

The Impact of Digitalization & Smart Industry on Healthcare and Life Sciences



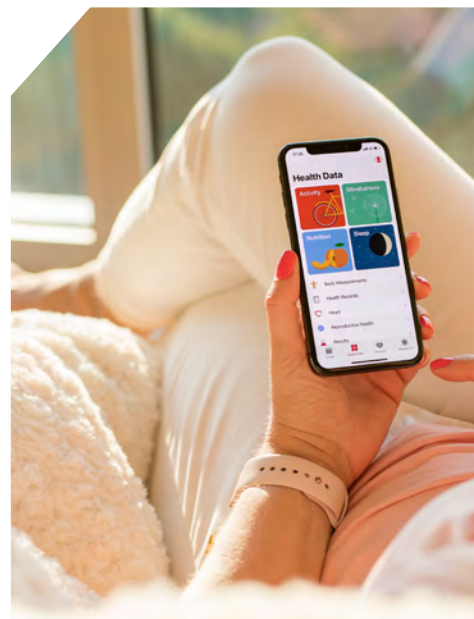
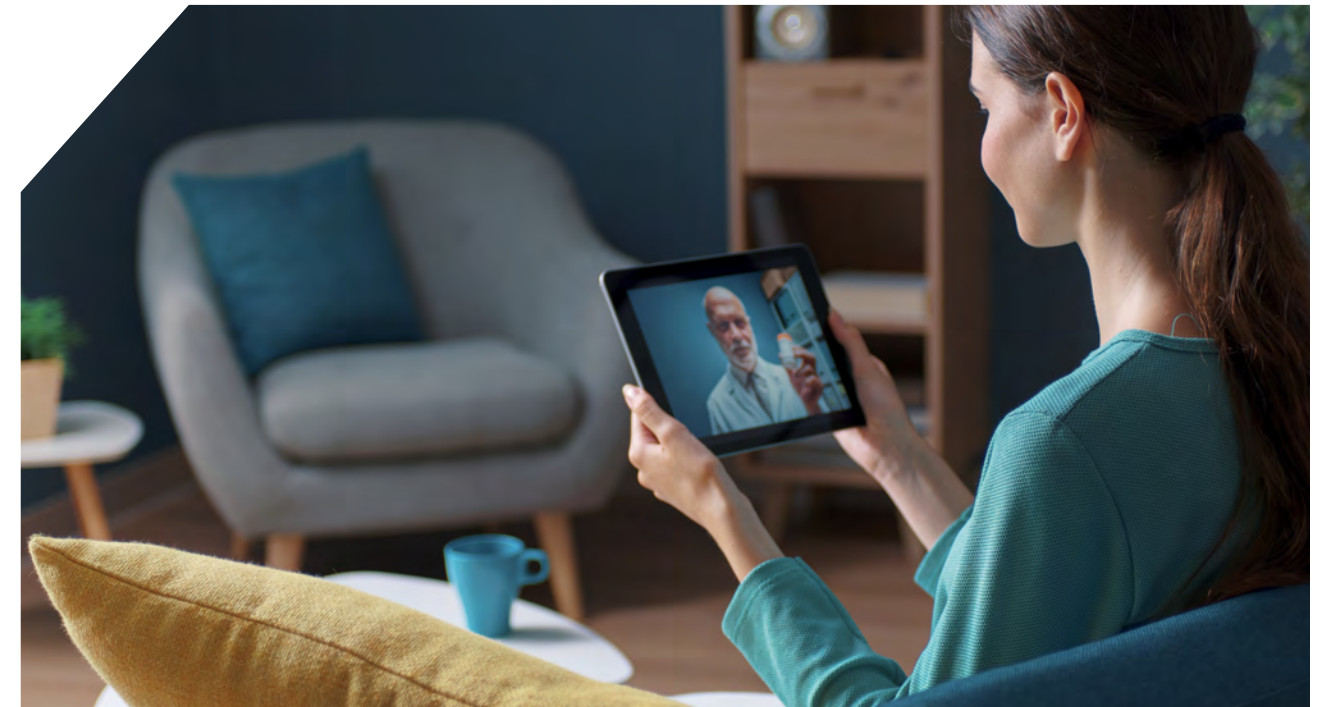
The Future of Healthcare is Precision

Welcome to the future of healthcare - it's called precision medicine: As every patient is unique and deserves to be individually treated, we are striving for treatments tailored to each individual in every way possible. Precision medicine will gradually, but fundamentally change the Life Sciences industry.

In the not-too-distant future, your treatment could be developed especially for you. It will be based on your personal DNA and RNA, together with data about your specific health condition collected by your healthcare wearables, which may have monitored you for years. Your e-doctor will continuously control your wellbeing and administer your personalized medicine at just the right moment.

This is what the world of precision medicine looks like. It encompasses the convergence of genomic testing, advanced diagnostics, digital health records, 24/7 monitoring of patients and much more into an intensely data-driven approach to individual healthcare.

Big-production pharma will still be needed, no doubt. But this new trend is growing stronger and stronger: Healthcare is becoming increasingly personal and tailor-made.



30%

Today, approximately 30% of the world's data volume is being generated by the healthcare industry.

37%

By 2025, the compound annual growth rate of data for healthcare will reach 37%. That's 6% faster than manufacturing, 10% faster than financial services, and 11% faster than media & entertainment.

Source: RBC Capital Markets: The healthcare data explosion

Why precision medicine?

You could argue that medicine already is – and has always been - about precision. Nothing new about that. For instance, a blood transfusion is based on the blood type of the patient, and treatment of a patient is to a great extent based on his or her health, age, and lifestyle.

However, new discoveries and technologies take all this to a whole new level. The rapidly expanding field of genomic testing reveals that your genes can influence how you respond to medications. Also, new diagnostic methods are becoming more and more precise in measuring the effect of a treatment, allowing for tiny adjustments to find the optimal solution for each individual patient. And, as health records are digitalized and large health data bases are created, sophisticated algorithms can start looking for patterns and hidden similarities, and discover new causal relations, leading to even more precise and customized treatments.

1.249M

Globally, 1.249M health and fitness apps were downloaded I Q1-Q2 2020 compared to 934M during the same period a year earlier, a rise of around 34%.

15,5%

The global virtual diagnostics market is projected to grow annually by about 15,5% during 2019-2030

19%

The global telemedicine industry is expected to grow 19% a year by 2025

Source: Deloitte, Predicting the future of healthcare and life sciences in 2025)

New technologies coming

In the coming years, a lot of new solutions have to be implemented to secure state-of-the-art data collection, data management, and data cleansing in the sector. A common data infrastructure is sorely needed, and the winners of the future will be the companies that succeed in this.

Harnessing the power of a common data infrastructure will speed up drug development and secure the ability of pharmaceutical companies to use their patent time as efficiently as possible. Also, data scientists can extract new knowledge from the data, using advanced statistical methods and machine learning to crunch large data sets.



A new vision for precision medicine in a data-driven world

Ubiquitous Sensors

Networks of stationary and wearable sensors gather simple baseline measurements and flag anomalies.

Standardized Diagnostics

Samples and data from advanced omics and non-invasive tests are collected using a standardized master protocol including key meta data to ensure comparability.

Data Platform

Standardized results are continuously streamed through a secure network to an integrated data storage and computational platform.

Impact Generation

The platform aggregates these data and uses advanced machine learning algorithms to come up with diagnoses, prognoses, and optimal treatment plans for each patient

Continuous Feedback

Patients are continuously monitored, and their outcomes data are used to adjust treatment plans and inform treatment algorithms for future patients.

Accelerated Discovery

Research and drug developers use this rich source of interconnected data to dramatically improve efficiency by rapidly testing hypotheses.

Source: McKinsey: Precision Medicine: Opening the aperture

Data is at the center

Looking at the Life Science product life cycle, data is at the center.

Each phase produces vast amounts of data. From the development of drugs to testing, documenting, and seeking approval, from manufacturing the drug and securing its consistency and traceability, all the way to what the industry calls "post-marketing": After release, documenting its actual efficiency, investigating possible side effects etc.

However, Life Science is not yet a truly digitalized and data-driven domain. Typically, data is siloed and not standardized in a way so it can be utilized in large, cross-disciplinary analyses, using for instance AI. And although healthcare and life sciences are producing these vast amounts of data, the level of digitalization in the sector is still significantly lower than in other sectors such as banking and insurance.



Paradigm shift

As in the automotive and aerospace industries, future growth will mainly originate in software and data. For the Life Sciences industry this paradigm shift is challenging the traditional ways of doing business. Creating change on such a fundamental level can be difficult, as there is a high level of regulation in the sector, together with a long-standing tradition of manual skills and craftsmanship, for instance when it comes to lab work. Nevertheless, change is necessary, and it will come.

Currently, the life science world is only at the starting point of this fundamental change.

Akkodis is aware of the multi-level challenges the industry is facing looking forward, adjusting to accelerated market needs and to the push towards precision medicine. Therefore, we are

bundling our competences and offering end-to-end solutions, for instance when it comes to manufacturing or data management. Because that is what the industry needs to reach the next level of digitalization, be it in the laboratory, on the factory floor, or in the boardroom.

Akkodis is contributing to this transformation by offering a multitude of expert skills, refined through our work across different sectors.

What's more, we speak the language of the Life Sciences industry and are intimately familiar with the ground rules of this specific domain.

Welcome to the age of precision medicine. Together we are transforming the Life Sciences industry – for the benefit of everyone.

Going from Craftmanship to Data Management: Mastering Data from A to Z

The Life Sciences industry must reach the next level of digitalization, realizing a common data infrastructure, encompassing the laboratory, the factory floor, and the boardroom. One ring to rule them all.

The importance of data management cannot be underestimated. It influences everything. No reinventing the wheel anymore. If you can ensure data integrity throughout all processes, efficiency in research and development will increase. You'll be able to link laboratory data with regulatory affairs, medical writing, data coming from manufacturing and much more. It will be a single flow of data all the way from research to post-marketing. If you can master the data from A to Z you'll increase your speed and efficiency. And time is money in the Life Sciences industry.

Currently, there is a lot of craftmanship in the industry. That, together with a high level of regulation, creates a kind of inertia for change. Also, the industry's core business is to develop new drugs and treatments, not doing data management. However, gradually Life Sciences will become a data-driven domain embracing Smart Industry principles. New technologies and processes will be implemented. Not least new ways of data collection, data management and data cleansing.

Akkodis is uniquely positioned to help the industry. All the way from research to post-marketing Akkodis' expert consultants can support the industry, with skills for collecting data, placing them in secure data lakes, performing statistical analysis, improving processes, and optimizing production capacity. And Akkodis understands the different languages spoken in the industry, from researchers to regulatory affairs people to marketers to top management. Building on its experience as a Smart Industry frontrunner in industries like automotive and aeronautics, Akkodis is an ideal companion for the Life Science industry on its digitalization journey.

As digitalization increases, the need for trust increases as well. You need to be able to guarantee the safety and reliability of the computer systems used in research and in laboratories, for clinical trials and for documentation. The systems have to be validated from A to Z. Akkodis' consulting team helps clients manage the increasing level of information complexity. **They offer extensive experience in the selection and validation of all main IT and automation systems, supporting strategic decisions and on-site project management with a deep knowledge of technology, processes and regulations)**

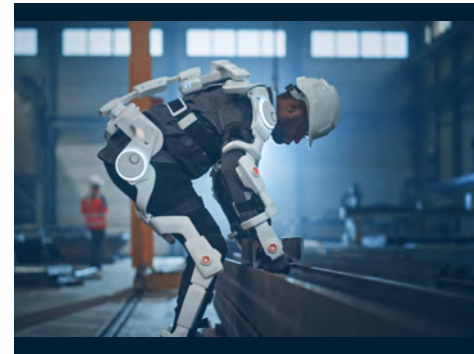
Akkodis has carried out several projects to redefine and redesign the flow of validation documents and data in the pharma industry. Its consultants have tailored state-of-the-art document management systems for Life Science, such as Veeva, to fit specific customer needs, opening new possibilities for process optimization in the industry.



The Tools and Devices of Personalized Health

The gadgetry of health is developing at rocket speed. There is a device for everything, no matter if you're a fitness geek with impeccable health or you suffer from a medical condition that needs monitoring. And all the devices are digitally empowered, collecting data, and communicating.

A fitness tracker records daily burned calories, running distance, heart rate, sleep patterns and much more. If you're the competitive type, you can even share your fitness data with your gym buddies, just for the fun of it.



If you're a diabetic, you'd like to share your data as well, but for much more serious reasons. You're wearing a sensor controlling your blood sugar level in real-time, enabling you to keep the level much steadier than without the sensor, reducing the strain on your organs, improving your health significantly. And when you're going to your doctor for check-up, she can view the data and administer your treatment much more precisely than before.

Or, if you're recovering from a stroke and doing the daily exercises required to get back into shape, your efforts can be monitored remotely by your physiotherapist, who can help you keep track of your progress and adjust your workout schedule according to your condition.



Made with the same blocks

This is the fascinating thing about these modern health gadgets: Although they cover an impressively broad scope of functionality, they all utilize the same technical advancements. It's all about sensors, 24/7 monitoring, data collection and analysis, connectivity, and digital ecosystems. These are the basic building blocks for a new generation of tools and devices, empowering medical professionals, patients that suffer from various degrees of medical conditions, as well as perfectly healthy people.

As consumer wearables are converging with medical technology, health monitoring is becoming ubiquitous. From socks monitoring a baby's heart rate to earbuds measuring your body temperature, insoles analyzing the way you walk, and glasses checking your brain activity – all these devices are creating new layers of data around people. And, due to the increasing digitalization of the health care sector, all these tools can feed their data into electronic health records, creating the potential for a much more fine-grained, data rich approach to medical treatment and prophylaxis.

The future of personalized health

We're looking into the future of personalized health: A multitude of new healthcare technologies can fit treatment to your specific profile, for instance your genes, your lifestyle, your response to specific medications, and real-time data monitoring, allowing for a degree of customization never seen before.

Medtech:

For more than a decade Akkodis has worked together with Laerdal Medical, a Norwegian manufacturer of medical equipment and medical training products. Laerdal produces lifelike manikins used for resuscitation training, emergency care and trauma. Akkodis experts have delivered various IoT solutions including wireless handheld controllers used to simulate training scenarios.

Wearables:

Fluispotter is a wearable and fully automated blood sampling system, produced by Danish company Fluisense. It's the only wearable blood sampler in the world and can collect and store up to 20 serial blood samples in 20 hours with minimal stress for the patient.

Consultants from Akkodis have developed the brush-less engine unit and blood circulation control in the catheter and valve that opens and closes for access to blood sampling. They have also developed and designed the user interface for programming the device.

Addressing the Need for Accelerated Product Development

Based on data from a wealth of sources, patients diagnosed with the same disease can benefit from individualized therapy. The vision of “one patient, one therapy” may for a long time yet remain a vision, but ultimately that’s where we’re heading.

The trend towards precision medicine requires Life Science companies to change and adapt to a new era of speed and flexibility. That is no small transition for an industry, which is not only highly regulated but also consists mainly of very large companies, that struggle with the challenge of leaving the big-production pharma mindset behind and embracing agility.

So, the industry needs to accelerate product development. Companies are forced to use their patent time more efficiently than before, and software and data are the answer to that challenge.

Harnessing the power of data may even change something that lies at the heart of the industry: the sequential ways of doing things. Most of the processes in the industry are sequential. But, as the development of Covid vaccines has demonstrated, it is possible to develop medicines in overlapping stages, going to the next stage of testing earlier than usual.

Through AI, different datasets can yield new insights, speeding up drug discovery. Instead of clinical trials, researchers can do computer simulations to accelerate parts of the early-stage research.

Just as Covid has triggered the industry to take another look at its processes, artificial intelligence may have the same effect. It will become possible to give deep learning predictions about the outcome of future data, based on the data already received.

Pharma companies will look towards Deep Learning and Artificial Intelligence to optimize drug discovery processes. Through AI, different datasets can yield new insights, speeding up drug discovery. Instead of clinical trials, researchers can do computer simulations to accelerate parts of the early-stage research. And companies will increasingly use digital tools to match patients to clinical trials and use wearable devices to monitor their wellbeing.

Life Sciences Manufacturing of the Future

It may seem awkward to compare pills and vaccines to smartphones, cars, or even airplanes. But actually, the Life Sciences sector is looking to the electronics, automotive and aerospace sectors for inspiration.

These sectors are frontrunners within Smart Industry, optimizing industrial processes by connecting production lines and plants, and enabling more efficient supply chains and logistics, predictive maintenance, smart services and much more.

Compared to electronics and automotive the Life Sciences sector is lagging, for several reasons. For one thing, the sector is heavily regulated. For good reasons obviously, to ensure safety and effect of medications and treatments. However, this slows down change and innovation. For industrial processes to change and improve, rules must change, and that takes time.

Also, the pharmaceutical industry consists of a number of very large companies, and compared to for



Engineers at Akkodis are helping local pharmaceutical companies reduce production downtime related to validation and approval: When a production line goes from producing one drug to producing another, it must be thoroughly cleaned and disinfected, to avoid contamination. Three types of mandatory tests are performed: installation qualification, operation qualification and performance qualification. Utilizing Smart Industry concepts, and leveraging data from the production equipment, the time required for testing is reduced, while still ensuring full compliance with rules and regulations.

instance start-ups, large companies have a tendency to lose agility, due to size, silo mentality and rigid processes. Consequently, these companies are arriving late at the starting point of their Smart Industry journey.

Based on its extensive experience in the electronics and automotive sectors, and other sectors embracing Smart Industry, Akkodis is helping Life Science companies to adapt new solutions. For instance, harvesting data from machines and thus improving the process of documenting that your production line lives up to all requirements.



Regulators require manufacturers to document, that they can produce a drug in a consistent, repeatable way, batch after batch. To ensure this, manufacturers perform rigorous tests, for instance installation qualification, operation qualification, and performance qualification tests. But while these tests are undertaken, the product is quarantined for up to 15 days before being allowed to leave the factory. And everything starts over again when the line is converted to produce another product. Smart Industry concepts can help reduce quarantine time by improving and automating documentation processes.

Robotization

Automating production is a key factor, and Akkodis is working extensively on automation to help the Life Sciences industry become more efficient. Increasing the robotization of e.g., the packaging of drugs optimizes production. At the same time, it reduces the space needed for production, leaving room for additional production equipment.

This new equipment can be used to produce smaller batches of pharmaceuticals at a reasonable price, thus being able to meet market demands for specific medicine for increasingly smaller target groups.

Akkodis is also bringing several other Smart Industry concepts into play, like

At a specialized production facility in the Netherlands, a global pharmaceutical company is manufacturing small-series medicine. For each new series the setup of the production equipment must be changed. That takes time, and is primarily done by older, experienced technicians with a unique knowledge of the facility. **Akkodis gathered this knowledge, structured it, and created a training program for young engineers, using HoloLens technology.** This digital instruction solution increases production efficiency and reduces downtime between production runs.



going from paper based to paper-less processes, integrating electronic batch record systems, and using simulation software and augmented reality to set up a line for a new product without interfering with ongoing production.

Traceability is extremely important in the medical sector, and there's a strong push towards moving from paper-based to paperless tracing. **Akkodis has helped a large number of medical companies with electronic tracing and implementation of electronic batch record systems.** These systems collect production data related to a specific batch of drugs and enables tracing all the way from the production plant to the patient. This also eliminates the risk of the original product being replaced by unauthorized copy products before it reaches the user.

About Akkodis

Akkodis is a global digital engineering company and Smart Industry leader. We enable clients to advance in their digital transformation with Consulting, Solutions, Talent, and Academy services. Headquartered in Switzerland and part of the Adecco Group, Akkodis is a trusted partner to the world's industries. We co-create and pioneer solutions that help to solve major challenges, from accelerating the clean energy transition and green mobility, to improving user and patient centricity. Empowered by a culture of inclusion and diversity, our 50,000 tech experts across 30 countries combine best-in-class technologies and cross industry knowledge to drive purposeful innovation for a more sustainable tomorrow. We are passionate about Engineering a Smarter Future Together. Akkodis is part of The Adecco Group.

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