

## Tech Trends 2023

### Life Sciences perspective

The technologies that enhance our organizations and our lives are more powerful (and more essential) than ever before. Forward-thinking life sciences organizations understand the technological forces that surround them and look for ways to harness them for the benefit of consumers and patients alike. On the pages that follow, we provide a life sciences-specific take on Deloitte's *Tech Trends 2023* report, spotlighting the accelerating technology trends most likely to cause disruption over the next 18–24 months.

We explore which trends may be most relevant as well as how ready life sciences organizations are to take advantage of them. From the rise of generative artificial intelligence (AI), augmented reality (AR), and virtual reality (VR) to decentralized architectures and ecosystems, the trends we explore could have profound implications for business, life sciences, and society in the months and years ahead.

# Through the glass: Immersive internet for enterprise

As we look to the future, the combination of AI-powered unlimited reality capabilities, 3D spatial computing, and adoption of AR and VR devices, as well as the necessary data interoperability will be leading us toward more personalized and more self-driven care. Through the familiarization, comprehension, and adoption of these virtual environments, life sciences companies are empowered to leverage new business models that can help them operate more effectively and efficiently. In turn, companies are also helping to enhance the consumer experience, strengthening the relationship between the industry and consumers.



Businesses and consumers alike naturally have higher expectations of user experience today versus the past. New virtual, digital environments cater to these ever-increasing desires and needs. As ecosystems within various industry sectors continue to develop and evolve, life sciences organizations are similarly becoming compelled to deliver more comprehensive and immersive experiences for patients. For these companies, these emerging imperatives drive innovation in business models, as well as create novel ways of accessing health care services and information in general that all promote a larger sense of community and promise to change more lives. This is, of course, just the tip of the proverbial iceberg, and a deeper look at current health care trends and their relation to technology innovation is warranted.

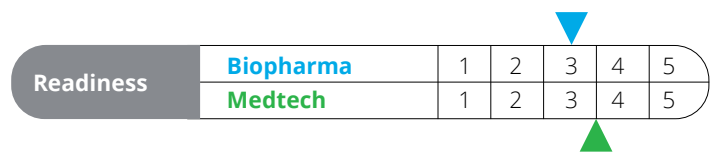
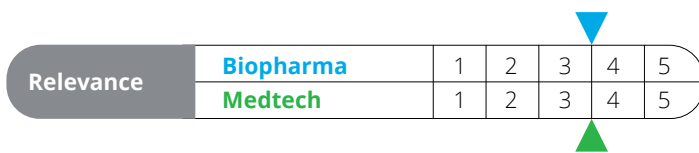
## Getting started

- Experiment with the technology.** Introduce 3D spatial computing and advanced analytics, applications of AR/VR, digital assets such as non-fungible tokens (NFTs), and avatars into select parts of the business to get a sense of application, utilization, and impact.
- Acquire the right talent and consider organizational changes.** Unlimited reality will present organizations with choices to internally make to adapt and stay ahead. Upskilling or hiring individuals who have expertise in virtual world design, 3D modeling and animation, game design, blockchain development, and user experience/user interface (UX/UI) design are likely key to building an engaging, immersive, and enjoyable experience for users.
- Partner externally with a purpose and scale.** Identify existing unlimited reality platform partners that share your vision and leverage their capabilities to enter the space. This provides an opportunity for organizations to scale without investing heavily in-house and explore additional areas where offerings can be deployed to drive value and increase adoption.
- Continue the quest for knowledge and learn.** This technology will continue to change and evolve. It is important to stay up to date on the latest developments and what features make sense to build into your organization.

## Trend in action

As patients evolve into health care consumers, life sciences companies have an opportunity to use the metaverse to create a more patient-centric experience. For example, take the concept of a virtual pharmacy. What might that look like? A metaverse-powered pharmacy—staffed by avatars—could make it possible for customers to ask questions, seek advice, fill prescriptions, and even shop. A patient could enter a metaverse pharmacy to discuss medications or a treatment plan with a pharmacist avatar. This avatar’s language ability may be powered by generative AI technology, making the metaverse pharmacists/avatars highly engaging and personalized. The future pharmacy isn’t only virtual—it also offers real-time, unique conversations with individual patients.

In another example, imagine that a headset combined with VR haptic gloves might allow a patient to experience a disease that has progressed or see the effect a therapy might have on symptoms. However, emerging technologies, across all industries, mature differently. As more and more unlimited reality use cases are identified and prioritized, and education occurs in life sciences, so, too, will familiarization and implementation. Small proof-of-concept pilots lead to more potential value testing in the year ahead.



At some point, life sciences organizations will have to put a ‘big bet’ down—a bold play concerning this trend. But for today, experimentation remains key, followed by where and how to scale being the next step.

—Jonathan Fox, managing director, Deloitte Consulting LLP

In a world where digitization of interactions, changing behaviors, and higher customer expectations are fueling a rapid advancement of extended reality, life sciences companies need to capture the opportunity to experiment with new business models by leveraging immersive digital experiences and risk-free simulations throughout the value chain. We believe that the significant opportunity lies in combining that extended reality experience with integrated data, content, and AI capabilities to drive research, simulation, and enterprise workflows.

—Puneet Sharma, principal, and Alessandro Ucci, managing director, Life Sciences Unlimited Reality offering leads, Deloitte Consulting LLP

# Opening up to AI: Learning to trust our AI colleagues

We've spent the past decade trying to get algorithms to understand us better. Now it looks like the next decade's true value might be more about AI-powered innovations that help us decipher and deploy even more effective algorithms. [Applying AI to big data in life sciences](#) can help life sciences companies reshape business models, streamline biopharma manufacturing, and enhance everything from cognitive molecule research and clinical trial data flow to self-healing supply chain applications and product intelligence.<sup>1</sup> It can also enable companies to be more personalized and authentic in how they engage with health care professionals, patients, and other stakeholders. And as generative AI continues its recumbent innovation track, we expect proliferation and impact across every aspect of people, process, and technology. Today, three types of interactions are occurring at the crossroads of artificial intelligence, algorithms, and trust:



- **Interpretation vs. misunderstanding.** AI models with complex architectures pose challenges for end-user interpretation, which can be easily influenced by human biases.
- **Action vs. inaction.** After AI gives a specific recommendation, it's up to people to accept or reject that recommended action. For example, AI suggesting the optimal engagement tactic for a sales rep to meet with a health care provider.
- **Reaction vs. feedback.** The insight exhibits observations and recommendations much like people would, so we should consider working alongside AI, reacting to what it has performed. For instance, when AI autonomously changes the shipping pathway of products.

Algorithms are beginning to move beyond data interpretation and into stages of automated judgment and decision-making, but the shift in creating better trust-based mechanisms to have confidence in these new technologies has been slower than anticipated.

## Getting started

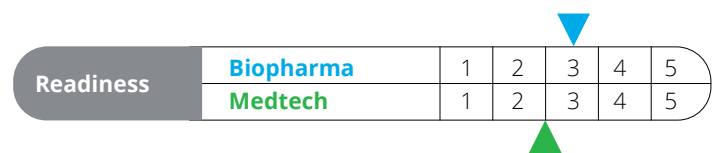
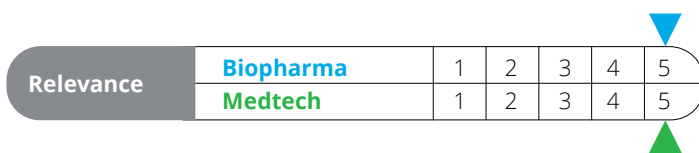
To fully realize the business potential of AI, we must meet a number of challenges head-on:

- **Ensure your samples are representative.** After gathering the data sets used to train the algorithm, consider having a representative sample of the population that you're hoping to help with that device, drug, or therapy. Make sure your data is comprehensive, accurate, and representative of the problem you're trying to solve.
- **Have a diverse team interpret your data.** A diverse team should be creating and training algorithms. If you cannot count on a diverse algorithm development team, there will likely be blind spots in the ways that team thinks about patients, data results, and the right questions to ask to train the algorithm. You may consider also instituting an AI ethics framework to mitigate the potential bias of data interpretation.
- **Deliver trustworthy results.** To continue building trust equity, it's critical that data sets, algorithms, and the testing of AI models are free of biases. To get started, confirm that the right controls and checks are in place so that your data is diverse and representative of targets and your development teams build balanced algorithms that provide organic results. Test and interpret the data with full objectivity in mind.

## Trend in action

Medtech devices are increasingly connected, sending out waveforms full of data requiring constant interpretation by someone, or by an algorithm. And today's clinicians—amid a widespread talent shortage—are already overwhelmed by an onslaught of data alerts. This is where AI can step in to generate an automated clinical or operational insight.

For example, when administering glucose readings, medical professionals are used to receiving patient scoring results from AI patterning. Moving forward, because it's being built into algorithms, AI is now consistently providing insights and recommendations to consider as next steps in patient care. In fact, generative AI can be utilized as a seamless interpreter of the AI pattern results and to summarize key findings for medical professionals. The implication of this enhanced capability is the reduction of the cognitive load on clinicians, many of whom are increasingly overwhelmed. It's not about replacing their decision-making capacity; rather, it's about informing their decisions in a more streamlined way.



The lowest trust index in this space continues to center on action—when decision agency is taken out of the equation, and you have to trust that AI is right. While many still deviate from AI recommendations, most retrospectives uncover lost advances due to those departures. We stand in the balance of time and results.

—Adam Israel, senior manager, Deloitte Consulting LLP

Most of the value from medical devices in the next few decades will not be the actual physical device itself, but the insights generated from the data coming from these devices. This will all be highly dependent on our ability to leverage AI. The amount of data is simply too overwhelming. There's no human who could possibly look at all the patterns in the data and quickly generate a clinical insight. AI-driven algorithms will enhance the way clinicians arrive at the key insights."

—Pedro Arboleda, managing director, Deloitte Consulting LLP



## Above the clouds: Taming multicloud chaos

Life sciences companies continue to navigate a complex regulatory environment. Unfortunately, the regulated landscape hampers the industry from leading in cloud innovation. The cloud infrastructure that exists for life sciences organizations now is a tangled web of tools with limited interconnectivity. So, the emergence of metacloud—or supercloud—is especially exciting for the future of the sector.

The single-pane compatibility layers that the technology can provide offer the comforts of simplification, synchronicity, and security. Benefits are known and adoption continues to rise. Are there potential holes in the midst? Challenges will most likely arise. Before businesses can achieve the metacloud level of optimization, they'll have to consider if they're making the most of their current cloud investments at the baseline level. Moving ahead demands reenvisioning your business—both people and process—to [take advantage of centralized cloud services](#) under a metacloud, which can help promote speed, agility, and innovation.<sup>2</sup>



### Getting started

- **Don't stop at IT.** Go to the business too. While cost is important, the most value lies in the innovations an organization can put into place after it moves to the cloud. This process may require reenvisioning people and processes to achieve the most return on investment from cloud investments.
- **Engage your ecosystem.** Understand that this is an ecosystem of providers. Beyond working directly with a hyperscaler, understand your partners who've built upon that platform. They can generally offer quicker solutions that run in the cloud environment you're paying for. By learning from other organizations, you can better understand how they're optimizing while leveraging partnerships.
- **Diversify your hyperscalers.** Remember that each cloud service is unique, so you'll want to maximize the capabilities of each by diversifying hyperscalers, which each have their own unique technology disruptions. Both from a price and knowledge perspective, it's important to keep that competition going. Beyond cloud infrastructure, make sure you're taking advantage of all the other capabilities they each have across their enterprises.

### Trend in action

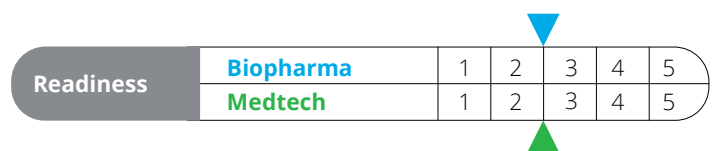
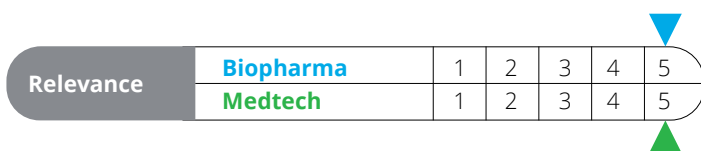
[Novartis](#) was able to string together data from 20 different instances of SAP across 60 manufacturing sites to create an "Insights Center" that acted as a single pane of control.<sup>3</sup> This center then provided real-time information to people working on the shop floor so they could:

- Increase their yield and efficiencies.
- Control predictive maintenance to avoid machine downtime.
- Create a new line of sight into supply chain forecasting.

They were able to pull all this together in less than a year.

[Medtronic's](#) breakthrough colonoscopy pill offers an alternative to the traditional colonoscopy process by way of a swallowable capsule containing a tiny camera.<sup>4</sup> The at-home procedure's capsule records its trip through the digestive system. Health professionals can then analyze the recording through AWS cloud technology and help detect potential polyps.

Life sciences companies that are utilizing advanced cloud capabilities such as these, and modernizing across value chains, are the industry players that will likely continue to win. Those that still view the metacloud trend solely as an infrastructure IT play—concerned only about cost management versus how to bring the business along with them—may end up being left behind.



Implicit in the idea of multicloud is that you have the best cost profile possible. But if you haven't done all of these other steps, you'll never achieve its full nirvana.

—Lita Sands, managing director, Deloitte Consulting LLP

## Flexibility, the best ability: Reimagining the tech workforce

For life sciences organizations to advance their digital transformation journeys, they should ensure that they're hiring talent and/or upskilling their workforce to support rapid innovation. This shift may demand finding talent with specific expertise: a data scientist who understands the nuances of complex clinical trials or a robotics engineer able to build a surgical robot. Amid a limited supply of technology talent, these dual-threat roles may be difficult to fill when competing for top tech talent with other industries.

Rather than competing in scarcity, life sciences leaders might consider a new strategy, wherein technology talent can be curated, created, and cultivated. Some companies are organizing their new and existing talent into “capability sets” to improve flexibility around assigning staff to new roles or products. Others hope to retain top talent by doubling down on company culture, offering remote working opportunities and programs that promote more wellness and equity.

Ultimately, centering a life sciences organization’s workforce around elasticity can help produce better business models that promote talent acquisition, collaboration, retention, and success. Leaders should also prepare for the workforce of tomorrow defined by human *with* machine collaboration—if time-consuming computations are delegated to AI, human coworkers can focus on the tasks that need the human touch.



### Getting started

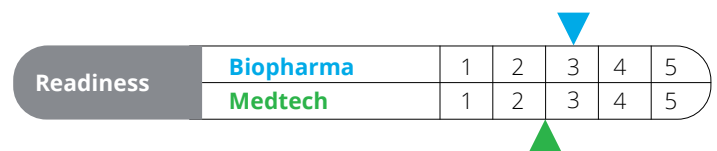
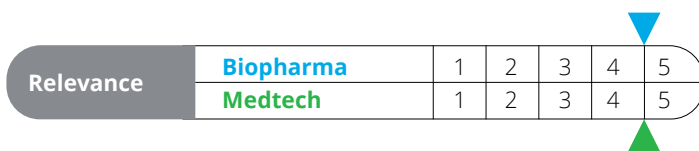
- Nurture transferable skills.** Build a more skills-based organization by seeking personnel with transferable skills first—abilities that can segue into more complex roles down the line. Think of each unique talent as a portfolio of skills that can slowly and progressively transform into the unicorn you desire.
- Leverage the power of teams.** Create a more agile working environment built on outcome-based teaming models that place different, developable individuals—with different skills—into complementary, collaborative partnerships. Your human resources and talent infrastructure departments should implement teaming, networking, and pairing that can provide your organization with the diversity of experience and skills needed to deliver against your product ambition.
- Adopt AI agility.** As the number of skilled cybersecurity professionals dwindles,<sup>5</sup> life sciences companies are increasingly reliant on technology that can perform more routine tasks—freeing up talent to focus on humanistic, higher-level issues and strategy. And with the emergence of generative AI also comes new roles that may not have existed a year ago, such as prompt engineers. Companies will likely need to determine whether to upskill or reskill certain positions. Evaluating the most valuable functions of a job versus its processes should be built into your workforce—where robots aren't replacing employees but rather working alongside them and helping to elevate their work.

### Trend in action

Johnson & Johnson is creating a skill-ontology platform to better understand what abilities their organization and people possess, require, and need. Their demand model includes project sharing and accessibility fostering a dynamic outlook of organizational scalability in this area versus a one-time view.

J&J talent can then begin bidding on projects and contributing to work that may be outside the details of their daily function—opening the doors to explore or exercise new skill sets. HR solutions like this, within talent marketplace technology, can enable skills-based companies to truly execute at organizational scale.

In support of their new talent infrastructure, the adoption of technology such as natural language processing and AI chat tools will likely advance the company’s future of work in life sciences.



Looking for people who are flexible is not enough. How you create a workforce environment of flexibility that can harness that talent is more important now.

—Elaine Loo, principal, Deloitte Consulting LLP

To truly activate a skills-based organization at scale, technology needs to support a dynamic model within human resources that keeps a pulse of the skills that are needed versus the skills of the workforce. This creates an accurate method of matching and pairing talent, individuals, and teams to work most efficiently.

—Chloë Domergue, senior manager, Deloitte Consulting LLP

## In us we trust: Decentralized architectures and ecosystems

In recent years, cyberattacks against pharmaceutical, medical technology/device, and other life sciences companies have disrupted supply chains, hobbled manufacturing processes, erased years of research, and resulted in hundreds of millions of dollars in damages. However, thanks to the emergence of decentralized architectures and ecosystems, organizations can now harness the power and security blockchain technology. These blockchain-enabled “trustless” systems not only help solve data-related credibility issues but also can win much-needed confidence across employee and customer groups. They help create a single version of irrefutable truth.



Relying on cryptography and code-driven consensus of systemwide users—rather than moderation by third-party intermediaries—these decentralized systems also can help close the digital trust gap by safeguarding data privacy.

Whether blockchain or Web3, the potential is there. Now's the time to experiment in creating infrastructures, mindsets, and information-sharing platforms that support decentralization's strong data security. Trust can indeed be more tangible, together.

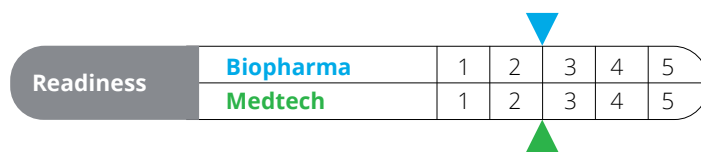
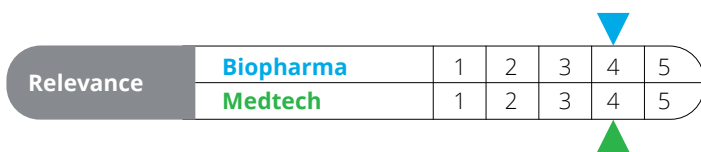
### Getting started

- **Look outside your industry.** Take cues from other businesses that may be a bit further along in this space. Lessons around customer and patient data, product life cycles, and shifting organizational liability can be mined from a myriad of industries. For example, megastore retailers are increasingly using blockchain to manage and track their entire supply chain logistics and recording, while following entire product paths. From origination and tracking tactics to purchasing and logistics plans, many organizations are using blockchain technology to reduce risk while promoting reliability and trust.
- **Invest early.** Early investing in blockchain methods can keep you at the forefront of the trend versus falling behind and learning about the competition's adaptation and adoption. This train is already in motion. The sooner you can adapt and adopt, the faster you can earn and build market trust while creating more business.

### Trend in action

Organizations that entirely store record data on their own are responsible for all data protection, obtaining consents, and sharing it with third-party providers. Different compliance and regulation conflicts and penalties can arise if there is a mismatch of a user's consent. But today, digital identity and Web3 implementations are promoting the concept of global identity in which you empower end users to bring in their own identification data. This new ecosystem—built upon the secure use of cryptographic hashes—can help facilitate more accurate, reliable, and safer recordkeeping, as well as transferring risk to third parties.

Additional security benefits are seen in nations where pharma organizations are creating and issuing new products. Decentralized architectures help in quieting counterfeit drugs. Blockchain also helps create safer environments for digitized medical equipment, pacemakers for example, to continue sending information back and forth from a decentralized hub. Pharma companies, beyond patient interaction, also have a lot of trusted interactions with health care professionals across the globe. Leveraging [technologies](#)<sup>6</sup> such as blockchain and Web3, these companies are now creating international credentialing systems. Several nations have their own system established, which users must use in order to interact and download information.



Trusting individuals to secure their own identity will take time though. There are different liability scenarios that still need to be hashed out, similar to what we're seeing in the world of autonomous automobile driving. Experts still need to map out concrete liability and insurance plans before this technology becomes pervasive.

—Amit Chhikara, principal, Deloitte Advisory LLP and Deloitte Cyber Risk Services

## Connect and extend: Mainframe modernization hits its stride

The benefits of cloud computing, AI, and other transformative technologies are helping life sciences organizations generate new paths to business value while creating positive change for the greater good. For example, medical technology devices, such as wearables and digital therapeutics, are expected to have a huge impact on the future of life sciences—achieving better, more personal health outcomes and communities. But as organizations journey along new, adventurous paths, they can't abandon the safeguarded successes of the past. More and more life sciences companies are leveraging things like mainframes—due in large part to their high level of data security—to drive digital transformation.



Since data is one of the most valuable assets in the increasingly digitized health care space, instead of completely replacing existing legacy core systems, leading organizations are opting to creatively connect them to emerging technologies so that each family of systems can do what it does best. AI and other tools now offer middleware solutions that act as hybrids between trust and advancement.

The result can be a powerful pairing: the trusted functionality of core legacy systems with the expansive capabilities of emerging technologies. In this way, legacy systems don't have to be roadblocks on the path to digital transformation, but rather, engines that drive businesses forward.

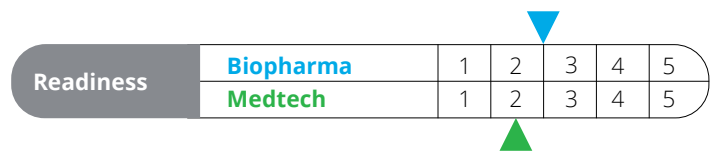
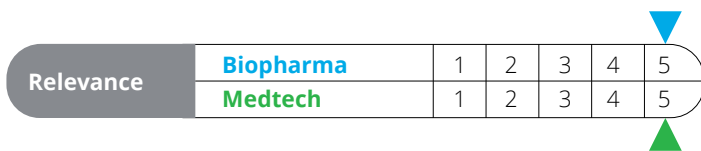
### Getting started

- **Defend data above all else.** Your data is precious, so protect it. Nearly impossible to hack, government regulations around data security drive more organizations to mainframes every day. Nearly three-quarters of business and IT executives believe mainframes have long-term viability in their organization, and more than 90% expect to expand their mainframe footprint.<sup>7</sup>
- **Leverage AI.** Thanks to emerging technologies such as AI, the mainframe might actually become more relevant in the years ahead. At the crossroads of trust and flexibility, moving to an AI model for middleware solutions that can handle network support while managing a mainframe can prove invaluable.
- **Connect tried-and-true with emerging and new.** Adding fresh integration on top of existing legacy systems can help bring data to life in fresh ways. Investigate connecting your mainframe to modern tools such as AI-powered middleware solutions, advanced microservice applications, and refreshed user interfaces. Diversifying these layers, web services, and applications can help provide your staff with new, larger sets of data and insights. To that end, we expect an ecosystem data and informatics provider role will emerge at many life sciences organizations to help collect, aggregate, curate, analyze, and interpret data from various sources.

### Trend in action

Life sciences companies are increasingly leveraging mainframe technology to optimize the utilization of artificial intelligence and foster consumer trust. Mainframes provide the processing power and scalability necessary to handle large volumes of data generated by life sciences research and enable the application of AI algorithms for advanced analysis and insights.

By harnessing AI capabilities on mainframes, companies can streamline drug discovery, clinical trials, and personalized medicine. Moreover, mainframes offer robust security features that help ensure data privacy and compliance, enhancing consumer trust in the handling of sensitive health information. This integration of mainframes and AI empowers life sciences companies to make significant advancements while prioritizing data security and privacy concerns.



“ Whether you receive services from a hospital, a bank, or an airline—your data is being stored somewhere on a mainframe. It may not be the most fun or the latest and greatest, but mainframes are what really drive this world.  
 —Robert Miller, senior manager, Deloitte Consulting LLP

## Author

For questions regarding the *Tech Trends 2023 Life Sciences perspective*, please contact:

### Todd Konersmann

Principal  
Deloitte Consulting LLP  
[tkonersmann@deloitte.com](mailto:tkonersmann@deloitte.com)  
+1 214 840 1993

## Related resources

### Tech Trends 2022

[www.deloitte.com/us/techtrends](http://www.deloitte.com/us/techtrends)

### Digital Transformation in Life Sciences

[www.deloitte.com/us/digital-transformation-life-sciences](http://www.deloitte.com/us/digital-transformation-life-sciences)

### Future of Health™

[www.deloitte.com/future](http://www.deloitte.com/future)

### Life Sciences at Deloitte

[www.deloitte.com/us/life-sciences](http://www.deloitte.com/us/life-sciences)

## Endnotes

1. Aditya Kudumala et al., "[Biopharma digital transformation: Gain an edge with leapfrog digital innovation](#)," Deloitte Insights, December 8, 2021.
2. Raveen Sharma and Lita Sands, "[Life sciences firms should try to find cloud's virtuous circle](#)," *Deloitte Health Forward Blog*, March 23, 2023.
3. Shez Partovi and Ian Meyers, "[AWS and Novartis: Re-inventing pharma manufacturing](#)," *AWS Blog*, December 4, 2019.
4. Medtronic, [PillCam™ COLON 2 System](#), accessed October 2023.
5. Tara Mahoutchian and Jimmy Joseph, "[Finding, cultivating cyber talent in health care and life sciences](#)," *Deloitte Health Forward Blog*, July 20, 2023.
6. Kudumala et al., "[Biopharma digital transformation: Gain an edge with leapfrog digital innovation](#)."
7. Deloitte, "[Hello mainframe, our old friend](#)," July 2020.

# Deloitte.

This communication contains general information only, and none of Deloitte Touche Tohmatsu Limited, its member firms, or their related entities (collectively, the "Deloitte Network") is, by means of this communication, rendering professional advice or services. Before making any decision or taking any action that may affect your finances or business, you should consult a qualified professional adviser. No entity in the Deloitte Network shall be responsible for any loss whatsoever sustained by any person who relies on this communication.

### About Deloitte

Deloitte refers to one or more of Deloitte Touche Tohmatsu Limited, a UK private company limited by guarantee ("DTTL"), its network of member firms, and their related entities. DTTL and each of its member firms are legally separate and independent entities. DTTL (also referred to as "Deloitte Global") does not provide services to clients. In the United States, Deloitte refers to one or more of the US member firms of DTTL, their related entities that operate using the "Deloitte" name in the United States and their respective affiliates. Certain services may not be available to attest clients under the rules and regulations of public accounting. Please see [www.deloitte.com/about](http://www.deloitte.com/about) to learn more about our global network of member firms.

Copyright © 2023 Deloitte Development LLC. All rights reserved.  
6880704

## Contributors

**Larry Samano**, principal, Deloitte & Touche LLP  
**Aditya Kudumala**, principal, Deloitte Consulting LLP  
**Adam Israel**, manager, Deloitte Consulting LLP  
**Dan Grayson**, principal, Deloitte Consulting LLP  
**John Conrad**, principal, Deloitte & Touche LLP  
**Tony Jurek**, managing director, Deloitte Consulting LLP  
**Rajiv Ahuja**, managing director, Deloitte Consulting LLP  
**John Lu**, principal, Deloitte & Touche LLP  
**Jonathan Fox**, managing director, Deloitte Consulting LLP  
**Sanjeev Sharma**, managing director, Deloitte Consulting LLP  
**Christine Lyman**, senior manager, Deloitte Consulting LLP  
**Abhisek Ghosal**, manager, Deloitte Consulting LLP  
**Connie Ritchey**, managing director, Deloitte Consulting LLP  
**Russell Jones**, partner, Deloitte & Touche LLP  
**Todd Konersmann**, principal, Deloitte Consulting LLP