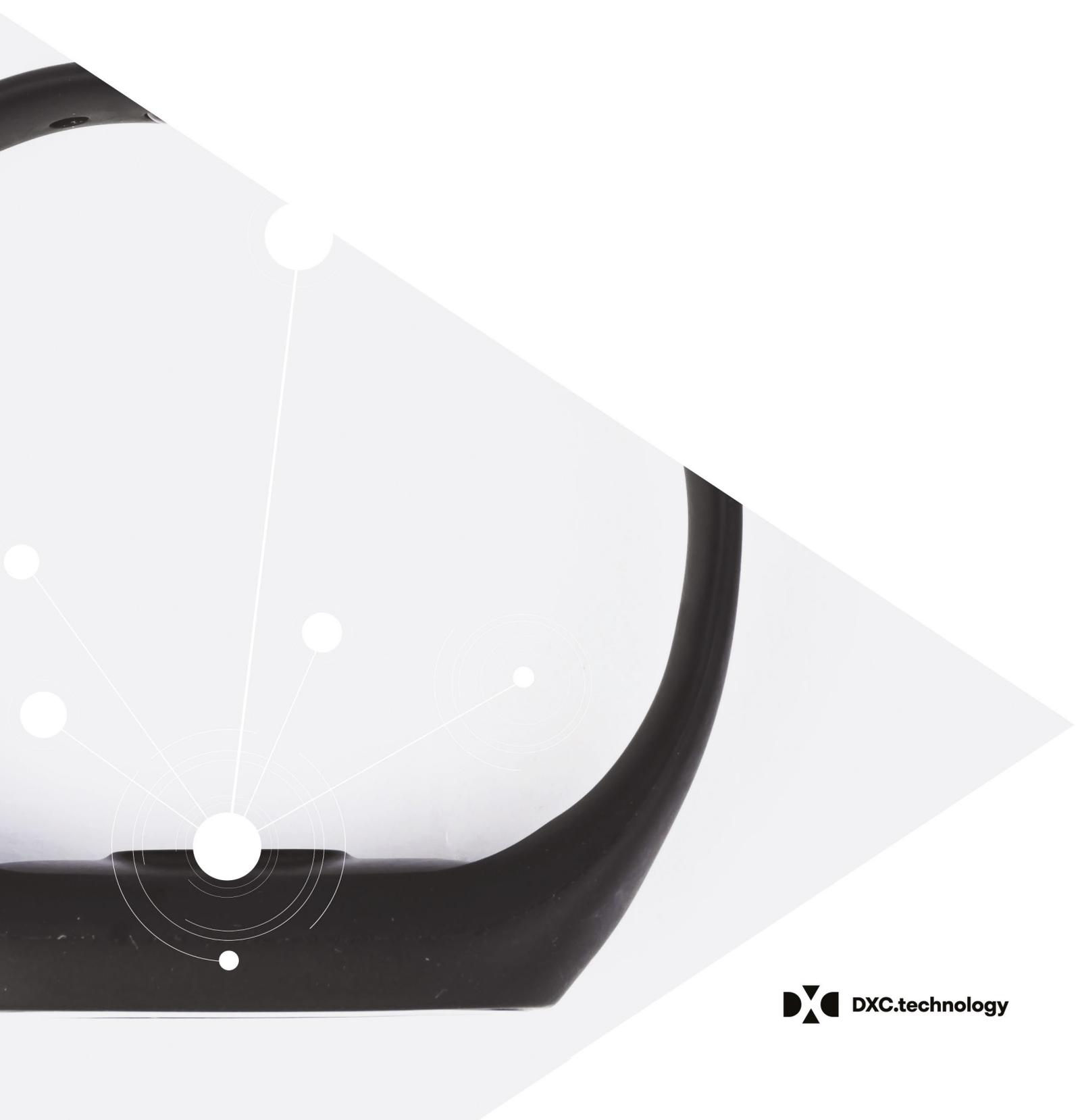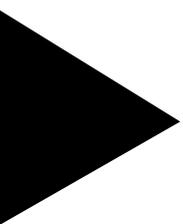# Unlock healthcare data to deliver better patient care

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As digital approaches continue to revolutionize healthcare delivery, technology is enabling new insights. These insights combine personal, social, population and research data to create actionable information. Twenty-first century healthcare combines this broad-based and integrated information to drive precision outcomes.

Healthcare and life sciences organizations need to ingest the unprecedented amounts of health data being generated, contextualize the data, and build and participate in information ecosystems. The goal is to derive insights from the data to deliver better patient care, better outcomes and lower costs.

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Personal data stewardship practices in healthcare will triple globally by 2023 due to digitally engaged patients bringing their own data and industry- and government-led data guardian initiatives.

Source: IDC FutureScape: Worldwide Health Industry 2019 Predictions (Doc #US43122618 / Oct 31, 2018)

Although physicians have traditionally directed patient care, as patients gain access to more information about their health, including genome data, and become empowered by technologies such as wearables and implants, they are becoming increasingly proactive in their own healthcare.

This is giving rise to what some call the 21st century digital citizen, a topic DXC Technology's Leading Edge Forum explored in a paper entitled "The Shift to the Human Platform." In healthcare, 25 percent of data used in medical care is expected to be collected and shared with healthcare systems by the patients themselves by the end of 2020.

This fundamentally changes the game for healthcare organizations, which can integrate that data with other data sources to understand each patient as an individual while gaining a clear understanding of what's happening in population health, chronic diseases and the research community.

For example, information can be gleaned from a variety of internet of things (IoT) devices, from cameras providing video analytics to assess people's behaviors as well as ergonomic and safety factors at work, to communication and conversational artificial intelligence (AI) devices that can interact with patients in their homes and provide new insights.

Patient-driven care turns traditional business models upside-down, and requires some basic rethinking, as we'll explore. And making the most of the new opportunities will require the healthcare industry to find new sources of IT talent and address new security concerns.

The shift to more proactive, patient-driven care dovetails with the healthcare industry's desire to shift from intervention to prevention. Digital transformation — providing better information for better patient care, better outcomes and lower costs in healthcare — accelerates this shift.

The 21st century digital citizen

Meet Peter, the embodiment of a 21st century digital citizen who is highly proactive about his health.

A tech-savvy middle-aged man, Peter is not your typical patient. He learns a lot about himself using haptic devices such as wearables and even has a device implanted in his body to monitor his blood glucose levels. Peter has also used a DNA testing service to access his genetic information and is aware of his level of risk for conditions such as Alzheimer's disease.

When Peter visits his physician, he is armed with pertinent data so he can participate in making decisions about his own care plan, such as scheduling fasting periods that might help reduce cholesterol. He also works closely with his life insurance company to link his lifestyle and well-being efforts to his policy premium.

While Peter is the exception today, people like Peter are going to drive new and innovative care management and digitization. As technologies such as machine learning and IoT proliferate in the healthcare industry and augment physicians in the care equation, it is 21st century citizens like Peter who will usher in a new era where people take better charge of their care and wellness.

LEF Perspective

Taking charge of our health

The 21st Century Human, a research topic at the Leading Edge Forum (LEF), lives in a world of dynamic, living data, yet is not "biologically equipped" to see this reality. We want to manage our personal health, yet we have no way to easily peer inside the human body.

The LEF envisions a future where healthcare shifts from being reactive to illness and injury, to being proactive about wellness and prevention. This will be aided by better access to data about our own bodies, a trend that has been emerging since the advent of the smartphone. As the consumerization of IT continues, advanced technologies for managing personal health are reaching consumer products faster and faster, with far-reaching implications for the 2020s.

Consider the winning entry for the XPRIZE to develop a Star Trek-style "tricorder" that empowers personal healthcare. The winning entry diagnoses 13 health conditions without needing a doctor or hospital, monitors five vital signs in real time, and provides a compelling user experience.

Now consider how many of these capabilities will soon be available in your watch and phone. Just look at all the new watches and their sensor-driven approach to monitoring your heart health.

As these capabilities evolve and simple devices become more ubiquitous, the level of skill required to derive potential benefits decreases. People will be better able to monitor, and therefore manage, their own health; over time this will become the rule rather than the exception. Insurance company John Hancock requires its life insurance policyholders to join its Vitality Health program. Although sharing personal fitness data is not mandatory, John Hancock is encouraging everyone to participate for extra rewards.

Over time, health ecosystems that combine consumer technologies with rewards and behavioral change programs will become more commonplace. This will boost proactive wellness and prevention, and contribute to a global healthcare ecosystem that promotes health, well-being and better health outcomes for all.

Leading Edge Forum (LEF) is DXC Technology's independent cross-industry think tank.

Genome Generation

The good news for 21st century digital citizens is that their participative approach to healthcare is relatively inexpensive, and the rewards of better health, reduced hospitalization and potentially longer life far outweigh the investment. In fact, the wide accessibility to genetic testing services has fostered the emergence of the Genome Generation, a growing set of people who use genetic information to inform their life decisions and improve their health.

As pharmaceutical, payer and provider organizations acquire data from multiple sources, they will need to compile a wealth of information, including physiological data, clinical outcomes data and social determinants such as diet, exercise, family history and environment. A robust platform is required to ingest and contextualize the information in a way that allows organizations to make timely decisions.

The convergence of this information will be bolstered by genetic data provided by the Genome Generation, and 21st century digital citizens like Peter who contribute their own lifestyle and health data. The key for healthcare organizations is having the ability to capture data from these disparate sources and integrate it in a way that will focus on care that helps patients stay healthy.

Turning the care model inside out

As the 21st century digital citizen ushers in patient-driven care, healthcare organizations are going to have to rethink their business models, taking into consideration:

- **Population care.** A proliferation of digitally conscious citizens like Peter will produce enormous benefits. By collecting data from participants, we can begin to understand the dynamics of the entire population. One example is that people with the same profile as Peter can be identified, successful care paths can be determined, then a pattern can emerge to identify the most effective interventions. Thus, the 21st century digital citizen will produce sufficient real-world data for the ecosystem of provider, payer and life sciences companies to understand the real-world data in context — i.e., as real-world evidence. That evidence can be used as insight. (More on evidence-based insights later.)

- **Integrated partnerships.** A fundamental shift has occurred in the relationship between providers, payers and the pharmaceutical industry. The increased scrutiny of drug costs versus improvements in clinical outcomes has resulted in a subsequent shift toward outcome-based procurement models and value-based pricing. Pharmaceutical companies are now providing condition-specific health programs, in partnership with payers and providers, in which their medication plays a role but whose value is determined by patient outcomes.

  This requires significantly more data to be captured relating to patients' clinical status — data that must be gathered from across the care continuum. Longitudinal patient data, held by the digital systems used to deliver patient care, is also rapidly becoming a necessity. This data frequently exists in different forms and structures that demand normalization to enable effective analysis and derivation of insights.

A robust health information ecosystem

A robust health information ecosystem includes community clouds and data markets that are sensitive to data privacy and key characteristics of data:

- **Data inertia.** As the amount of data increases, particularly data generated by citizens, that data is more difficult and more expensive to move around.

- **Data gravity.** More data attracts more users and hence more processing is needed. In the future, these "users" will include AI and will demand new sources of computing power that are ever closer to the data.

- **Data decay.** Data value can decrease over time, especially in healthcare. Data that decays rapidly must be processed quickly, often as soon as it is produced. This also requires localized compute capabilities.

- **Data location.** In terms of economics, processing data as close to the source as possible is cheaper. In terms of regulations, there are constraints to moving data across borders. So, in those cases, data must be processed locally, and derivatives of that data can be aggregated and sent to a more centralized location for analysis that leads to broader insights, such as population health insights. No matter where the data is located, it must be secure.

- **Monetary incentives and data markets.** Today, the provider world is not as connected as it should be with the payer world unless the provider is related to the pharmaceutical or life sciences world. The world of the 21st century digital citizen links those together.

  Once linked, persons who are proactive and knowledgeable about their health data and genomic makeup can spend time with their insurance company or commissioners of healthcare services (in the case of public-funded health systems) and make the case that they have less risk for certain diseases, which could have an impact on their premium.

  Better still, equipped with insights, Peter could argue that his particular genetic makeup makes the use of certain drugs more effective — leading to a better quality of life and a reduction in total cost of care. The net effect is that providers, payers and pharmaceutical companies will have to partner more as the cycle for bringing drugs to market gets shorter.

- **Privacy in the ecosystem.** Even though proactive patients are in control of more of their health, there is still a lot of information outside of their direct span of control, meaning their privacy and confidentiality can be compromised. In the genome world today, DNA testing services have control mechanisms but need to demonstrate continuous security and regulatory compliance (more on security later).

- **Standards.** The healthcare industry has a strong foundation in place to support the 21st century digital citizen. As most organizations have created proprietary structures, a shift is taking place to models such as Fast Healthcare Interoperability Resources (FHIR), a standard for data formats that gives the industry a consistent framework. This means that any structure can be converted into the FHIR standard. In doing so, data can be normalized, making it easier to link data from different sources at speed. FHIR is not a silver bullet but goes a long way toward achieving interoperability of healthcare data from multiple sources.

- **Contextual data.** The key to delivering better information for better healthcare decisions is to turn raw data into contextual data, allowing organizations to drive the workflow upstream. Once healthcare providers have collected persistent data on a patient, insights for treatment plans can be created. For example, if a patient's family has a history of diabetes, the system could trigger a blood glucose test directly into the workflow and prescribe software that will allow the patient to undergo a meaningful self-assessment.

Closing the digital talent gap

While all of this makes sense on paper, making it a reality will require the industry to address a key shortcoming: the availability of data scientists. The NEJM Catalyst reports a drastic shortage, estimating that the healthcare sector employs 18 times fewer data science professionals compared to the IT industry and 60 times fewer than knowledge-based industries such as management consulting.[1]

There are simply not enough professional health school graduates and technology professionals who want to change careers to pursue data science in the healthcare industry. It is vital, however, that we have professionals well versed in data science and technology and clinical healthcare.

Solving the long-term talent gap will involve recruiting professionals from a range of fields and will take career and economic incentives. Positions need to be created and nurtured, specifically for those who have a clinical background — doctors, nurses, physical therapists and others — as well as technology and data analytics capabilities.

There's a variety of reasons for today's shortage. Students attending medical school and other healthcare professional schools have many goals and options today. Most all are driven to care for people, but they have options of direct patient care, research, healthcare administration, and entrepreneurship. Working in technology and data science must be seen as a viable, rewarding option as well.

Some action is being taken to reduce the digital talent gap. Professional organizations such as Healthcare Information and Management Systems Society (HIMSS), American Medical Informatics Association (AMIA) and the College of Healthcare Information Management Executives (CHIME) have been introducing big data analytics use cases to their members for years and have focus groups to help introduce these skills, along with best practices, into traditional healthcare organizations.

The healthcare industry needs to ensure that data professionals on the back end are provided with viable career paths, as others pursue careers in the more traditional clinical front end. Through it all, it is crucial for medical organizations and healthcare professional schools to be cognizant of the data revolution taking place and engage in technology's role in improving care.

Dealing with security risks in the new delivery model

Some of the new talent will have to be focused on security. Tomorrow's systems will rely on a new sense of interoperability among devices, doctors and patients, but while this interoperability helps catalyze the healthcare revolution, it also introduces acute new risks.

Patient records are extremely valuable to cyber criminals, since the level of detail they contain enables identity theft. The internet of (medical) things (IoMT) offers an even more severe threat. Should a healthcare device be breached, an attacker could reprogram the device to take actions that endanger the life of the patient, such as instructing an insulin pump to release excessive amounts of insulin to a diabetic patient.

Cyber criminals are very creative. Ransomware, for example, is exploding. Criminals infiltrate and lock down enterprise systems and demand a ransom to release the system. Extortionists also steal patient data and demand that hospitals pay a ransom to prevent the stolen data from being released online. To add further pressure, the extortionists sometimes threaten to release a subset of the stolen data online and inform the media. The hospital finds itself in a no-win scenario: pay, and other extortionists will be invited to attack, or don't pay and suffer brand damage as well as class-action lawsuits. This sort of crime represents the future.

Security professionals employ a doctrine of zero trust: treat everything as hostile until proven otherwise. Defense-in-depth practices are vital: don't rely on any single security control, but layers and layers of countermeasures. Security will be more reliant on AI-driven security as threats become more sophisticated, the attack surface widens and social engineering becomes more common. Security professionals always assume the adversary has compromised the network and position defenses accordingly to create a hostile environment for any attackers that breach the perimeter.

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By 2022, 40% of healthcare providers will leverage machine learning and AI-algorithm advances to improve their cybersecurity capabilities with automated threat detection to thwart ransomware.

Source: IDC FutureScape: Worldwide Health Industry 2019 Predictions (Doc #US43122618 / Oct 31, 2018)

How artificial intelligence changes healthcare jobs

Human interaction is the core of good healthcare. Because of this, the risk of healthcare job loss due to automation driven by artificial intelligence (AI) is low compared to other industries. Instead of replacing people, AI can give nurses, executives and clinicians more time to connect with patients and provide more personalized and compassionate care.

Recognizing this, the American Medical Association has renamed AI as "augmented intelligence." The technology helps doctors and other healthcare professionals take better care of patients. As such, AI can make healthcare more efficient and effective in identifying and streamlining the who, what, how and where of healthcare. This gives doctors and healthcare professionals more time for providing the very human delivery of personalized, compassionate care.

When AI is used to spot patients who may have problems with recovery, nurses can spend less time searching for the right care and more time providing patients with specialized care. They can also focus more on engaging with patients' families, friends and communities.

When AI is used to learn from millions of patients and advise doctors on diagnoses and treatments, doctors can spend less time searching for the most effective treatment and more time applying it. AI can transform personalized care by eliminating the need for doctors to rediscover lessons learned.

When AI is used to forecast admissions and plan staffing, administrators can spend less time managing hospital operations and more time improving care for entire populations. Executives can dedicate more time to creating chronic disease management programs and community outreach initiatives such as volunteer medical projects for underserved people.

Of course, there is the danger that an AI-driven tool will perpetuate "bad habits" because, by default, AI has inherent bias. That bias is continuously refined by iterating the AI algorithm using more data. So, AI and tools such as robotic process automation need a strong governance process to guard against so-called "bad AI."

Administrators, doctors, nurses and patients are eager for technologies that can improve the quality of care. For healthcare organizations that learn to unite fragmented data systems and apply AI, AI can shift healthcare jobs from administration to human connection, compassion and personalized care.

More ▲		Less ▼	
▲ Providing patients with specialized care	♥	Poring through data from electronic medical records and patient monitors ▼	👆
▲ Improving care for entire populations	👥	Managing hospital operations ▼	📊
▲ Applying the most effective treatment	⊞	Searching for the most effective treatment ▼	🔍

AI in healthcare can shift the job focus from administration to human connection and personalized care.

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By 2022, 20-30% of acute care providers will deploy smartwatch-based apps, thus improving clinician productivity by more than 50%.

Source: IDC FutureScape: Worldwide Health Industry 2019 Predictions (Doc #US43122618 / Oct 31, 2018)

Building data bridges for healthy outcomes

Beyond security, many challenges exist, but it basically comes down to understanding a patient as an individual, knowing his or her genomic makeup, and determining and facilitating the best paths to quality care. Future healthcare is about figuring out personalized treatments and the medications that may be required, and putting technology, workflows and systems in place to ensure that the intervention has been correctly targeted for the patient.

Putting all this together means building a bridge between clinical research and real-world data, and contextualizing the data into real-world evidence. Significant amounts of patient data are still in unstructured formats, which often limit its use. The goal is to understand what's happening in the research community, combining the worlds of the provider and payer to gain insights, and turning outcomes into computable workflows that can be brought into the clinical world.

Much needs to change for the 21st century digital citizen to serve as a model for future healthcare delivery. For one, there will need to be a change in mind-set to accept technology advances. For example, having a glucose monitor implanted in your body may seem wacky in the late 2010s, but it is not a whole lot different from getting a filling for a tooth or a knee replacement.

In the end, technology can deliver better information for better decisions in healthcare. The key is gaining insights that change decisions and actions and, therefore, drive better outcomes. The healthcare industry is struggling with problems such as linking insights back to the workflow of the consumer. Solving that dilemma will be the next big shift in the industry.

But the 21st century digital citizen and Genome Generation are more informed and more engaged in their care. Highly federated care and business models can bridge the chasm among healthcare, life sciences and patients, and can deliver better health outcomes with greater efficiencies. That is a healthy system!

How DXC can help

With more than 50 years of experience, DXC Technology offers a wide range of provider, payer and life sciences solutions for healthcare organizations around the globe. Our portfolio of healthcare-related services is focused on such areas as digital care transformation, population health management and healthcare data analytics. DXC delivers healthcare innovation by tapping into our own expertise and resources while leveraging industry partnerships to bring together all the pieces of the healthcare ecosystem. Through DXC Bionix™, our digital-generation services delivery model, we provide intelligent automation at scale to accelerate innovation and transformation.

DXC helps organizations create a digital core infrastructure to connect disparate data sources in a controlled and secure way. Our core products include DXC Open Health Connect, a digital health and analytics platform that delivers the speed, scale, flexibility and continuous innovation needed to gain value from healthcare data including internet of (medical) things data and other social determinants. We help healthcare and life sciences organizations transform their information fabric and clinical system infrastructures into adaptive, open and secure platforms that drive operational and workforce efficiencies, clinical effectiveness and favorable outcomes for patients.

DXC is committed to helping organizations gain benefits from electronic health records using DXC Care Suite, and from other patient-centric data sources and healthcare data analytics. We help companies digitize their products and services, so they can unlock the treasure chest of real-world data to take advantage of the core infrastructure that is built. For example, DXC Health360 is DXC's population health management solution that enables personalized care experiences and proactive care planning and coordination. Our services help organizations optimize the process flow and achieve contextual insight to drive true digital transformation.

Now is the time to act. Don't be disrupted — be the disruptor. Let us help you innovate and transform to differentiate with speed and quality. That's DXC. That's Digital Delivered.

Learn more at
- **dxc.technology/healthcare**
- **dxc.technology/lifesciences**

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1. NEJM Catalyst, "Using It or Losing It: The Case for Data Scientists Inside Health Care," May 4, 2017, https://catalyst.nejm.org/case-data-scientists-inside-health-care/

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