Changing the shape of the life sciences industry

Digital transformation as a force multiplier

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Life sciences companies are facing rising expectations about medicines: that they should produce better outcomes than existing alternatives, their efficacy claims should be backed by real-world data, and the medicines should allow optimized treatments for the individual.

But to achieve these goals, life sciences companies must break away from traditional ways of doing business. They must leverage the tools and knowledge of other industries to improve drug discovery, development, manufacturing and market access, and introduce new concepts such as outcomes management and treatment optimization. This bold departure from the norm means exploring and embracing next-generation digital technologies such as robotic process automation (RPA), artificial intelligence, machine learning, and advanced analytics and cloud-based platforms **(Figure 1)**.

Biopharmaceutical executives are asking tough questions about how to compete and succeed in a patient-centric, outcomes-focused environment. In this industry perspective, we consider those questions, examine the journey that life sciences organizations must undertake, and discuss the force multipliers that can be gained by including digital transformation in your strategic roadmap.
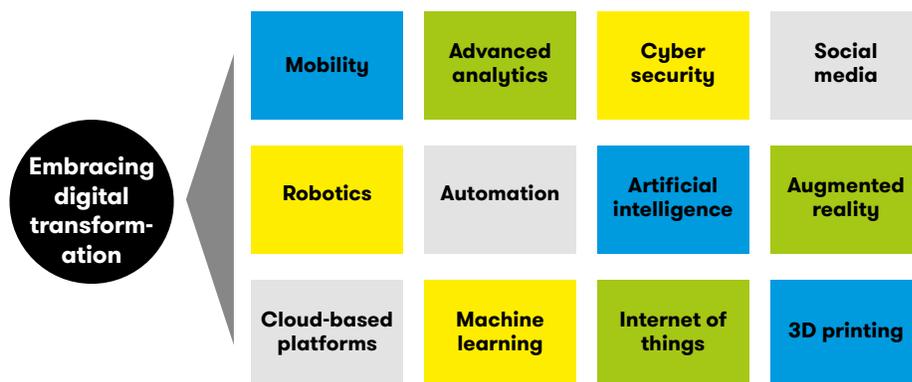
Embracing digital transformation

Mobility	Advanced analytics	Cyber security	Social media
Robotics	Automation	Artificial intelligence	Augmented reality
Cloud-based platforms	Machine learning	Internet of things	3D printing

Figure 1. Digital technologies affecting the life sciences industry

Individualized medicine and treatments

There are several business trends in the industry where life sciences companies can apply emerging technologies to gain an advantage. As a whole, the industry is moving from "selling pills" to delivering tailored drugs and therapies that require a clear understanding of the patient. Data acquired from a variety of institutions (investigator sites, research universities, patient associations and integrated delivery networks, for example) needs to be integrated and standardized in a format that all parties can easily digest and securely collaborate on.

Increasingly, that data is genome focused. With each human genome taking up nearly a half a terabyte of storage space, and hundreds of patient genomes needed to complete a study, the size of data is becoming unwieldy. No longer can USB hard drives containing the data be shipped around.

There is a trend toward collaborative science in the cloud — secure, private collaboration environments provisioned to share and analyze massive amounts of data among research partners.

Digital transformation can also help advance personalized medicine far beyond the collaborative study of the genome. For instance, 3D printing is another technology trend that is making people's lives better — from dentistry to surgical devices, orthopedic components, organs, customized prosthetics and bone implants, as well as 3D-printed pills.

Accelerating research through the cloud

As the sheer size of genomic data causes storage and collaboration issues, the need for enormous computational work in research has been slowing the pace of discovery. Fortunately, "pay-per-use" compute power is here, and it's here on a massive scale.

For example, Amazon Web Services worked with a large global pharmaceutical company to complete 39 years' worth of computational chemistry in 9 hours, virtually screening 10 million compounds against a common cancer target. The project utilized about 87,000 computer cores and identified three successful compounds out of the 10 million. The cost: less than $5,000.[1]

Personalized consumer/patient experience

Digital interaction with the patient will open major opportunities for the industry to provide highly personalized services. As the pace of technological advancement continues to increase, consumer and patient willingness to adopt new technologies will grow. Self-service will become mainstream. In return for sharing more data about themselves, patients will demand an even greater level of personalized services.

Personalizing the patient journey with individual follow-up will enable the point of care to be further decentralized from the doctor or health consultant. Healthcare will be geared toward the individual through social media, augmented reality and medical-grade wearable devices connected to the internet. Especially interesting will be the concept of the "digital twin": No longer will your medical record be a snapshot of health data from your last visit. Instead, it will be fed with live data from wearable devices. It will become a kind of real-time model (a twin) of you, and protective algorithms will monitor your "twin," making recommendations back to you to improve health and quality of life — recommendations ranging from relaxation advice to reminders to help the patient adhere to medication for chronic conditions such as diabetes and multiple sclerosis.

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1 https://aws.amazon.com/solutions/case-studies/novartis/

For pharmaceutical companies themselves, the internet of things (IoT) and wearables will bring major breakthroughs beyond medication adherence — ranging from collecting real-world evidence data in patient networks to measuring outcomes and optimizing treatment protocols to maximize results and minimize cost. Ultimately, this will lead to truly personalized medicine and treatments, providing direct feedback from the patient experience back into clinical development.

Increased focus on post-marketing surveillance

Post-marketing surveillance can help companies ensure drug safety and efficacy. Technology plays an important role in such pharmacovigilance, allowing those companies to share, aggregate and mine large datasets to monitor drug events and interactions beyond the regulated environment.

One example is the Sentinel Initiative, the national electronic system of the U.S. Food and Drug Administration (FDA). Sentinel has transformed the way researchers monitor the safety of FDA-regulated medical products, including drugs, vaccines, biologics and medical devices. Sentinel uses a distributed data approach, which allows the FDA to monitor the safety of regulated medical products, while securing and safeguarding patient privacy.

The growth of the IoT helps these efforts, with robotics and biometric sensors offering the greatest opportunities. For example, there is great potential in technologies for high-precision, automatic detection of adverse drug reactions. And using big data techniques can enhance and complement traditional surveillance systems, passive reporting systems and clinical trial monitoring.

At the forefront of patient safety is the Identification of Medicinal Products (IDMP) standard. Due to the cross-functionality and interconnectedness of data, people and processes, IDMP will serve as a catalyst of change in how data is collected, managed and shared. Life sciences companies can go beyond compliance to leverage the IDMP standard — both externally and internally — to increase productivity, reduce redundancies and improve data quality throughout the entire enterprise.

Life Sciences 4.0

As these trends take hold, we also find ourselves at the beginning of the next industrial revolution, which will affect repetitive, high-volume, highly transactional processes. Back-, middle- and front-office processes will be increasingly automated and integrated, underpinned by agile infrastructure and services platforms.

Process automation and the introduction of RPA agents have the potential for achieving tremendous productivity gains. RPA agents will enable the industry to fundamentally rethink the way clinical, safety, marketing and sales, supply chain, and application development processes are performed.

Pressure to reduce costs, increase innovation and meet growing customer expectations requires a fully integrated and flexible manufacturing ecosystem — one that connects operational technology, IT, and communications and consumer technology. Connected manufacturing, or "Life Sciences 4.0," will reshape manufacturing and supply chain processes, integrating the different components of internal and external supply chains in a digital way.

At the heart of Life Sciences 4.0 is a vision of "smart factories." These will modernize information and communication technology (ICT) across supply chains and production lines to deliver a much higher level of automation and digitization.

Just as in personalized medicine, the concept of the digital twin is moving to the forefront. Critical, expensive production and logistics assets — such as large motors, trains and jet engines — now have a vast array of sensors monitoring them for health and reporting back to a kind of medical chart for these assets. In turn, real-time analytics relying on the digital twin model can predict when the real asset needs maintenance or replacement, vastly reducing unplanned downtime.

Digital technologies will enable the industry to build intelligence into their innovation process, product development, supply chains and factories, even up to the component level, enabling finished products to be tracked and managed throughout the supply chain. This will provide, among other benefits, end-to-end product authentication and counterfeit protection.

A framework for a digital strategy

Working with multiple companies in different industries to identify which digital strategies and capabilities drive value, DXC has developed and implemented a hands-on approach to developing a digital roadmap to support your business strategy **(Figure 2)**.
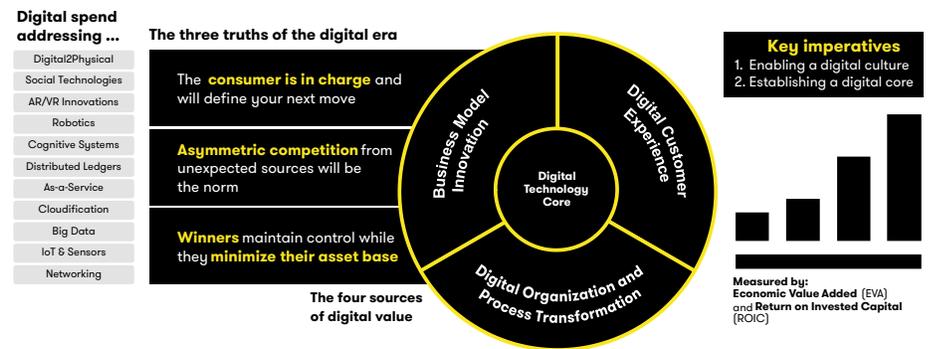

Figure 2. Digital strategy framework

The four dimensions of digital transformation:

- **Digital customer experience.** For life sciences, this translates into consumer and patient experiences, such as patient engagement platforms.

- **Digital business process transformation.** Using robotic process automation agents in finance and accounting (F&A) and in serious adverse events administration, connected manufacturing and virtual discovery.

- **Business model innovation.** An example is Flatiron Health's informatics-driven business model, optimizing oncology treatments based on deep genetic and therapeutic insights.

- **Digital technology enablement.** Building or leveraging a digital platform to support and implement your digital initiatives.

Life sciences companies will need to understand the digital dynamics of their business within each of these four dimensions of digital transformation. **Figure 3** shows the framework that each life sciences company must understand, allowing it to uncover organizational and digital capability gaps to assess whether its business is ready to execute a digital transformation program.
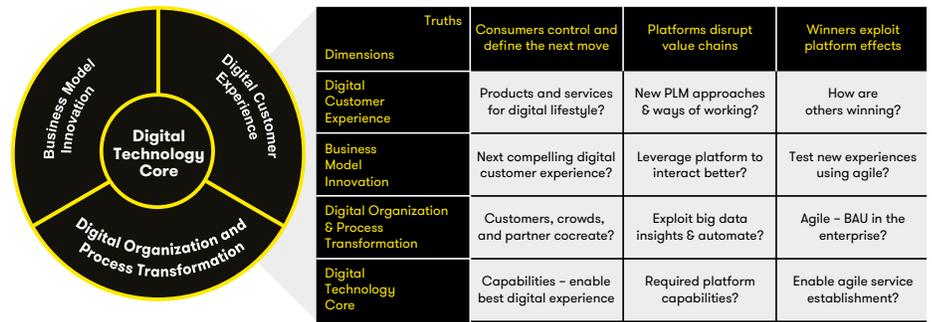
Dimensions / Truths	Consumers control and define the next move	Platforms disrupt value chains	Winners exploit platform effects
Digital Customer Experience	Products and services for digital lifestyle?	New PLM approaches & ways of working?	How are others winning?
Business Model Innovation	Next compelling digital customer experience?	Leverage platform to interact better?	Test new experiences using agile?
Digital Organization & Process Transformation	Customers, crowds, and partner cocreate?	Exploit big data insights & automate?	Agile – BAU in the enterprise?
Digital Technology Core	Capabilities – enable best digital experience	Required platform capabilities?	Enable agile service establishment?

Figure 3. Understanding your digital dynamics

Four steps for developing digital roadmaps **(Figure 4)**:

1. Understand why digital is important to your life sciences business

2. Identify your industry context and potential options for each of the digital dimensions, and map this to our digital platform business model

3. Identify your digital readiness and organizational and digital capability gaps

4. Develop your digital roadmap and value-impact assessment

Figure 4. DXC destination digital

Reshaping your position in the industry

The healthcare ecosystem will undergo a major transition in the next 3 years. The life sciences players that will gain a competitive advantage are those that can leverage powerful and innovative digital technologies to successfully integrate data and deliver customer-focused solutions.

Data and analytics will be key to optimizing performance across organizations and throughout global value chains. Companies will need better ways to capture and manage data, to derive real-time insights from that information and to transform that intelligence into positive business outcomes.

Digital platforms

A key piece of any strategy to achieve these goals is a digital platform. Digital platforms will integrate different players in the industry, allowing life sciences companies to kick-start new initiatives and scale up to critical mass without significant capital investments.

We expect to see digital platforms emerge to support these industry trends:

- **Patient engagement platforms.** These platforms will enable life sciences companies to scale up rapidly to millions of patients, devices and sensors that process an endless flow of data and provide better therapies and outcomes for their patients.

- **Collaborative partnership platforms.** An increasing number of partnerships will be forged in precompetitive discovery, clinical development and go-to-market projects. As a result, life sciences companies will require digital platforms that help them quickly integrate new partners around a common set of collaboration tools, analytics capabilities and specific applications.

- **Mergers and acquisitions (M&A) platforms.** Life sciences companies that are acquiring multiple smaller companies per year should develop an M&A and integration platform that provides the acquired companies with state-of-the-art capabilities.

New platform-based business models will emerge based on private, public or hybrid cloud platforms — and could potentially disrupt major parts of the healthcare ecosystem. These business models will enable established players and incumbents to scale up with unprecedented speed and reach.

The move toward cloud-based platforms reflects a larger shift toward enterprise marketplaces, which will see life sciences companies increasingly seeking consumption-based alternatives for applications, infrastructure and other business solutions.

About DXC Technology

DXC Technology (DXC: NYSE) is the world's leading independent, end-to-end IT services company, serving nearly 6,000 private and public-sector clients from a diverse array of industries across 70 countries. The company's technology independence, global talent and extensive partner network deliver transformative digital offerings and solutions that help clients harness the power of innovation to thrive on change. DXC Technology is recognized among the best corporate citizens globally. For more information, visit **www.dxc.technology**.