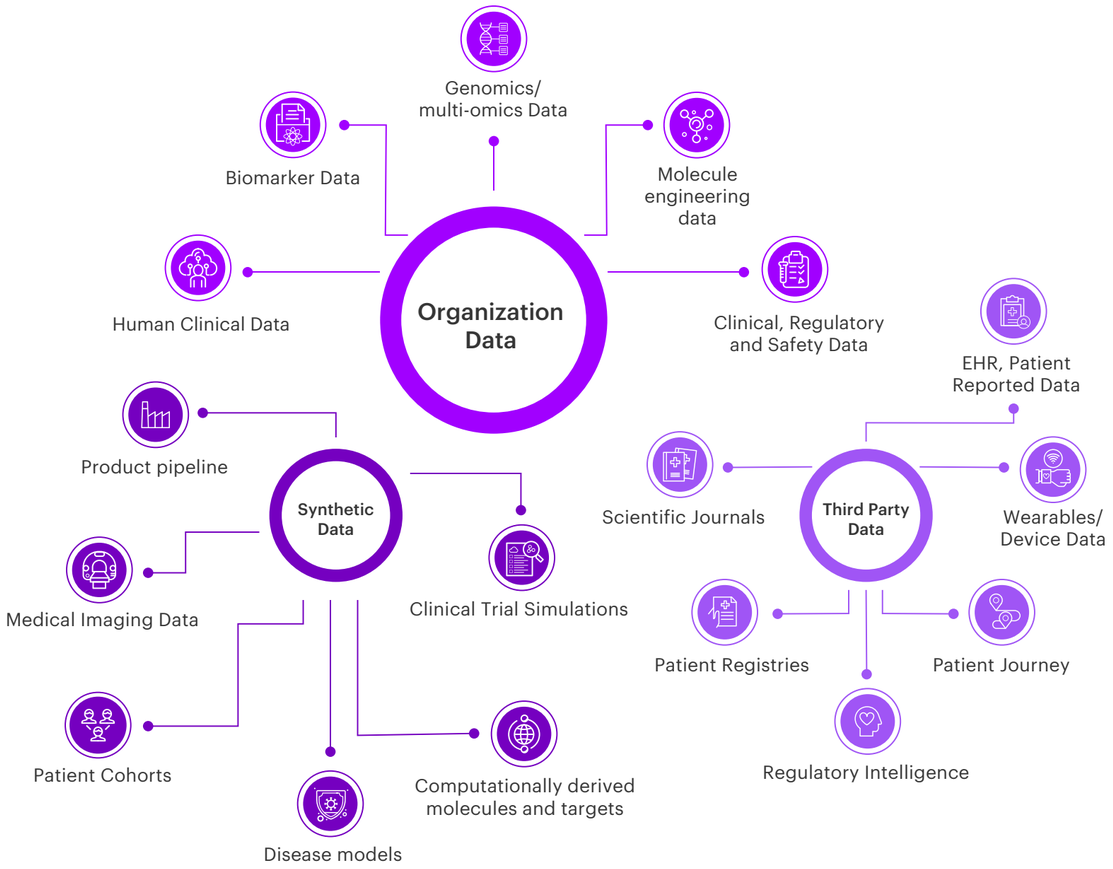
In biopharma R&D, the digital core discussion cannot be separated from the highly disjointed data landscape. The two primary challenges are: the rapid influx of data and its heterogeneity, which is exacerbated by the lack of standardized formats.

At the initial stages of data collection, companies frequently struggle to identify which data will be valuable in the future, leading to indiscriminate data retention. This necessitates significant investments in data curation and storage, often in data lakes and warehouses. When it comes to using the data, there is a critical need to focus on data interoperability rather than rigid data standards, allowing for the flexibility to adapt to evolving use cases.

Effective data infrastructure in R&D must integrate three critical data elements: internal organizational data, external data from partnerships and synthetic data. Internal data spans early discovery, translational sciences and clinical development, while external data is increasingly significant due to a growing number of partnerships aimed at generating novel molecules and biological insights. Additionally, synthetic data plays a crucial role in filling data gaps, particularly in clinical development and the creation of digital twins for patients. Thus, a modernized data infrastructure in biopharma R&D must unify these diverse data sources, ensuring an analytics-ready environment that supports innovation and operational efficiency.

Figure 9

Illustrative data infrustructure for R&D



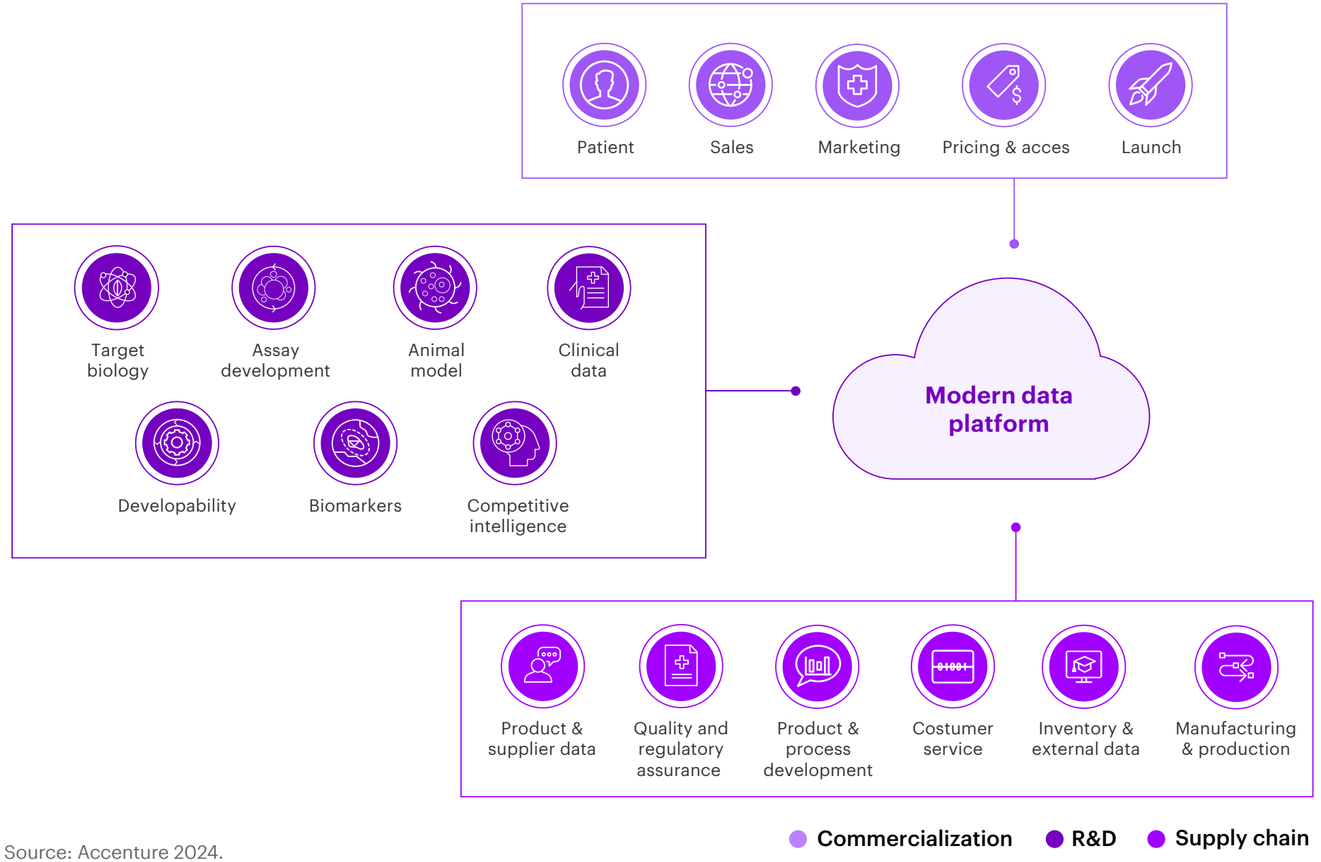
Source: Accenture 2024.

The integration of data also needs to go beyond R&D and extend to interconnected parts of the value chain. For example, improving the bioavailability of a drug in R&D has downstream implications on how much manufacturing capacity a company will need in the future, potentially influencing billions of dollars of investment down the line. Similarly, commercial data provides market signals in terms of patient outcomes, reimbursement and market access considerations which impact decisions in clinical development.

An accessible and democratized data platform is crucial for integrating these diverse sources of data. A modern data platform breaks down functional silos, enables a data mesh and data-as-a-product architecture and provides high-quality, curated and diverse inputs for AI ambitions.

Figure 10

Illustrative modern data platform that integrates data across the value chain



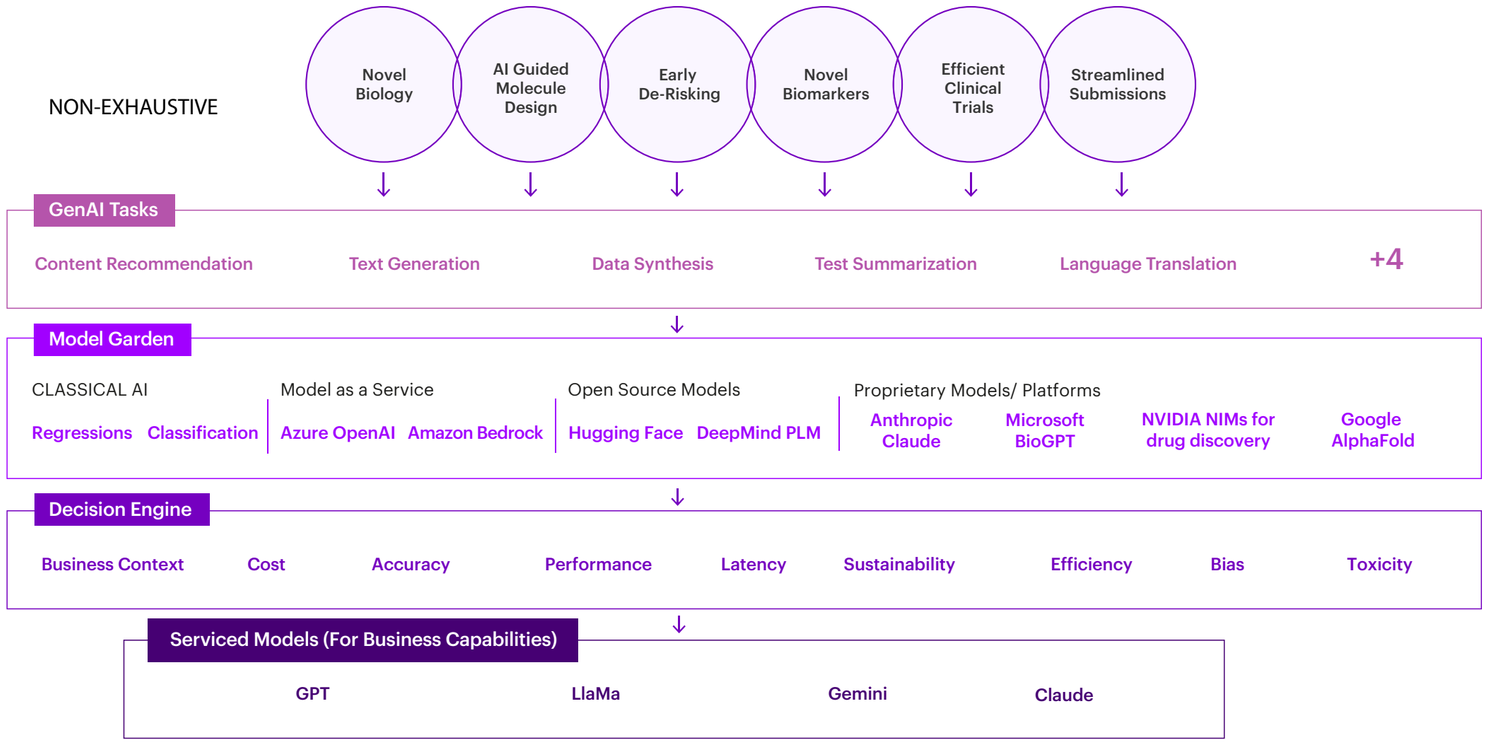
Source: Accenture 2024.

R&D example: Switchboard

With an accessible and contextual data foundation in place, companies can turn to the generative AI interface that will sit on top of it. New foundation models are being released every week, each of which has different use cases. Rather than be locked in to any one model, a flexible switchboard architecture enables companies to select the right combination of models to address their business needs while managing cost, risk and sustainability. See Figure 11 for an illustrative example for R&D.

Figure 11

Illustrative generative AI model "switchboard" for the biopharmaceutical R&D workflow



Disclaimer: this view represents a point in time and is not exhaustive and might not cover all capabilities of the industry players.

Source: Accenture 2024.

04/

Close the gap on responsible AI

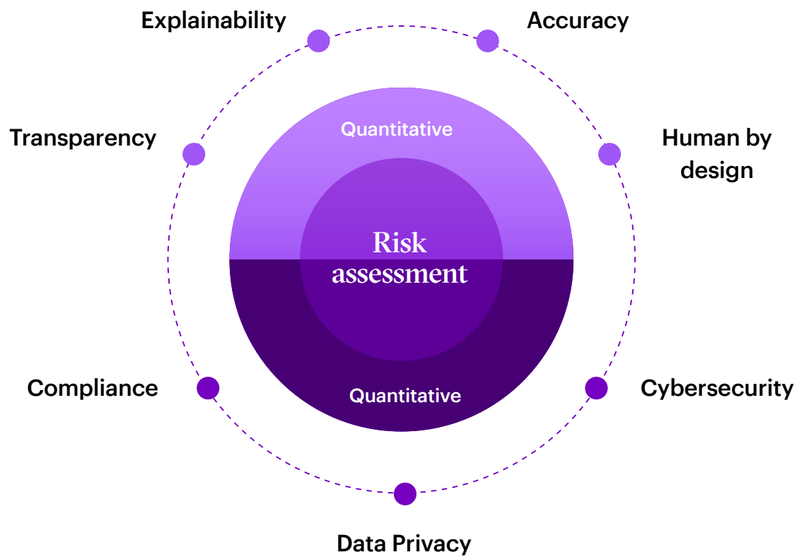
Intelligent technologies can have a profound impact on human health and well-being (see Figure 13), making responsible AI crucial in the biopharma industry. The deployment of AI in these fields involves analyzing complex biological data, developing new drugs and personalizing medical treatments, all of which directly affect patient outcomes. Ensuring that AI health systems are ethical, transparent and free from biases is essential to maintain trust and reliability in medicines. Moreover, responsible AI practices help prevent potential misuse of sensitive health data and ensure compliance with stringent regulatory standards, ultimately safeguarding patient privacy and safety.

Finally, generative AI's vast power demands a lot of energy — according to our calculations, its use could account for a 5% share of global electricity consumption growth between 2022–2027[13]. By prioritizing responsible AI, the biopharma industry can harness the transformative potential of AI while upholding the highest standards of ethical, environmental and scientific integrity.

Responsible AI thus begins with a set of governing principles that are shown in Figure 12. Each organization must set its own; each must adopt them and hold itself accountable for delivering on them.

Figure 12

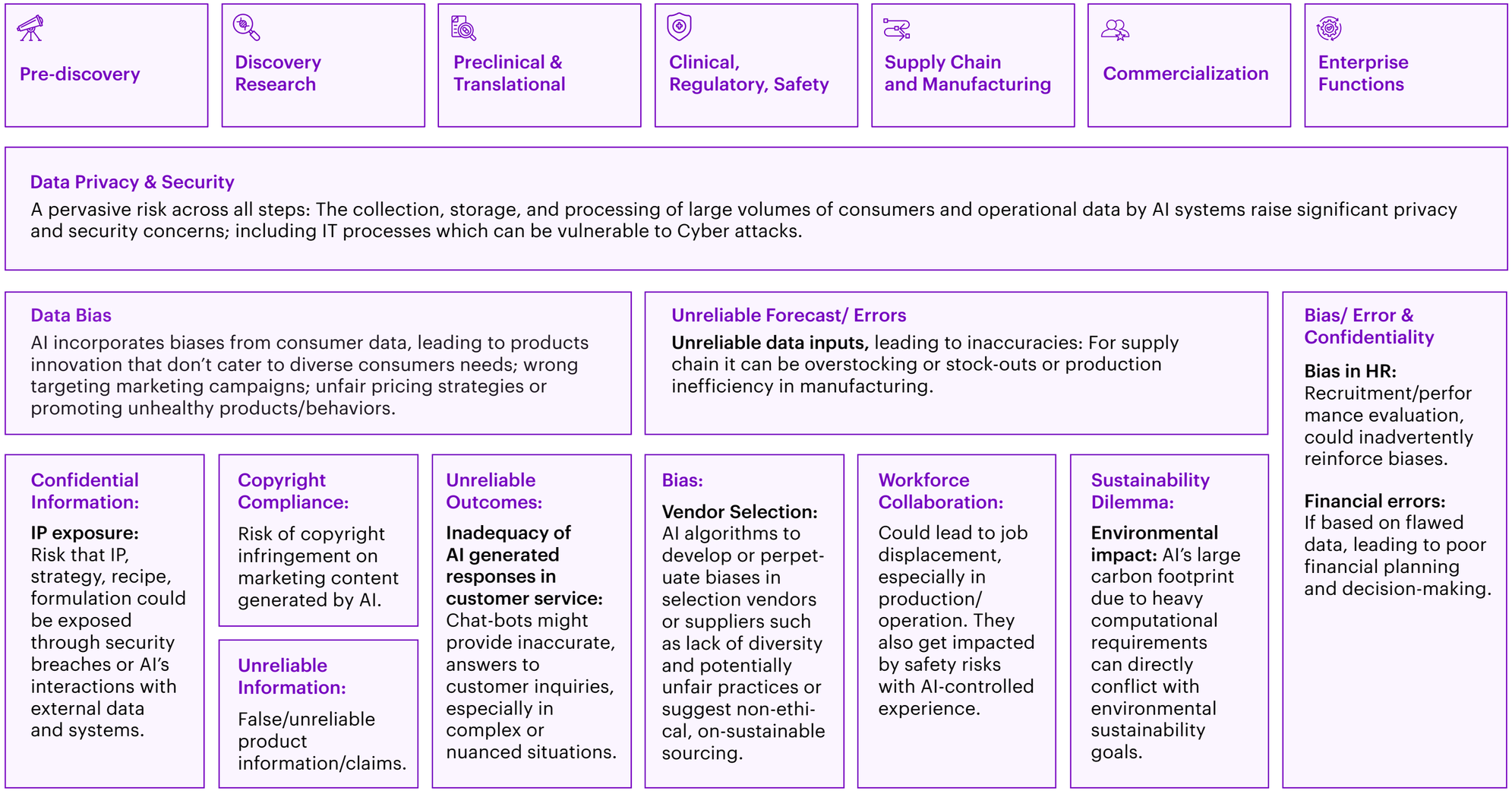
Operationalizing responsible AI



Source: Accenture 2024.

Figure 13

AI risk dimensions in biopharma



Source: Accenture 2024.

05/

Drive and support continuous reinvention

Continuous reinvention is an ongoing process that demands a persistent effort and a cultural mindset geared towards change. It requires three key elements:

1. The capability to sense what's new from the outside-in: Organizations must develop the ability to continuously identify emerging trends, strategic opportunities and new performance frontiers. This involves staying attuned to external developments and being proactive in recognizing shifts that can impact the business.

2. Organizational readiness and mindset for change: Building a culture that embraces change is crucial. Leaders must foster an environment where perpetual reinvention is part of the organizational DNA, allowing the company to adapt and operate seamlessly without undue stress. This includes cultivating agility, encouraging new thinking and leveraging a flexible digital core supported by generative AI.

3. Implementing initiatives on a continuous basis: Effective reinvention requires the continuous execution of new strategies and performance goals. This involves actively managing infrastructure, value-tracking practices and change management capabilities. Integrated planning, stakeholder management and proactive risk management are essential for success. Reinventors emphasize transparency and informed decision-making through dedicated units, integrated tools and ongoing data analysis. They focus on managing the change and talent journey, with change management as a core competency and continuous performance assessment.

Start your reinvention journey

Generative AI has transformed how technology is used, making interactions more human-like and greatly accelerating the process of reinvention. This rapid evolution means that generative AI could transform entire value chains and thus cannot be ignored. In particular, the life sciences industry is poised to unlock tremendous value and become stronger. To achieve this, however, companies need to apply AI wisely and in combination with human creativity.

Consider the following critical actions as you explore how generative AI can — and will — reinvent your business.

1. Lead with value:

- Leverage AI and advanced data analytics to not only to reduce the time and cost of bringing medicines to market but also to enhance strategic development and commercialization, delivering greater value to patients and healthcare systems.
- Integrate generative AI into commercial planning to establish a continuous feedback mechanism that adapts swiftly to changes in market conditions and patient needs.
- Use AI to improve the prediction and mitigation of off-target effects during the drug development process.

2. Reinvent talent and ways of working:

- Leverage AI to streamline roles across manufacturing, quality and supply chain to enhance operational efficiencies.
- Scale up investment in human capital by expanding reskilling programs and cultivating a culture of continuous learning and adaptation.
- Use predictive insights from AI to solve problems more quickly, enable proactive improvements and enhance efficiency across the organization.

3. Understand and develop an AI-enabled secure digital core:

- Develop a customized digital core that integrates advanced digital platforms and a seamless data and AI backbone to support strategic growth and operational efficiency.
- Take steps to modernize applications and ensure the digital core provides a secure foundation for the company.
- Enhance data and AI capabilities to maintain agility and ensure technology aligns with the evolving generative AI landscape for competitive differentiation.

4. Close the gap on responsible AI:

- Design and implement AI systems that are transparent, unbiased and prioritize human well-being, while ensuring compliance with regulatory standards and maintaining patient privacy and safety.
- Adopt governing principles and responsible AI practices to uphold high ethical, environmental and scientific standards in AI deployments.
- Conduct thorough risk assessments to ensure AI systems are resilient against biases and build a reputation for reliability, trust and transparency.

5. Drive and support continuous reinvention:

- Foster a company culture that continuously embraces reinvention, aligns with emerging market trends and integrates advanced technologies like generative AI to enhance innovation and resilience.
- Adopt the necessary strategies and changes to your infrastructure are necessary to promote agile responses and ensure alignment with stakeholder expectations during transitions.
- Develop your talent management practices to emphasize change management skills and continuous learning, keeping your team adaptable and competitive in a dynamic business environment.

Contact us: Experience the life sciences generative AI studios in person

To truly appreciate the power of intelligent technologies and their impact on the biopharma industry, we invite you to visit one of Accenture's life sciences generative AI studios. Located in New York and Dublin, these studios are spaces dedicated to applying leading-edge practices to realize business value quickly from intelligent technologies. The experience allows individuals to step out of the day-to-day and explore industry case studies, conduct generative AI pilots and co-innovate with ecosystem partners and leading academic organizations alongside top industry advisors, and data and AI specialists.

Here, you'll hear and learn from AI specialists, participate in workshops, and activate joint projects. Our spaces are designed to maximize collaboration, experimentation and inspire new thinking about the future as you accelerate your generative AI journey — from interest to action to value.

To bring your team to our generative AI studios to assess your readiness, contact Orlaith Burke, Global Innovation Lead, Accenture.

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André Dahinden
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BJ Brunner
Celeste Valverde
Chris Pullon
Christina Chou
Christina Gunther
Cornelia Schaeffer
Deavon Denzel Lynch
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Erica Castillo
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Laura Rasmussen
Lindsey Loughman
Lucia Cenderelli
Medb Corcoran
Meghashree Iyenger
Patricia Tomasiewicz
Phillipe Schotte
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About the research

Accenture Reinvention Survey

Accenture Research conducted a survey of 1,516 C-suite executives in November 2022 and of 1,500 C-suite executives in October-November 2023. Respondents were asked about their organization's approach to business transformation and reinvention strategy, as well as about their specific programs and success factors. We conducted the surveys in 10 countries: Australia, Canada, China, France, Germany, India, Italy, Japan, United Kingdom and the United States. Respondents represented 19 industries: Aerospace and Defense; Automotive; Banking; Capital Markets; Chemicals; Communications, Media and Entertainment; Consumer Goods and Services; Energy; Health; High Tech; Industrial Goods and Equipment; Insurance; Natural Resources; Life Sciences; Public Service; Retail; Software and Platforms; Travel; and Utilities.

Client experience

We draw on our client experience from across thousands of transformational engagements and more than 1,000 generative AI projects (many with leading biopharma companies) in which companies had applied the technology to reinvent how they operate. All client examples referenced in the report are based on Accenture client engagements unless sourced (or cited).

Accenture Pulse of Change:

Accenture Pulse of Change probes C-suite leaders on the issues and technology that are driving change, how leaders are responding and their perspectives on the future. For the latest edition, Accenture Research conducted a survey of 2,800 C-suite executives across 18 countries and a variety of industries and functions. The survey was fielded in March 2024. The global sample has a margin of error of +/- 1.9%.

2024 CEO Imperatives Research

13 qualitative interviews with the CEOs of the top 40 biopharma companies by revenue. These trends were validated in our annual CEO roundtable, where industry CEOs gather to discuss the industry's most pressing issues and upcoming opportunities. They were also validated at Davos WEF, where we gathered industry C-suite leaders to discuss the impact of classical and generative AI on the Life Sciences industry.

Value case for reinvention with intelligent technologies

R&D:

- Time savings based on industry case studies and expert & client discussions. Almost three years of time savings during target discovery & validation and lead ID and optimization using AI-methods and workflow reinvention. 1.5 years of time savings during clinical trial period that come from accelerated clinical protocol design and better patient selection & recruitment

- Revenue uplift was calculated based on the additional four years of exclusivity period in market with average peak sales of $500M. This calculation does not take into consideration other qualitative factors such as first mover advantage. As such, we believe this number to be conservative. Additionally, revenue uplift can vary dramatically depending on indication and potential peak sales.

- Cost savings based on Accenture's Taking R&D From Billions to Millions model. Cost savings come from the uplift in probability of success of clinical trials based on better target validation, understanding of the disease mechanisms, trial design and patient selection. Reported cost savings are per successful drug including cost of failure and cost of capital.

Product development, manufacturing, quality, and supply chain:

- Revenue uplift based on expert and client discussions. Revenue uplift is attributed to better product availability globally, by lowering supply chain risk and improving predictability of manufacturing.

- Reduction in production & fulfillment costs based on Accenture client projects

- Reduction in working capital (inventory) based on Accenture client projects

Commercialization:

- Accelerated time to peak sales based on expert interviews and client discussions attributed to simulations of payer discussions & deal modeling, minimizing rebate leakage and improved customer engagement.

- Reduction in commercial costs based on analogs of former technology transformations and their impact, especially in the context of content generation.

- Improved script conversion and adherence based on analogs of former technology transformations and their impact.

Enterprise functions:

- Reduction in enterprise function cost based on expert interviews and Accenture client work.

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About Accenture

Accenture is a leading global professional services company that helps the world's leading businesses, governments and other organizations build their digital core, optimize their operations, accelerate revenue growth and enhance citizen services — creating tangible value at speed and scale. We are a talent- and innovation-led company with approximately 750,000 people serving clients in more than 120 countries. Technology is at the core of change today, and we are one of the world's leaders in helping drive that change, with strong ecosystem relationships. We combine our strength in technology and leadership in cloud, data and AI with unmatched industry experience, functional expertise and global delivery capability. We are uniquely able to deliver tangible outcomes because of our broad range of services, solutions and assets across Strategy & Consulting, Technology, Operations, Industry X and Song. These capabilities, together with our culture of shared success and commitment to creating 360° value, enable us to help our clients reinvent and build trusted, lasting relationships. We measure our success by the 360° value we create for our clients, each other, our shareholders, partners and communities.

Visit us at **www.accenture.com**.

About Accenture Research

Accenture Research creates thought leadership about the most pressing business issues organizations face. Combining innovative research techniques, such as data-science-led analysis, with a deep understanding of industry and technology, our team of 300 researchers in 20 countries publish hundreds of reports, articles and points of view every year. Our thought-provoking research developed with world leading organizations helps our clients embrace change, create value and deliver on the power of technology and human ingenuity. For more information, visit Accenture Research on **www.accenture.com/research**.