



Digital strategy: 3 trends health industry and technology leaders need to know

Three technology trends—augmented experiences, industrialized intelligence and connected data—hold the potential to revolutionize the healthcare landscape.

By Mahmood Majeed

Forget inching forward. Healthcare leaders are now rewiring their business and integrating emerging technologies deeply into their day-to-day operations and planning their own disruption.

Think Novartis and Sanofi with their commitments to scale data science and AI as part of their corporate strategies. Or Lilly bringing direct-to-patient digital services that offer a variety of options to those in the U.S. living with obesity, migraines or diabetes, including a plan to deliver medicines through Amazon.

Blue Shield of California is speeding ahead, too. They're just one example of a company bringing together like-minded digital partners for patient benefit and a value-based prescription model that has a projected annual reduction of \$500 million in drug costs.

Others are creating whole new revenue models based on digital, data and AI expertise.

AstraZeneca's global health tech unit, for example, is designed to scale data, digital and AI solutions for customers based on their track record of optimizing their own digital products in 40 different countries. Mayo Clinic's marketplace for data and AI models and BenevolentAI's drug discovery platform are core to their platform-as-a-service revenue goals.

This is the next chapter of healthcare that's smarter, faster and more connected—all thanks to the power of emerging technologies that are fundamentally shifting how healthcare leaders identify and create value.

Understanding the trends and integrating them into company operations is now top-of-mind for board members, but it's the job of every leader in healthcare today, not just the CIO or CDIO.

Here, we'll share three of the essential trends in technology that are enabling impact stories like these in healthcare. We'll explore the benefits of investing in each one and why they deserve your attention. As with any set of emerging technology trends, each is powerful on their own, but they have greater potential when used in combination with each other.

The essential trends

Our three trends are: augmented experiences, industrialized intelligence and connected data. Each is reinforced by strong governance practices for data privacy and security and responsible AI development (see Figure 1).

FIGURE 1:

Essential technology trends in healthcare



Augmented experiences

Why? Augmented experiences empower people to make informed decisions about what they see and touch.



Industrialized intelligence

Why? Industrializing the use of data and AI unleashes an organization's decision-making capabilities across interconnected business products, services and processes.



Connected data

Why? Connected data leads to patterns, trends and relationships in data that would otherwise be invisible to decision-makers.

Data privacy, security and responsible AI development

Source: ZS

Why these trends?

Our picks are a select group of high-impact trends chosen specifically for healthcare, each with the potential to create exponential impact for organizations that master them. These trends hold the power to disrupt the current healthcare landscape by enabling:

Augmented experiences to engage patients, customers and end users

Augmented experiences create opportunities to engage patients, customers or end users with what they see and touch. These experiences simulate different possibilities, essentially showing people the “art of the possible” before they commit.

Industrialized intelligence to deliver value

Industrialized intelligence empowers healthcare organizations to make smarter decisions across their entire business. It uses artificial intelligence (AI) to analyze vast amounts of data from a company's products, services and operations. This unlocks valuable insights that can lead to new business opportunities, streamline processes for unmatched efficiency and, importantly for pharma, accelerate drug development timelines.

Connected data to personalize care and support

Imagine healthcare as a complex ecosystem, where valuable data flows from different sources like hospitals, clinics, pharmacies, insurers and even device and drug makers. Connecting this data creates a unified system, allowing everyone involved to communicate and collaborate more effectively. Healthcare providers then benefit from a holistic view of each patient—a complete picture built by integrating all this data. This comprehensive understanding empowers them to deliver more precise and personalized care for everyone.

Trend #1: Augmented experiences

Today, companies are leaning into augmented experiences in three broad categories: the patient care experience, the healthcare provider experience and the employee experience.

Imagine as a patient, using 3D models from your own MRIs, CT scans and angiograms to educate yourself and your care team on your condition. Or knowing your surgeon's been trained in a simulated environment to get the exact feel of an injection site for a new type of drug.

Before that drug even got to you, manufacturing teams anticipated scenarios that might have delayed your treatment using a digital twin. Or at the manufacturing plant where the drug was made, technicians use virtual features overlaid on real machinery to efficiently maintain production lines.

With advancements in technology and adoption, the development of these experiences is becoming easier to do, even for less tech-savvy developers. Intelligent virtual assistants, enabled by generative AI, can support a range of tasks that augment work further, boost productivity, experience and overall performance.

FIGURE 2:

What does it mean to augment experiences?



Augmented experiences

- Empower users to make better choices with greater contextual information.
- Facilitate quicker, safer and easier idea testing in simulations.
- Deliver memorable and interactive experiences for enhanced learning.
- Expand healthcare access through wider reach via digital front-door applications and connected devices.



Common technologies and approaches

- Digital twins
- Extended and augmented reality
- Intelligent virtual assistants
- AI-augmented software development
- Privacy by design
- Responsible AI development and governance



Benefits

- Cost efficiency
- Operational excellence
- Customer engagement

Source: ZS analysis

What's accelerating this trend

Digital twins for low-risk experimentation. These virtual representations of physical objects or systems can be used to analyze behavior. You might first think of IoT sensor-heavy manufacturing and logistics, but there's significant potential to use digital twins to map biological systems and clinical research, too. They're ideal for experimenting with changes to systems to identify cause-and-effect implications.

Merck, for example, has begun incorporating prognostic information from digital twins into randomized controlled trials so that treatment effects can be estimated with greater precision. With this approach, Merck expects to reduce control arms by 30% or more while generating reliable clinical evidence in less time.

Other technologies and approaches that are enabling this trend include: IoT sensors, continuous intelligence, 3D visualization and contextual data

Extended reality makes near-live, location-agnostic engagement possible, while empowering users to interact with virtual surroundings. These technologies add a dimension to experience, which can increase an individual's attention span and engagement.

Novartis, for example, has experimented with a virtual reality experience for surgeons to get the feel of sub-retinal injections for ocular gene therapy. It's a cost-effective, remote way to support continuing education.

In manufacturing, Novo Nordisk is simplifying and augmenting a range of manual processes, like clearing production lines. Using mixed reality, technicians go through complex procedures by following 3D instructions for each step in real time. These instructions help to guarantee that every step has been completed successfully, while allowing technicians to visualize the full work environment.

Other technologies and approaches that are enabling this trend include: Augmented reality, mixed reality, virtual reality and the metaverse

AI-augmented software development uses an ecosystem of tools and platforms to speed up the delivery of solutions by helping teams handle massive amounts of data and churn out code to build and test augmented experiences much more quickly. Not only is the work experience better, but the outcomes for customers happen faster, too.

Augmenting development helps:

- Speed up the time-consuming steps in core development workflows across design, coding, testing and integration.
- Connect other applications together with plug-and-play style connectors.
- Empower people to innovate on their own terms, regardless of their technology skills, with the aid of low- or no-code assistance.
- Open doors to new and innovative product improvement ideas.

For example, hearing aid retailer **Amplifon** leverages a central platform to store its code, facilitate development across a dispersed workforce, and automate steps to deliver software leading to a savings of 30,000 minutes (about 3 weeks) of build time per month. A generative AI-based coding assistant supports code development and completion for efficient production of new code.

Other technologies and approaches that are enabling this trend include: Classical AI, generative AI, low- and no-code microservices and APIs



Trend #2: Industrialized intelligence

Our view of industrializing intelligence aims to make AI:

- Relevant to solving global healthcare issues.
- Integrated into each step of the healthcare value chain.
- Broadly used by anyone making decisions about the healthcare journey—across different functions, settings, products and services, and geographies—maximizing value at every stage.

To get there, leaders must focus on industrializing the development of AI capabilities to enable widespread adoption and utilization of intelligent systems. This involves automated decision-making processes, which requires implementing advanced algorithms and machine learning models to analyze vast amounts of data and provide actionable insights at scale.

And now, the emphasis in AI development is beginning to move from designing complex models to acquiring and utilizing high-quality data for training them. In our research, 92% of pharma's tech decision-makers say that any future success with generative AI depends on their company's data strategy.

FIGURE 3:

What does it mean to industrialize intelligence?



With industrial-grade intelligence:

- People make decisions powered by connected data, richer context and continuous analysis.
- Paths to scale the adoption of AI are considered in the development process.
- Automation across core products, services and processes frees up human potential for higher-value activities.
- Employees understand how their use of AI is tied to goals, they become continual learners, expect change, and adapt to changing AI systems.



Common technologies and approaches

- Classical and generative AI
- Scaled AI
- Augmented analytics
- Intelligent automation
- Privacy by design
- Responsible AI development and governance



Benefits

- Revenue
- Cost efficiency
- Customer engagement
- Operational excellence
- Data security and compliance
- Energy efficiency/environmental footprint

Source: ZS analysis

What's accelerating this trend

Generative AI has a wide range of uses to improve workforce productivity and accelerate the generation of content and insight through integrated AI agents. AI agents can significantly automate processes, including simplifying access to enterprise knowledge and data, reshaping and personalizing the care experience and shortening the drug discovery process. Alone, generative AI is a powerful technology, but there's even more power in its potential to be combined with other technologies to reimagine business processes and ways of working from end-to-end.

In pharma R&D, generative AI is already adding new links to the chain of activities that speed drug discovery. **Absci Corporation** is working on zero-shot generative AI to create and validate de novo antibodies in silico. Their system combines data to train, AI to create and a wet lab to validate millions of designs a week. The hope is to reduce the time it takes to get new drugs into the clinic from as much as six years down to just 18-24 months while also increasing their probability of success in the clinic.

Other technologies and approaches that are enabling this trend include: Classical AI, automation, generative adversarial networks, foundation models, large language models, retrieval augmented generation

Scaled AI is an approach that replaces the custom and bespoke ways a company develops and manages computing resources, data pipelines and AI models. Companies are learning that without an approach that considers scale from the start, they're unlikely to reach their goals.

For example, **Janssen** uses a low-code visual workflow service from Amazon Web Services (AWS) to automate data preparation and feature engineering for a machine learning model that generates insights about the experience of being on Janssen's therapies. It's part of a program that's improved the accuracy of model predictions by 21% and increased the speed of feature engineering by approximately 700%.

Other technologies and approaches that are enabling this trend include: MLOps, DataOps and DevOps

Augmented analytics is like augmented software development, but with analytics processes. It leverages technologies to automate tasks and augment decisions in the end-to-end data analytics life cycle, from data preparation to insight generation and explanation. Teams leverage this approach when they need to ensure quality, speed and scale for the data needed for key processes or decisions.

Sanofi's analytics app, plai, for example, offers real-time 360-degree insights across all areas of the company. Plai isn't just about information, it accelerates progress. By leveraging advanced predictive modeling, plai streamlines research, automating time-consuming data tasks.

This translates to significant gains: it enables teams to slash key research processes from weeks to hours and improve potential target identification in therapeutic areas like immunology, oncology or neurology by 20% to 30%. In the supply chain, plai predicts 80% of potential stock shortages, allowing teams to take proactive measures and ensure a steady supply of materials.

Other technologies and approaches that are enabling this trend include: AI and ML, NLQ, embedded dashboards and data storytelling via NLG

Intelligent automation, when used at scale, can streamline and automate tasks by empowering domain experts to configure bots and automate workflows leveraging easy to integrate, low- or no-code applications. This enhances operational efficiencies, empowers employees as citizen developers and fosters a culture of innovation and ownership.

Moderna, for example, leverages an intelligent conversational AI engine, powered by AWS, to streamline customer inquiries, interactions and support across preferred communication channels. This boosts customer service efficiency with real-time content delivery, seamless search, self-service options and CRM integration, leading to cost savings and enhanced customer and employee experiences.

Other technologies and approaches that are enabling this trend include: Robotic process automation, AI and ML, natural language processing, low-code platforms, computer vision, optical character recognition



Trend #3: Connected data

The concept of connected data goes beyond data collection and toward data ecosystem connectivity. It leverages cloud and edge computing to enable organizations to continuously connect, understand and monitor relationships between all their existing and real-time data sources.

Some common ways to think about these relationships are:

- In a pharmaceutical commercial setting, no matter your function or region, the organization's full understanding of the customer is available to you through data that is easy to use and understand. A 360-degree view is built from various data sources, including devices, sales interactions, digital marketing engagement, rebate programs and market access considerations. This empowers every decision-maker with richer context.
- In a research or clinical setting, a connected data strategy might focus on relationships in data from every step in an R&D life cycle. This data could be from any source of data important for optimizing a clinical trial, for example. Or it may focus on relationships in data related to biological processes, from genes, proteins and diseases, including real-world data from patients living with a disease.

FIGURE 4:

What does it mean to connect data?



With connected data

- Data can come from a variety of sources, but a 360-degree view provides rich context.
- Skills shift beyond collecting data and toward encoding knowledge about the important relationships between data.
- Analytics can begin to occur away from central networks or "at the edge" for immediate use or use in local devices.



Common technologies and approaches

- Data mesh, data fabric, distributed data management
- Edge analytics
- Knowledge graphs
- Ontologies
- Privacy by design
- Responsible AI development and governance



Benefits

- Cost efficiency
- Revenue
- Customer engagement
- Operational excellence
- Data security and compliance

Source: ZS analysis

What's accelerating this trend

Next generation data management, as a broad category, uses modern techniques and cloud services to enable the availability of high-quality data. It combines both technologies and governance practices that enable ease of data storage, access, sharing, collaboration and automating processes with accountable data owners. Having this capability in place can ensure an organization has high-quality data to feed into models for generative AI systems.

In a customer-focused CRM enablement, for example, **Humana**, a U.S. insurance company, uses Salesforce to connect data about its customers from various sources, including health records and service interactions. The result is a single, unified view of each customer to help teams better understand everyone's healthcare journey—and provide 3-4 times faster service by having the right context.

Gilead modernized its data infrastructure using AWS and a modern data mesh approach to tackle challenges in accessing and analyzing vast data across the organization. Through a simplified user interface and platform APIs, it improved agility, accelerated insight generation and increased ROI. With hundreds of data products in the catalog, it enabled cross-business coordination and decentralized data ownership.

Other technologies and approaches that are enabling this trend include: Cloud services, knowledge graphs, data mesh, data fabric, augmented data management, data interoperability, data products

Edge analytics technologies empower on-device analysis at sensors, switches and connected devices, generating real-time insights and enabling immediate decision-making.

This solution prioritizes high security and privacy standards, making it well-suited for various healthcare scenarios, including care centers with complex IT systems, remote areas with limited infrastructure or even secure collaboration for healthcare data-sharing consortiums.

Generative AI is now driving strong demand for edge infrastructure as the models get smaller and compute power as the edge gets faster.

For example, **Pfizer** is using an AWS-based edge analytics platform for continuous real-time monitoring of its bioreactors at its global manufacturing centers. Sensor data not only helps teams reduce the risk of contamination but also increase yields and shorten cycle times.

Edge analytics opens new avenues for collaborations where larger data sets could yield breakthrough insights. **BMS** and **Sanofi** are engaging in such a collaboration, which enables researchers to connect data using a federated learning-powered platform. The goal is to train predictive AI models on multi-party data sets for four types of cancers

Other technologies and approaches that are enabling this trend include: Cloud services, internet of things, internet of medical things, federated learning.

Driving these trends in your operating model

To capitalize on these trends, aim for a digital native operating model. In this model, a connected data ecosystem equips teams with real-time insights. Advanced analytics and AI then transform that data into actionable intelligence, enabling optimized interventions and smooth workflow orchestration.

Even if your company doesn't currently operate this way, you can still embrace these core principles (as shown in Figure 5) to move closer to a digital native model.

FIGURE 5:

The 'must get rights' from a digital native model

Must be

Value obsessed:

Stay focused on value realization at every step in the process from prioritization to design, implementation and adoption.

Must know

Meaningful value starts with quick wins:

Learn how to identify quick wins to build momentum toward a scalable solution.

A growth mindset culture starts at the top:

Emphasize continuous innovation through learning, development and improvement with transparent success metrics.

Must do

Design for people first:

Demonstrate the value you're creating and avoid solutions that are too complex for users to embrace.

Shift to product- or platform-based delivery models:

These include clear objectives, rapid innovation and reusable components for speed and scale.

Develop responsibly:

Prioritize data privacy and security and responsible AI practices.

Source: ZS

We believe embracing this moment and these tech trends—augmented experiences, industrialized intelligence, and connected data—are essential to revolutionizing the patient experience, unlocking new levels of efficiency and personalizing care like never before.

We also believe companies that achieve the greatest value will be those that seamlessly integrate these trends into their strategies, operations and implementation. You don't need to build from the ground up. Start from where you are, learn from industry leaders, take bolder steps and leverage the experiences of others to leapfrog your current position.

About the authors



Mahmood Majeed is a managing principal at ZS and leads the company's global digital and technology practice areas. He has partnered with more than 100 global life sciences companies, advising clients on delivering measurable business outcomes by realizing and optimizing the value of investments in technology, digital and AI that directly contribute to growth initiatives.



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