

Tech Trends 2024

Life Sciences perspective

As we peer toward the horizon of technological advancements, the life sciences sector stands at the forefront of unprecedented transformation. The rapid evolution of digital technologies is not only reshaping the landscape of health care delivery and life sciences research but is also empowering organizations to leapfrog traditional barriers in patient care and treatment innovation.

On the pages that follow, we provide a life sciences-specific take on [Deloitte's Tech Trends 2024 report](#), identifying key technological currents poised to redefine the industry over the next 18 to 24 months. Through interviews with subject matter specialists and a deep dive into emerging technologies, we uncover how life sciences organizations can not only adapt but thrive by embracing these innovations. Our exploration will focus on the potential of these technologies to enhance patient outcomes, streamline operations, and forge new paradigms across the life sciences value chain.

Relevance and readiness scale:

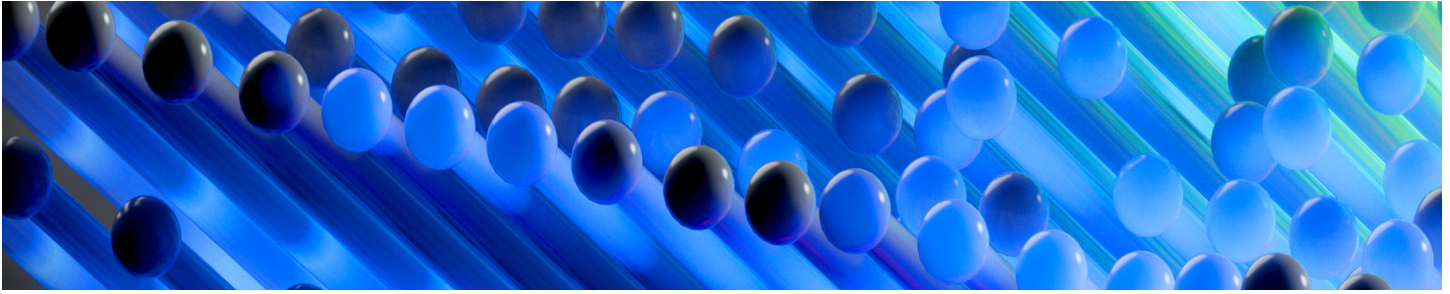
We looked at each trend and assigned a value from one (low) to five (high) based on the trend's relevance and readiness of adoption by biopharma and medtech organizations.

RELEVANCE:

How impactful would it be if biopharma and medtech organizations adopted the trend?

READINESS:

How ready are biopharma and medtech organizations to adopt the trend?



Interfaces in new places: Spatial computing and the industrial metaverse

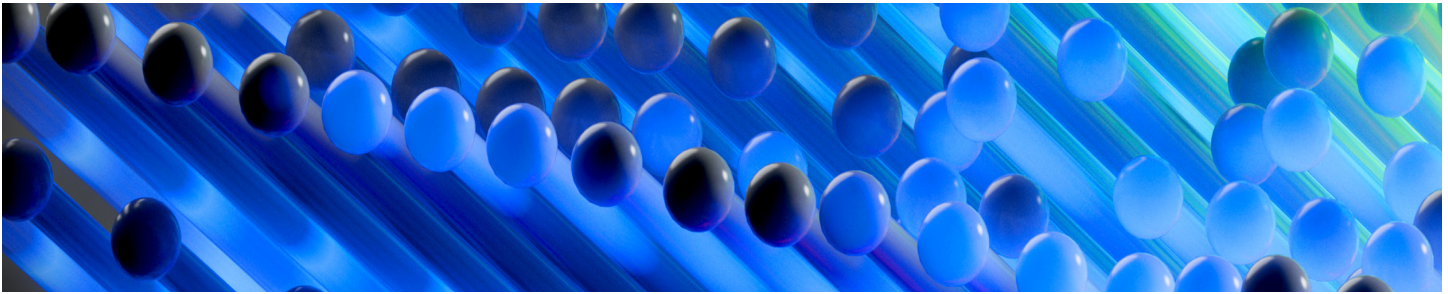
Spatial computing has the potential to redefine how entities across the life sciences spectrum—encompassing biopharma, medtech, and beyond—interact with digital and physical environments, enhancing the way data is visualized and manipulated. In the realm of augmented reality (AR) and virtual reality (VR), this trend offers transformative potential. For medtech, it can facilitate advanced diagnostics and more precise therapeutic interventions by enabling surgeons and clinicians to interact intuitively with complex medical data and patient-specific anatomical models.

In biopharma, spatial computing can help accelerate drug discovery by allowing deeper, more interactive engagements with molecular and biological datasets. By integrating these advanced visualization tools, life sciences organizations can help foster a more dynamic approach to innovation, from research labs to surgical suites, propelling both sectors into new frontiers of efficiency and effectiveness.

To begin exploring spatial computing technologies, organizations can initiate pilot projects in areas that can have immediate impact potential, such as R&D and surgical training, to understand the benefits and challenges associated with AR and VR integration.

Getting started

- **Integrate AR and VR in R&D and training.** Deploy augmented and virtual reality technologies in research and development (R&D), as well as in training simulations for surgical procedures, to leverage their full potential in enhancing medical education and operational precision. In R&D, AR/VR can transform traditional methodologies by providing scientists and researchers with immersive environments where they can visually manipulate and interact with complex molecular structures or simulate biological processes in real time.
- **Ensure access to specialized talent.** Facilitate access to talent with skills in 3D modeling, AR/VR development, and user experience design when needed to ensure that these new technologies are effectively integrated and optimized within your organization.
- **Establish technological partnerships.** Form alliances with established technology companies that specialize in spatial computing. This strategy can provide for the rapid integration of advanced capabilities without the need for extensive in-house development, reducing both cost and time to implementation.
- **Implement robust cybersecurity measures.** As spatial computing involves significant data exchange and user interaction, organizations should consider implementing stringent cybersecurity protocols to help protect sensitive data. Ensure compliance with privacy and regulatory standards to navigate the complexities of using AR/VR technologies in sensitive environments.



Interfaces in new places: Spatial computing and the industrial metaverse

Trend in action

In medtech, spatial computing is already revolutionizing how surgeries are performed. Surgeons are using AR goggles to see real-time data overlays during procedures, such as detailed mappings of a patient’s anatomy. This advanced technology is enabling more precise placements of implants or reductions in surgical errors, thereby enhancing patient outcomes.

Similarly, in biopharma, spatial computing is transforming drug discovery. Scientists are engaging with 3D models of drug compounds and their interactions with target proteins of interest in real time. This interaction is speeding up the drug discovery process and enhancing the selectivity of compounds, which helps reduce unwanted “off-target” effects that drive adverse events.

These ongoing applications of spatial computing aren’t just promising—they’re already making significant impacts on patient care and product development. They underscore the importance for life sciences companies to adopt and further integrate these technologies to stay competitive and meet the evolving demands of health care. Despite the transformative potential of AR/VR, [our research](#) indicates that an unexpectedly low percentage of industry professionals—only 19%—believe that their organizations are likely to invest in these technologies over the next five years. This gap underscores a critical area of focus for life sciences companies to explore and expand their AR/VR capabilities to fully capitalize on the benefits of spatial computing.



This trend is highly pertinent as it addresses a core area of innovation that can significantly enhance drug discovery and patient engagement strategies.



Organizations will likely require substantial investment in emerging technologies and platforms, such as AR/VR and 3D modeling, to fully leverage the benefits of this trend.



This trend closely aligns with medtech’s focus on advanced diagnostics and patient-centered technology solutions, making it extremely relevant.



While somewhat prepared, medtech companies still need to further develop their technological infrastructure and integration capabilities to capitalize on this trend effectively.

“Within biopharma, from a spatial computing perspective, we’re able to model a body’s response to something, and now interactively engage through novel visualization of data. This approach is especially relevant in R&D, for scientific and discovery breakthroughs, which I find quite fascinating.”

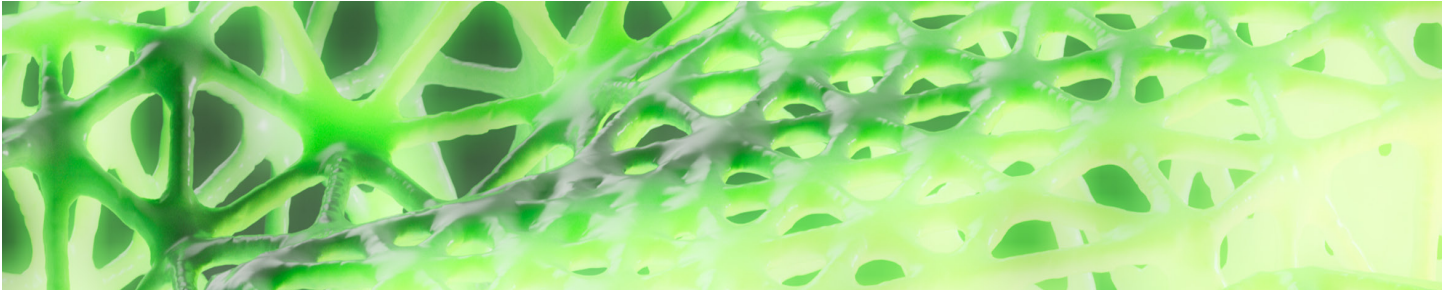
—**Jonathan Fox**, managing director, Deloitte Consulting LLP

“Spatial computing can be extremely useful, for instance, in robotic surgeries where precise mapping of the body, bones, and veins is crucial. This technology is part of a growing trend in medtech, particularly in surgeries where precision and accuracy are paramount.”

—**Sri Chennakesavan**, principal, Deloitte Consulting LLP

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[Biopharma digital transformation: Gain an edge with leapfrog digital innovation](#)



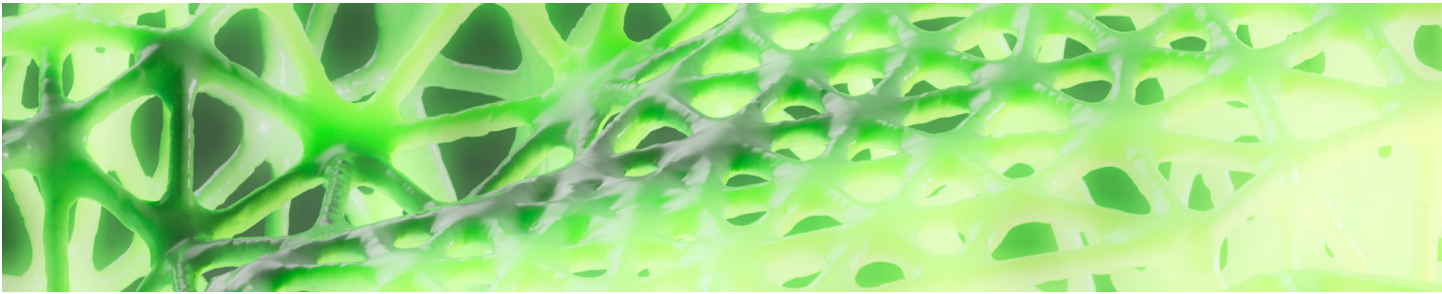
Genie out of the bottle: Generative AI as growth catalyst

In the dynamic realm of life sciences, the advent of Generative Artificial Intelligence (GenAI) marks a pivotal turn. As this disruptive technology continues to roll out capabilities, it has the potential to help catalyze unprecedented growth and transformation across biopharma and medtech sectors. GenAI, with its profound ability to create and simulate novel data and scenarios, is not just an enhancement to existing processes—it is a potential sea change in the making. This trend is about harnessing the creative potential of AI to innovate, optimize, and disrupt, propelling life sciences into a new era where data intelligence becomes the cornerstone of decision-making and development.

The impact of GenAI extends beyond mere technological enhancement—it embodies a shift toward more agile, tailored, and efficient solutions for life sciences. By integrating this technology, companies can significantly accelerate drug discovery and device development cycles, customize patient engagement, and streamline operations—all while maintaining stringent regulatory standards. The potential of GenAI to transform vast datasets into actionable insights can redefine the competitive edge, turning processes that were once complex and time-consuming into operations that are efficient and more comprehensive. As we examine this trend deeper, we explore how life sciences companies are poised to redefine their futures through the use of GenAI.

Getting started

- **Invest in AI literacy.** Enhance workforce capabilities by investing in AI literacy and technical training, ensuring that the workforce both understands and can leverage AI technologies effectively.
- **Develop ethical guidelines.** Establish clear ethical guidelines for the use of Generative AI to comply with [regulatory standards](#) and maintain public trust.
- **Leverage cross-industry collaboration.** Collaborate with technology leaders to stay at the forefront of GenAI advancements and applications.



Genie out of the bottle: Generative AI as growth catalyst

Trend in action

An example of GenAI within the life sciences could involve its application in drug development. By simulating the interactions of novel drug compounds with human proteins, GenAI can predict protein structures and the binding affinity of molecules faster than traditional methods. This not only reduces the time and cost associated with drug and device development, but may also increase the probability of success in clinical trials. Furthermore, GenAI can help revolutionize patient interaction by providing personalized treatment plans based on individual health data, significantly improving patient outcomes and satisfaction.

Beyond these applications, GenAI holds potential in transforming marketing within the life sciences. Its ability to enable hyper-personalized content at scale and precisely measure sales effectiveness can significantly disrupt existing marketing frameworks. To capitalize on this technology, marketing leaders should anchor their investments in solving key business issues and integrate GenAI with existing technologies. Starting with low-risk use cases can help manage risks effectively while focusing on differentiation to achieve long-term success in a competitive landscape.



RELEVANCE BIOPHARMA
This trend is very important, directly impacting drug discovery and personalized medicine.



READINESS BIOPHARMA
Biopharma organizations are moderately ready, with ongoing investments in data analytics and machine learning, though further advancements are needed for full utilization.



RELEVANCE MEDTECH
This trend is very relevant and central to medtech's core mission of improving diagnostic and treatment technologies through innovations like AI and IoT.



READINESS MEDTECH
Medtech is making strides in adopting these technologies but must consider evolving its capabilities in order to keep pace with rapid technological advancements.

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- [Can life sciences companies unlock the full value of GenAI?](#)
- [Realizing transformative value from AI and GenAI in life sciences](#)
- [The creative power of Generative AI to amplify marketing excellence](#)

“I think there are innovators who are pretty much going all in with a top-down mandate and a holistic strategy in terms of how they want to execute. And then there are other companies who are dabbling in no-regrets bets and use cases that they see the value in, to galvanize the enterprise in the hopes that they can sell it to management and eventually scale bigger.”

—**Aditya Kudumala**, principal,
Deloitte Consulting LLP

“Medtech has rapidly explored the capabilities of GenAI, making a number of ‘no-regrets’ bets that have proven successful. I view GenAI as a crucial accelerant for the long-anticipated AI-enabled transformation of medtech. However, success will likely hinge on a structured approach to scaling and the ability to build trust in these technologies.”

—**Wendell Miranda**, deputy manager,
Deloitte Center for Research

“From a patient experience perspective related to therapy onboarding, affordability, and continued adherence, we see GenAI playing a huge role in driving operational efficiencies across the patient support function, enabling our clients to do 100% more work with 50% less.”

—**Gerry McCormick**, principal,
Deloitte Consulting LLP



Smarter, not harder: Beyond brute force compute

As the life sciences sector continues to harness the transformative powers of AI and machine learning, a significant trend is emerging: moving beyond brute force compute to smarter, more scalable solutions. This trend is defined by its ability to use advanced computational technologies to enhance efficiency, accelerate innovation, and reduce costs. By leveraging cloud computing's scalability and AI's precision, life sciences companies can analyze complex datasets faster than ever, leading to quicker and more effective decision-making processes and outcomes.

Getting started

- **Embrace scalable cloud technologies.** Start by integrating cloud solutions that offer flexibility to scale resources up or down based on data processing needs. This approach can help manage costs effectively and also supports high-complexity tasks in drug discovery and genomic research.
- **Invest in AI and machine learning integration.** Focus on embedding AI and machine learning (ML) throughout research and development processes. This integration can significantly enhance pattern recognition and predictive analytics, driving innovations in drug discovery, clinical trials, and manufacturing quality control.
- **Optimize data management.** Implement systems that can handle large volumes of data efficiently. Consider technologies that enhance data ingestion, processing, and analysis capabilities, which are essential for managing the vast amount of data generated in life sciences.
- **Future-proof your infrastructure.** Prepare for future advancements such as quantum computing by building a flexible and robust IT infrastructure that can accommodate new technologies as they become viable and relevant to the industry.



 **Smarter, not harder:**
Beyond brute force compute

Trend in action

An example of this trend can be seen in how major pharmaceutical companies are utilizing cloud-based AI platforms to streamline drug development processes. One notable case is a life sciences company that has implemented an AI-driven platform to predict the success rate of drugs early in the development phase. This use of predictive analytics has allowed the company to make quick decisions about which drug candidates to move forward with, reducing time and expenditure on less promising compounds.

Another example involves a biotech startup that leverages ML algorithms to analyze genetic data from patients to identify potential targets for cancer therapy. By using cloud-computing infrastructure, the company can dynamically scale its computational resources to handle large datasets quickly and efficiently, accelerating the path of its research and development efforts.

“There is interest for many companies, specific to what the compute architecture can scale up to—the ability to ingest terabytes of data and quickly process what the models need to do efficiently. Clients are looking for architectures that lay out the back-end requirements, especially around CPUs and other compute capabilities needed. They’re also looking for accelerators that provide the necessary horsepower to run large language models.”

—**Tarun Singh**, managing director,
Deloitte Consulting LLP



This trend has a strong potential impact on operational efficiencies and clinical trial processes, though it is less directly tied to core product innovations.



Biopharma companies face significant challenges in integrating and scaling advanced computational technologies, indicating a lower state of readiness.



This trend is essential for medtech, as stronger computing power is central to driving better health outcomes through innovative engineering. It helps enhance device and software integration, which is key for advancing the primary functions of medical devices and improving patient care.



Similar to biopharma, medtech also struggles with the technical and infrastructural changes needed to implement complex computing solutions. To address these challenges, it's important for medtech companies to collaborate and partner with tech pioneers to enhance their capabilities and adapt more swiftly to these advanced technologies.

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- [Life sciences firms should try to find cloud's virtuous circle](#)
- [Industry clouds: Reimagine the future of business with industry clouds](#)



From DevOps to DevEx: Empowering the engineering experience

The pace of innovation is continually accelerating for many life sciences companies. As the complexity and centrality of engineering solutions and products grow, there's a heightening need to attract and retain top engineering talent to keep up with the demand for breakthroughs. This surge necessitates a shift from traditional DevOps to a Developer Experience (DevEx)-oriented approach. DevEx represents a strategic focus on creating an enriching environment for developers—one where technical creativity is highly encouraged as a central pillar of the organizational ethos. It involves crafting a holistic talent experience that extends beyond mere platforms, encapsulating everything from the physical workspace to the virtual tools and cultural elements that foster innovation.

DevEx goes beyond mere improvements in tools and processes. It's also about nurturing a holistic ecosystem that can help attract and retain top-tier engineering talent. This ecosystem can offer teams a dynamic environment in which they can thrive, innovate, and directly contribute to transformative outcomes in life sciences, supported by continuous skills development and learning opportunities.

The impact of embracing a DevEx mindset can be profound. It can help improve the efficiency and satisfaction of developers while also fundamentally altering how life sciences companies approach product development and systems operations. By prioritizing a superior developer experience, organizations can help unlock major productivity gains, reduce time to market, and elevate the quality of their outputs—all while fostering a healthier workplace environment.

Getting started

- **Assess current DevEx maturity in your organization.** Evaluate existing development practices and physical workplace environments, identifying areas for enhancement in skill-building and professional development opportunities.
- **Implement tools and systems that can help boost productivity.** Integrate state-of-the-art tools that can streamline development workflows, help reduce administrative overhead, and support skill utilization.
- **Focus on career development and growth.** Develop clear career pathways for technical staff that help emphasize continuous learning, skill advancement, and professional growth to keep pace with rapidly advancing technologies.
- **Cultivate a culture of innovation.** Encourage a workplace ethos that values creativity, experimentation, and user-centric problem-solving, where developers feel empowered to take initiative.



 **From DevOps to DevEx:**
Empowering the engineering experience

Trend in action

Life sciences companies are increasingly recognizing the value of improving the developer experience to enhance efficiency and innovation. For example, one multinational pharmaceutical, biotech, and medtech company has begun prioritizing DevEx within its IT strategies, developing robust platforms that can support and engage developers more effectively. These initiatives help improve operational efficiencies and help attract and retain top talent in a competitive market.

Moreover, smaller, agile companies are beginning to leverage DevEx to help accelerate their digital transformations, using advanced technologies and methodologies to improve their development environments. These efforts are important to stay ahead in a field where technological capability directly influences the speed and success of product development cycles.

“Most companies are now realizing that it’s not just about hiring the right talent—it’s about nurturing, developing, and retaining talent through enhanced developer experiences.”

—**Siddharth Karia**, principal,
Deloitte Consulting LLP



This trend is highly relevant as biopharma companies continue to integrate more software into their products and processes, making the efficiency and happiness of software development teams a priority.



DevEx is becoming more recognized as a vital aspect of biopharma, but companies typically need more systematic approaches to embed these practices fully.

“We need to think about how we can attract and retain talent, particularly by defining clear career pathways and learning opportunities within our organizations.”

—**Allyson Dake**, managing director,
Deloitte Consulting LLP



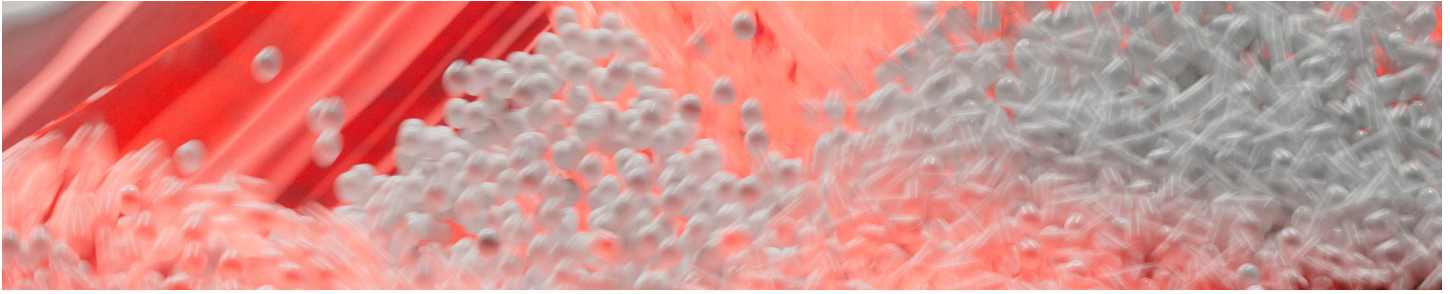
DevEx is especially important for medtech companies, which are tech-oriented by nature and want to excel in innovation and operations.



Medtech companies have an edge in adopting DevEx practices, since their business model is more tech-focused and can enable quicker adaptation to new IT methods.

Related insights and perspectives to support your tech journey

- [To digitize its supply chain, biopharma may first need to close a workforce skills gap](#)



Defending reality: Truth in an age of synthetic media

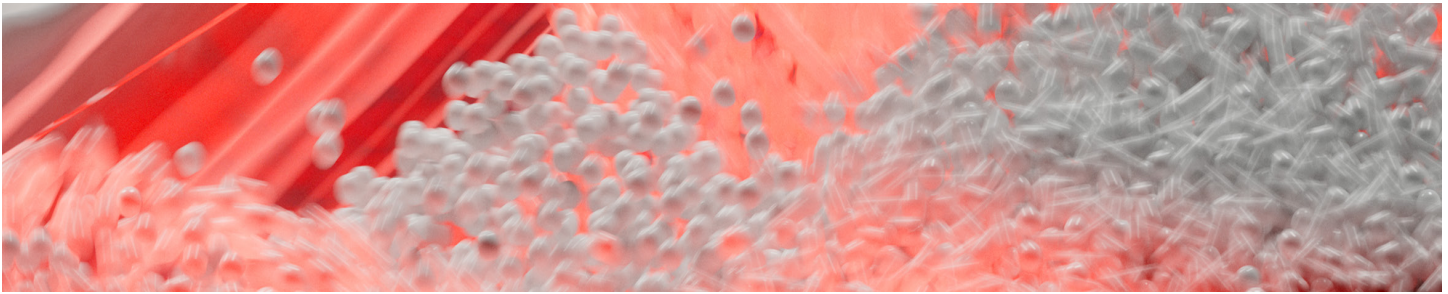
In an era where digital content can be manipulated with stunning realism, the emergence of synthetic media, such as deepfakes, and disinformation pose unprecedented challenges for many organizations. Synthetic media has the potential to go beyond disrupting individual reputations to undermining public trust and corporate integrity. The life sciences sector, which often relies on the credibility of scientific data and personal health information, stands on the front line of this battle. This trend dives into the critical necessity of defending reality, emphasizing robust digital verification processes to help ensure that authenticity remains uncompromised in scientific communication and data exchange.

A number of tools that help detect synthetic media have already been deployed, such as platforms that train on a petabyte-scale database of text, images, and audio, some of which is artificially generated. These AI models, trained on extensive data, can reliably identify manipulated content. This capability is crucial for enterprises, especially when facing misinformation and disinformation campaigns that could harm the business's reputation or that of its leadership. Synthetic media detectors are rapidly advancing and will soon become even more finely tuned.

The implications of deepfakes and inaccurate AI-generated content extend beyond misinformation. They represent a direct threat to the foundational trust that underpins patient relationships and scientific discourse. Life sciences companies are now prompted to adopt advanced technologies and strategies to help detect and mitigate these threats. By integrating such measures, companies can protect their own assets and help contribute to the broader integrity of health care and life sciences information across digital platforms.

Getting started

- **Assess current security posture.** Start with comprehensive evaluations of current cybersecurity protections to detect potential weaknesses.
- **Implement advanced detection tools.** Invest in technologies capable of detecting synthetic alterations in digital content, including deepfakes and other AI-generated media, to prevent misinformation from spreading.
- **Enhance training and awareness across the enterprise.** Keep employees apprised of the most recent cyberattacks and artificial media techniques to help create a watchful organizational culture.
- **Develop robust protocols.** Develop and execute clear guidelines that can quickly address issues with synthetic media to reduce possible harm and restore broken trust.



 **Defending reality:**
Truth in an age of synthetic media

Trend in action

These tools and platforms are already making a significant impact. For example, one leading biopharmaceutical company has implemented advanced digital verification systems for clinical trial data. Given the importance of accurate and reliable data for drug development and approval, this company took proactive measures to help secure its digital communication channels against the threat of deepfakes.

The company initiated a project to help integrate blockchain technology with its digital assets management systems. Blockchain's inherent properties of decentralization, immutability, and transparency make it an ideal solution to help ensure the integrity and traceability of clinical data. Each piece of data, from patient consent forms to clinical study reports, was hashed and recoded on a private blockchain. This setup can help provide a verifiable and tamper-proof record of data provenance and modifications.

“AI presents a new dimension of threats to life sciences companies. Organizations will have to rethink traditional controls and reformulate them as the adversary becomes faster and more nimble.”

— **Amit Chhikara**, principal, Deloitte Consulting LLP



This trend is highly relevant as biopharma companies increasingly depend on digital data integrity to help drive research and regulatory compliance.



Biopharma organizations are moderately ready, with many already investing in cybersecurity measures but needing more comprehensive strategies to help address emerging digital threats.



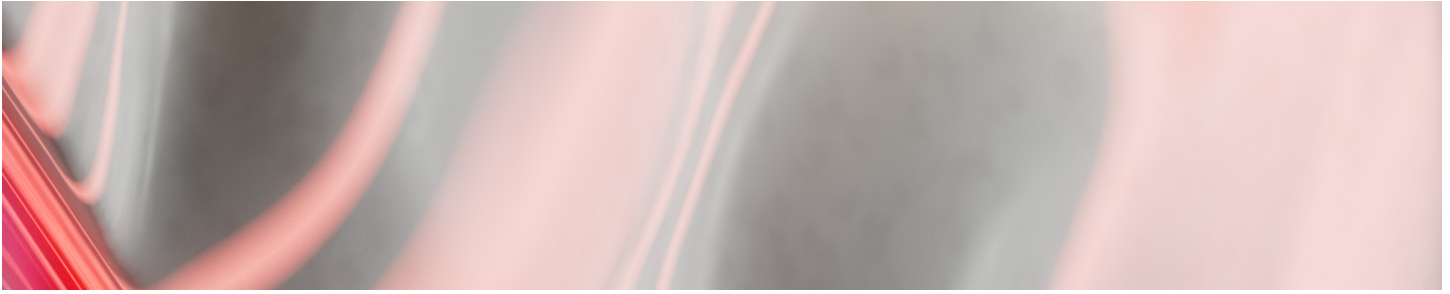
Medtech companies may also find this trend highly relevant, given their reliance on accurate data for device design, testing, and patient safety.



Medtech is moderately prepared, having taken steps toward securing digital assets, but requiring further integration of advanced defensive technologies to help handle evolving threats effectively.

“With synthetic content growing drastically in volume, variety, and sophistication, life sciences companies will increasingly look to processes and technologies that can help verify the authenticity of key data points.”

— **Don Williams**, managing director, Deloitte Transactions and Business Analytics LLP



Core workout: From technical debt to technical wellness

Many life sciences companies face growing pressure from “technical debt”—obsolete and ineffective systems that can hinder innovation and operational efficiency. Technical debt for life sciences organizations can be especially problematic due to the sector’s dependence on cutting-edge research and development, strict regulatory environments, and complex business needs. Moving from technical debt to technical wellness can involve system or infrastructure upgrades, but it’s also a strategic necessity that enables the sector to innovate and deliver on the potential of modern medicine.

In the past, some life sciences companies have made technology investments focused on immediate needs without a comprehensive view of their technological architecture’s long-term viability. This approach has often led to layers of disconnected technologies that can be costly to maintain and hard to update. Today, with the rapid advancement of digital technologies, especially in genomics, personalized medicine, and patient care technologies, there’s a strong need to reexamine and revitalize IT ecosystems to support more integrated, agile, and data-driven operations.

Getting started

- **Conduct a technical debt audit of your business.** Begin by surveying and evaluating the existing IT environment to find out-of-date systems, repetitive processes, and domains where obsolete technologies might hinder operational effectiveness.
- **Adopt and integrate modern platforms.** Modernize or improve outdated systems with adaptable platforms or custom solutions designed for life sciences requirements. Prioritize platforms that can enable integration with emerging tech like AI/ML to ensure future scalability.
- **Invest in skilled talent and training.** Build a team of professionals with expertise in new technologies within the organization or improve the current staff’s skills through specific training programs to help promote a culture of ongoing advancement and innovation.



Core workout:
From technical debt to technical wellness

Trend in action

This trend is illustrated by a global biopharma company that reduced its technical debt by merging several old systems into a single cloud platform. This project not only helped simplify data flows across R&D but also increased regulatory compliance and reduced time to market for new therapies. By moving its data to a modern cloud platform, the company enhanced its operational capability and scalability, allowing it to use real-time data analytics and machine learning for quicker decision-making processes.

“Technical debt reduction is more an enabler for you to do better things. If clients aren’t investing in tech debt reduction by modernizing their applications or by enabling more flexible platforms, they’re not unlocking the full potential of all their other technology.”

—**Nirav Mehta**, Principal,
Deloitte Consulting LLP



Technical wellness is key for biopharma companies to accelerate drug development and enhance patient outcomes.



While the sector recognizes the importance of modern IT infrastructures, the transition requires significant investment results and cultural shifts.



As medtech moves toward more integrated and patient-centric solutions, technical wellness becomes more critical.



Mid- and larger-size medtech companies are also struggling with a lot of integration issues, especially with ERP systems that are not modern. Most medtech organizations don't have a unified ERP system, leading to fragmentation. Despite these challenges, companies are somewhat ahead in adopting new technologies, given their focus on device and diagnostic innovation.

Continue the conversation

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