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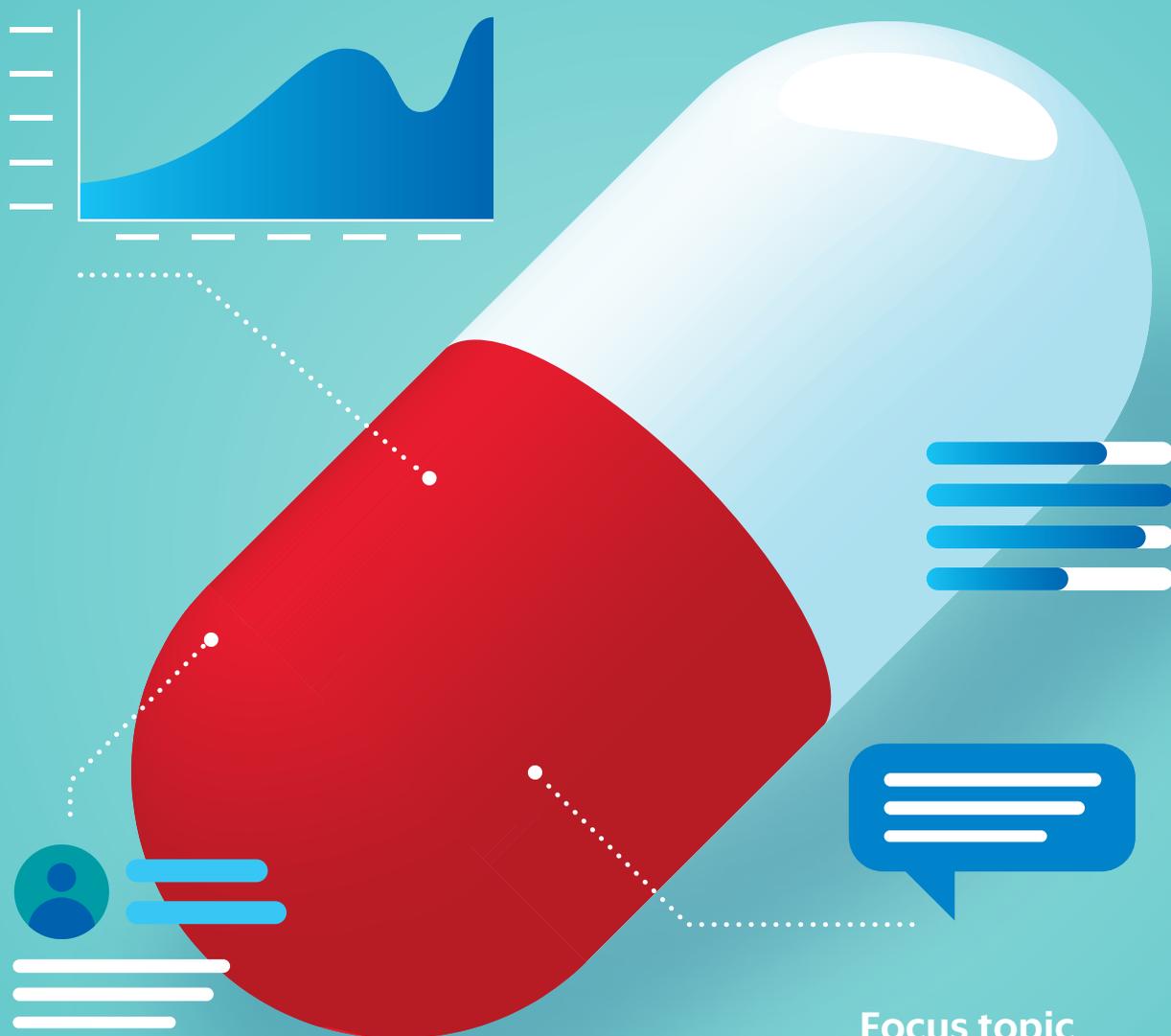
Innovation in Healthcare
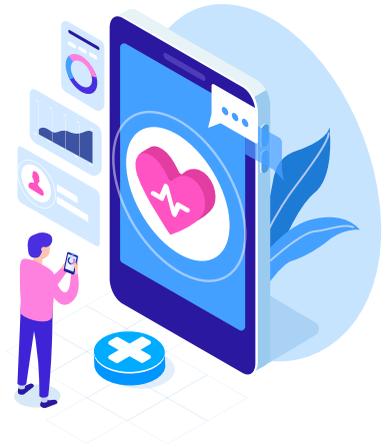
**Focus topic
Digital Hospitals**

Digitalisation takes time, courage and caution

Bruno Wassmer
Managing Director
ERNI Switzerland

Everything is moving forward. So is healthcare. The digitalisation of this field is rapidly progressing, and although it may be a bit more difficult and sensitive than in many other industries, it is just as – if not even more – important.

Switzerland is considered to be one of the most innovative countries in the world, and its healthcare system cannot be an exception. From April 2020, all hospitals, rehabilitation clinics and psychiatrists will have to offer digital documentation of medical history to their patients – an electronic medical report. The process of implementing such a huge change is challenging. From the human aspect and a certain hesitance in the face of adopting new technologies, and through data safety and resources, digitalisation is an ongoing pursuit that takes a lot of time, caution and courage.

With new technologies, platforms and accessibility of information, the whole healthcare chain is changing. Patients are becoming ever more active in their own health management, researching medical information,

monitoring their bodily functions and searching for healthcare providers that suit their needs. With such active clients, healthcare providers need to take a closer look not only at quality of services but also at the image they portray. It is not enough to rely on just "being there" anymore if they wish to attract new patients and clients. Taking a closer look at the brand and its positioning on the market and taking the necessary steps to ensure the best possible position among the competition is the best thing any institution in healthcare can do to improve its business.

In this issue, we will dive deeper into the topic of digital healthcare, its possibilities as well as pitfalls and we will take a good look at some of the hottest topics in this field from both points of view, inside and outside of ERNI.

So, let's use technology to change healthcare around the world and keep people as well as businesses healthy.

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Topic of the issue: Innovation in Healthcare

Hospitals in the digital world

Electronic records, faster and more precise diagnostics, new technologies helping people get better. There is no doubt that the future of hospitals is digital. Digitalisation is fuelled by rapid technological progress and almost everyone with a smartphone is already able to consult their health condition with a "pocket" doctor. However, every change is difficult, especially when large amounts of people, sensitive data and challenges are involved. Digitalisation of healthcare is one of the biggest challenges of the 21st century. Thus, successful encompassment of this shift requires an open mind, well-considered regulation and cooperation between the private and public sector.

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overseeing its entire service
portfolio across several industries

Hospitals create the backbone of the healthcare system. It is a place where healthcare professionals manage complex processes in order to help patients to stay healthy and enjoy life. Patients expect to get the best service there as hospitals possess the personal and material capacities needed, but in order to receive the best care possible, there is a vast amount of data that needs to be handled. An important step towards better and more connected healthcare is therefore creating electronic patient records (EPR). In Switzerland, this application is to be introduced nationwide from 2020 and is regarded as the key to the digital transformation of hospitals, doctors' surgeries, retirement and nursing homes, Spitex organisations, pharmacies and therapists. So far, Basel has been the pioneer of these developments in which the entire university hospital intends to introduce the EPR in the course of the year. Electronic records will bring efficiency, both in time and resources, and create a connected system that all doctors and healthcare professionals will be able to access to ensure personalised and best possible care for every patient treated.

For example, IT penetration in Thun Hospital has already progressed so far that doctors can access the electronic patient record anytime and from anywhere - even in the operating room. There, the surgeon can display important data, such as product information on implants. There is also software already supported by artificial intelligence that provides surgeons with important information step by step during operations, thus reducing the risk. Automated drug dispensing can also prevent human error and increase patient safety.

When talking about digitalisation, data security is always an important topic. That is why accessibility of EPR will be up to patients. Patients can define the access to each individual

document and choose between the three confidentiality levels "normal access", "restricted access" and "secret".

Although in 2017, U.S. News and World Report ranked Switzerland's public health system as the 'World's Best' with an overall score of 9.3 out of 10, Switzerland is still at the midway towards digitalised healthcare. There are countries that invest heavily in this field and with great benefits. The frontrunner – Denmark – has invested in this particular effort for two decades now. The result? According to a study by the Danish Ministry of Health, today 99% of all prescriptions are sent electronically to pharmacies, and 98% of general practitioners exchange diagnostic data digitally or receive laboratory data from hospitals this way. Likewise, 97% of all hospital referrals and referrals to specialists or psychologists are made electronically.

ONLINE DIAGNOSIS

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Examples from interesting markets

Some good experience exists in countries like Denmark, Estonia, Finland and Australia. All are based on projects transforming existing healthcare structure via digitalisation. In other words, data-driven
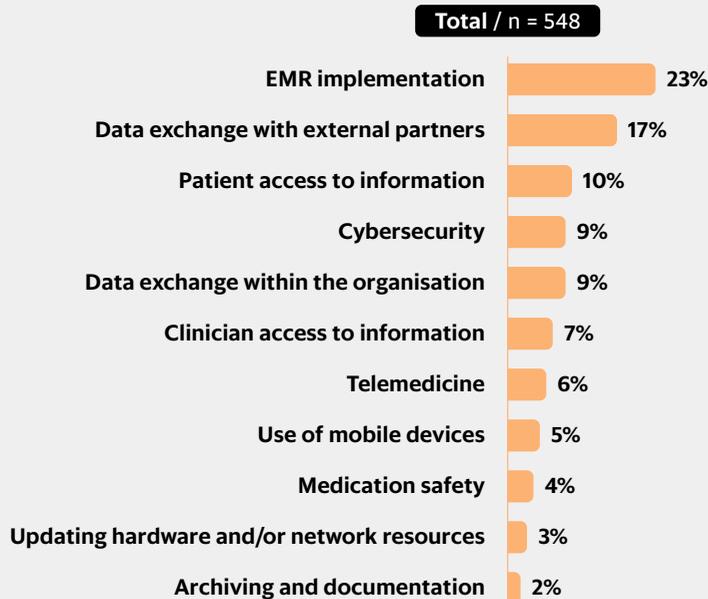
initiatives are creating new platforms for interconnection among patients, health professionals and institutions, including hospitals.

Mr Toomas Hendrik Ilves, former President of Estonia, was in the lead in implementing the digitalisation project in the country back in 2008. The reasons why he supported this process remain relevant today as well: "A more extensive and systematic implementation of e-Health solutions will allow us to make the service more flexible, improve the health of people by exercising more efficient preventive measures, increase the awareness of patients and also save billions of euros," stated Ilves.

Digitalisation and connecting data in healthcare is big topic in Germany too. Although the country is still gaining momentum, new laws and regulations are gradually being implemented to speed up the process. The government is putting significant emphasis on digital health and implementing electronic patient records to as wide a population as possible is a crucial part of it. Also, the effort towards digitalisation is creating new opportunities for medtech startups.
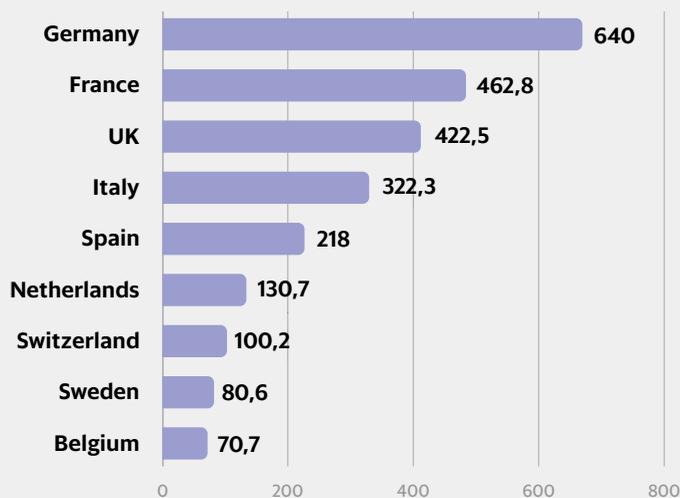
When we talk about good examples of the e-Health approach, there are some cities that stand out. One of them is Barcelona, Spain. The city is well known for its lively startup environment and new medtech companies are popping up on every corner. In a study done by The Healthcare Access and Quality Index, Spain ranked as having the 8th lowest mortality rates by non-fatal causes out of 195 countries, which emphasises the standard of care available in this country. Digitalisation is also helping. Thanks to new technologies, a vast amount of people use smart technologies to monitor their health standard and a majority of them are open to even more new technologies in healthcare in the future.

Biggest eHealth priorities for healthcare providers in Europe (includes health facilities, IT Software vendors and governmental health authorities)

Total / n = 548

Priority	Percentage
EMR implementation	23%
Data exchange with external partners	17%
Patient access to information	10%
Cybersecurity	9%
Data exchange within the organisation	9%
Clinician access to information	7%
Telemedicine	6%
Use of mobile devices	5%
Medication safety	4%
Updating hardware and/or network resources	3%
Archiving and documentation	2%

Source: HIMSS Analytics, Annual European eHealth Survey, eHealth TRENDBAROMETER Q3/2017 *EMR stands for Electronic Medical Record (equivalent to EPR)

eHealth revenue in selected European Countries in 2018 (in CHF million)

Country	Value
Germany	640
France	462,8
UK	422,5
Italy	322,3
Spain	218
Netherlands	130,7
Switzerland	100,2
Sweden	80,6
Belgium	70,7

Source: Statista.com

New technologies are here to help

As mentioned, data is the most important asset, even in medicine. The rapid rise of technologies is changing all the aspects of working with data from collecting through assessing to diagnostics and storage. Technologies like AI, IoT, wearable devices, cloud or complex algorithms are making it easier for healthcare providers to properly diagnose, assess, store and share data about patients and by that, help more people and save more lives. New technologies like virtual and augmented reality, all kinds of apps as well as remote and online classes are helping medical students and professionals get better training and polish their skills, while robotics and technologies like 3D printing are making it easier for surgeons to execute precise and minimally invasive operations.

What is even more exciting about this shift in hospital business is that patients themselves are becoming an active part of the health system. Even though a lot of medical professionals would agree that there is nothing worse than a "googling patient", an interest in one's own health can be crucial for healthcare providers. There are apps ranging from fitness, calorie intake, relaxation to prenatal care; there are also platforms and online forums for direct communication with health professionals. There are not only wearable devices that monitor your basic life functions but also those that are able to alarm doctors if there is a problem with a patient's new transplant. These devices are able to collect an unbelievable amount of data which, apart from medical benefits, brings huge value in statistics on the overall health of the population.

Switzerland to implement progressive system

The storing, sharing and interoperability of data is a big topic in Switzerland. Data forms the basis for the electronic patient record, which is the primary electronic document that circulates within a digitised healthcare system. Switzerland has started to implement this personalised record, known as EPR, in mid - 2018 and the application is to be introduced nationwide in 2020. Thus, this project of digital transformation of hospitals, clinics and other stakeholders will classify Switzerland as one of the most progressive countries transforming its healthcare system following the latest trends worldwide.

Basel hospitals on the move
The selected hospitals in canton Basel will start creating digital dossiers with doctor's reports, analyses, patient histories or X-rays, which can be accessed by other treating persons such as health professionals or family doctors, regardless of time and place.

Using this kind of new networking platform will offer a lot of the experience needed to tune it up. The goal to have a safe, seamless and secure healthcare structure requires overcoming various challenges.

Data stored in Finnish archives
Another example is Finland, where the ongoing digitalisation of healthcare is leading to patient empowerment. After years of precise collection of healthcare and social data, the Finnish Healthcare System has the fundamental material to digitise the whole sector, providing healthcare professionals and patients with high-qual-

ity data managed and stored in KanTa - the National Archive of Health Information. Decisive factors of successful implementation are legal framework, opening up the public healthcare system to private-sector activities and cultural context; the culture is very tech-savvy and prone to adopt new technologies. Having the National Data Exchange Layer allows people to renew electronic prescriptions, view records related to treatment, store their living wills and organ donation testament, etc.

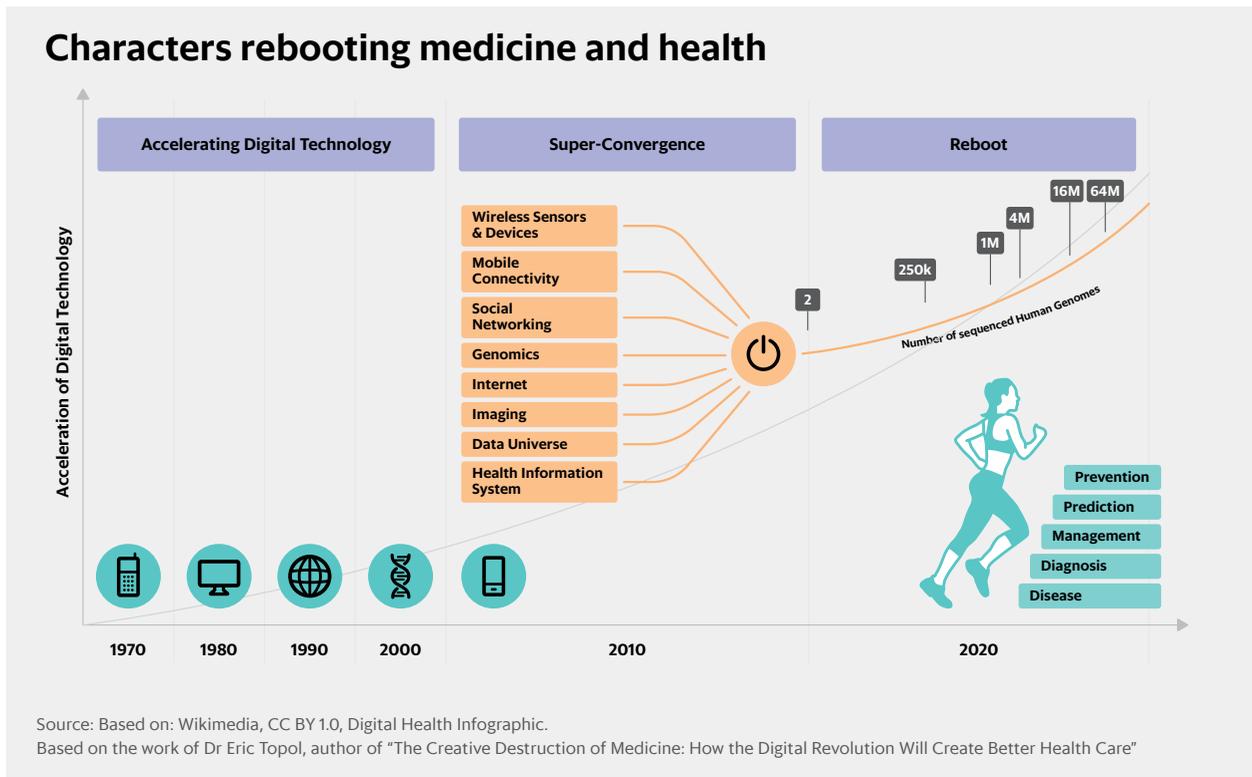# How to overcome doctors' resistance

Digitalisation is driven by fast technological progress and the desire for increased comfort in doing any activity in both professional and private life. It is enabled by data flow – data that is accessible and processed and transmitted in the desired structure in a matter of milliseconds. Data that are understandable to patients and doctors – with use regulated by principles agreed by all stakeholders upfront – help to achieve further efficiency gains and cost savings.

Data already available on paper can be digitised and transmitted where needed in order to quickly define a diagnosis and apply the most effective medication. Doctors – of first contact – are the first movers in this change. After good experience with sharing best practices with their colleagues-doctors, they save a lot of time when considering patient status and thus settle on medication more precisely. Overcoming
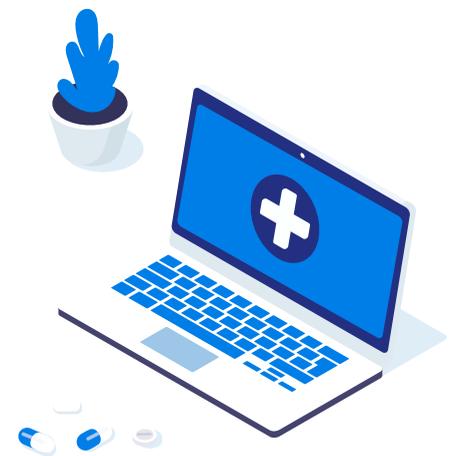
their resistance is the first step to spreading good experience through information sharing.

A survey from the Association of Swiss Specialist Hospitals for Medical Informatics (VSFM) shows that more than 30% of doctors' practices still keep their patients' medical records in paper form. Changing their approach requires time, experience and training. Hospitals that strive to become fully digitised must not forget that even though technology brings a lot of advantages, the human factor should never be forgotten in this sensitive environment. And that means taking care of doctors and other healthcare personnel too. Proper training, ongoing education and feedback from professionals can bring much more benefit for patient and hospital alike than any technology can.

Characters rebooting medicine and health

Accelerating Digital Technology   **Super-Convergence**   **Reboot**

Acceleration of Digital Technology

Wireless Sensors & Devices
Mobile Connectivity
Social Networking
Genomics
Internet
Imaging
Data Universe
Health Information System

2

250k   1M   4M   16M   64M

Number of sequenced Human Genomes

Prevention
Prediction
Management
Diagnosis
Disease

1970   1980   1990   2000   2010   2020

Source: Based on: Wikimedia, CC BY 1.0, Digital Health Infographic.
Based on the work of Dr Eric Topol, author of "The Creative Destruction of Medicine: How the Digital Revolution Will Create Better Health Care"

Digital skills needed

With digitalisation running across industries, healthcare is not exempt from improving its current level of service quality at lower cost. Thus, the hospital is subject to economic logic as well; just like any company, a hospital must cover its cost especially when comes to using public funds in an efficient way.

In Switzerland, not all healthcare players are fully digitalised; therefore, doctors and hospitals that already use isolated electronic solutions often have problems networking with each other. The system landscape is usually more heterogeneous than commonly assumed, and missing standards and interfaces slow down unhindered data exchange.

The trend of increasing outpatient cost triggers ideas of how to manage hospital performance – both in terms of quality improvement and cost rationalisation - by ambidextrously combining the exploration and exploitation of hospital assets.

How to use current assets in hospitals

- Exploratory activities: activities that explore new and better alternatives to deliver healthcare services - regarding both the administrative and clinical domains - in order to change existing routines;

- Exploitatory activities: activities that refine and extend existing healthcare competences, simplifying the use of existing routines in both the administrative and clinical domains.

(Source: WHO, 2018)

Healthcare professionals and especially managers in the health industry need to accept the challenge for further education - not just in the case of new technologies and approaches (digital skills), but in understanding the workflow driven by data – and take decisions within the new online interconnected and

interoperable structures (partly supported by AI too). Managers, roles change from distribution of tasks, control and evaluation towards engaging themselves into teamwork within Kanban and Agile methods based internal programmes.

Digitalisation will mean changes in the roles of established professions, and hence a need to clarify ownership and responsibility for the services and care provided through new, innovative systems. According to WHO, issues of resistance and trust will undoubtedly arise, and will have to be openly and transparently addressed for groups of health professionals and the public.

It is also important to remain sensitive to the degree to which health professionals invest in their personal identities as health workers, which they may have taken decades to build. These identities can be threatened by new technologies and changes to the

face-to-face, interpersonal aspect of healthcare. It is crucial that relationships are not destroyed in the process of digitalisation. What planners and policy makers perceive as small shifts may not be small to health workers. Development processes for digital health must closely involve both health professionals and patient representative organisations.

The digital hospital of the future can leverage technologies that transform care delivery, patient experience, staff management, operations management and hospital design.

A good example is the clinical command centre at Cleveland Clinic, which can help manage patient capacity and other operational processes. For example, using data on admissions, inter-facility transfers and predictive analytics on possible days for discharge, command centre analysts can help staff manage patient flow and improve care delivery, better manage lengths of stay and enhance the discharge process.

Healthcare issues in Switzerland

Two simultaneous trends are visible in Switzerland. A shortage of healthcare personnel and a growing proportion of older people. While lack of personnel might be solved by migration as in the past – today more than one in four people are of foreign origin and more and more of them have university education - the ageing reflects increased life expectancy. According to Swissinfo.ch, global average life expectancy rose by over 35% or 18 years between 1960 and 2012. On average, the Swiss live to be among the oldest people in the world, with a projected lifespan of 82+ years in upcoming years.

Digitalisation of the healthcare sector might bring partial resolution of both of these trends by applying labour-saving technical innovations like robotic assistance, monitoring sensors, ambient assisted living, telemedicine or artificial intelligence.

Benefits of digitalisation

– Leaner and more efficient processes increase the quality of the overall system and ensure more transparency.

– The safety of patients is significantly improved by digitalisation. For example, the availability of electronic patient records around the clock can help doctors make decisions even in operating rooms.

– Digitalisation in the healthcare sector can also compensate for the growing shortage of skilled workers.

Educating the public

Achieving steady progress in digitalisation of a healthcare system depends on the ability of patients to play an active role in this process and use digital devices in the proper manner. Therefore, programmes for health literacy for the public and health professionals are essential, and so are platforms for patients and health professionals that connect and unite different sources of data and information.

It will also be necessary to address the implications for patients of having responsibility for their own data and their own engagement with the system. This knowledge and interest in one's own health is a crucial part of the switch from reactive to predictive medicine.

Digital power

Predictions for the next decade's development show that digitalisation will become a leading driver in changing healthcare systems worldwide. Let's look at some global health IT predictions based on research by IDC International Data Corporation showing where and how fast these changes are going to impact healthcare enterprises, companies and departments in the upcoming years.

– Optimising the digital patient experience will become one of the top 3 strategic priorities by 2020 for 60% of healthcare providers;

– Personal data exchange in healthcare will triple by 2023;

– By 2022, 50% of clinical apps will include ambient interfaces and 20-30% of acute care providers will deploy smart watch-based apps - both ensuring higher data quality and improving productivity;

– Blockchain use for securing multiparty information sharing

across healthcare will increase eightfold by 2022;

– Artificial Intelligence (AI) will directly impact 25% of business processes by 2020.

Important steps to an e-Health future

❶ The digital hospital engages with patients in new ways using remote monitoring tools (wearables), teleconsultancy, patient flow management, etc., called digital care delivery and digital patient experience.

❷ Internal processes digitised with help of robotics, sensors, portals, communication systems and automation, which drive cost efficiency up.

❸ Data is key – collecting, storing, securing and analysing data in robust IT infrastructure is a fundamental investment in order to run the digital hospital.

❹ Digital skills are required from hospital personnel as well as from

patients to ensure smooth communication and quick response times in the decision-making process.

❺ Secure data - as medical information is of the utmost sensitivity, the digital hospital must possess solid anti-cyber breach solutions, and their steady upgrade must be an integral part.

Sources:
Association of Swiss Specialist Hospitals for Medical Informatics; Cleveland Clinic; Danish Ministry of Health; Kanta – National Archive of Health Information; KPMG; The Healthcare Access and Quality Index; Thun Hospital; U.S. News and World Report; WHO; IDC

TRENDS IN HOSPITAL CARE

Technological trends
Use of new information and communication technologies, such as the electronic patient dossier, to help implement e-Health

Digital transformation through e-Health

Personnel and Human Resources (HR)
The most important innovations in the field are in human resources structures (for example, expansion of the skill-grade mix)

Shortage of skilled professionals

Hospital services and competition
Includes topics such as compensation, optimisation of financial leadership, increased cooperation (integrated care), investment needs and the construction boom in the healthcare industry.

Falling prices per case force higher number of cases

Social developments
Demographic change, changes in patient behaviour, individualisation, health literacy, increased comfort and service demands

The future of hospitals is all about sophisticated patients

Source: ZHAW School of Management and Law - Das Schweizer Spitalwesen Eine Managementperspektive, authors: Alfred Angerer, Eva Hollenstein, Florian Liberatore, 2016

Digital hospital stages and criteria

Stage 0	• No part of the institution is included in the digital environment, including clinical support units (pharmacy, lab, radiology).
Stage 1	• Clinical support units (pharmacy, lab, radiology) are included in the digital environment.
Stage 2	• Digital environment includes a clinical data repository (CDR), physicians can view medical information and results internally. • The CDR can receive medical image documents. If applicable, information exchange is enabled between hospitals.
Stage 3	• Clinical documents, electronic medication management records, order entry, and tracking systems are integrated with the CDS. • Physicians located outside the radiology department can access medical images and image archive.
Stage 4	• Any licensed clinician can add a nurse to a computerised physician order entry (CPOE) system.
Stage 5	• Physicians outside the institution can access medical images via a secure, intra-institutional system.
Stage 6	• At least one in-patient has an integrated documentation system. • A closed-loop system manages medications; the hospital uses a coded drug system. • Automated ID and delivery technologies comply with the "5 Rights": – Right patient; – Right drug; – Right dose; – Right route; – Right time.
Stage 7	• Total digitalisation: no use of paper documents. • The institution stores and analyses data to increase healthcare quality and ensure patient safety. • All data is standardised and accessible to all hospital personnel. • A closed-loop system manages all healthcare materials.

Source: International Journal of Health Science Research and Policy Volume 1 Issue 2 2016

Creating stronger brand

Building a successful hospital brand strategy

Maneka Fahrer Bruno
Managing Director
Bloom Identity

The healthcare sector has undergone a drastic evolution in the last few decades. Previously centred on the management of disease and symptoms in a fee-for-service approach, the healthcare industry is currently focused on providing patient-oriented services with the aim of reducing costs and ensuring a better overall health outcome.

This new value-based healthcare model has been supported by the rapid progress of science and information technology. Indeed, patients have gained an increased access to scientific and medical information. They are now part of the decision-making process concerning the choice of their healthcare provider and the medical treatment they receive.

Healthcare has changed over the past few years. Like other industries, it's become consumer-driven. Patients, providers and anyone else who purchases healthcare or devices have developed a superpower. The superpower of knowledge. Google

receives a massive amount of searches every day, but did you know that 5% of all Google searches are health related? This means that every day millions of people see healthcare branding.

In the present era of patient prioriti-sation, competition between different healthcare providers is at its highest. Hospitals, walk-in clinics and private physicians' practices are in the dire need of promoting their services and engaging with their consumers in order to remain successful.

By developing and maintaining a brand that reaches in a meaningful way to their audience - patients

physicians and employees alike - healthcare organisations can remain profitable while providing higher - quality clinical services.

We support our clients during the whole process of branding and positioning. Our clients can rely on our skills, expertise and in-depth knowledge of this industry and its needs.

What is branding and why do hospitals need it?

Branding is the art of creating a brand which defines the company's goals and services, embodies the consumer's emotional connection to the product, and ultimately highlights its uniqueness in the market. Successful branding doesn't only affect consumers; it can also have an important impact on employees, investors and stakeholders.

In the healthcare sector, branding can play a crucial role in building patients, and employees' trust and can significantly reduce the usually perceived risks related to hospitals, disease and treatment.

It can enhance service quality by attracting competent medical specialists and by engaging the views and needs of patients.

More importantly, a strong healthcare brand can withstand financial uncertainties by boosting patients' loyalty and by increasing the value of the healthcare facility.

Branding represents the personality and promise of your services - the way you look, feel, act and deliver.

A huge shift in healthcare (hand-in-hand with the importance of branding for health providers) came with generation Y, better known as millennials. Young adults born between the '80s and '00s are the first to have grown up with access to the Internet and technology, which created so many new opportunities for them to be interested in research and take care of their health that their predecessors didn't even think possible. Thanks to all these possibilities, millennials are becoming more and more interested in their health and are changing the role of patient in healthcare from passive to active. They are actively seeking healthy lifestyle choices, turning to eco-friendly products, researching health-related information and turning to technology to monitor their own health status. And although millennials are the first to power digitalisation of the healthcare business, this is just the beginning.

Firstly, millennials want to play a relevant part in their healthcare, which means they expect to be equal partners with doctors, nurses and healthcare providers and to be involved in decisionmaking. They also expect medical treatment to be tailor-made for their personal needs and they are ready to take some responsibility for their health into their own hands, whether that means gadgets and wearables that monitor their bio-functions, seeking information on various medical platforms or trying telemedicine or online consultations.

Secondly, there is an even bigger shift coming with Generation Z. Although still very young – mostly in their teenage years – Generation Z is so accustomed to technology that digitalisation in healthcare is not a question of improvement, but a standard. Robotics, virtual reality in operating rooms, highly functional and detailed wearables, predictive

medicine and targeted treatment are just a few trends that will be considered normal for this generation.

So, when thinking about branding and positioning of healthcare providers, let's not forget that the patients are drastically changing with every new generation and what was once considered new, futuristic and innovative may be a standard norm just a few years later. Healthcare providers and hospitals must adapt as quickly as companies in other industries that wish to stay on top of the game.

Why is effective branding needed in healthcare?

A It differentiates your facility from the competition in the market;

B A strong brand sharpens your competitive edge;

C A strong brand builds trust;

D It provides a unique positive identity and increases the value of your company;

E It engages an emotional connection with patients, physicians, employees and stakeholders;

F It elicits the quality of your services by attracting and retaining highly talented experts;

G It builds trust in your healthcare service;

H It reduces financial risks by ensuring patients' loyalty and increases profit;

I It set guardrails for your marketing team.

Risks of not having strong branding

A Weak branding makes it hard for customers to recognise you or become repeat customers;

B You can get lost in the sea of competitors;

C It will be more difficult to get support, funding or partners;

D It's nearly impossible for people to emotionally cement a positive connection in their brain if you don't have a consistent way of presenting your brand at all touch points.

In the current shifting attitudes of the healthcare market, building and maintaining a strong, reliable, and competitive Hospital brand is becoming critical for the survival of an organization. A brand founded on consumers' expectations and needs while being consistent with its core values in delivering its promise, ensures a better navigation of the market and financial storms. Putting patient engagement at the core of your brand and ensuring excellency in service delivery creates trust, loyalty, and a long-lasting emotional connection between the patient and your facility. It increases your competitiveness and differentiates your company in the market. Moreover, solid and patient-oriented Hospital brands help bringing the healthcare industry to the modern standards of healthcare delivery.
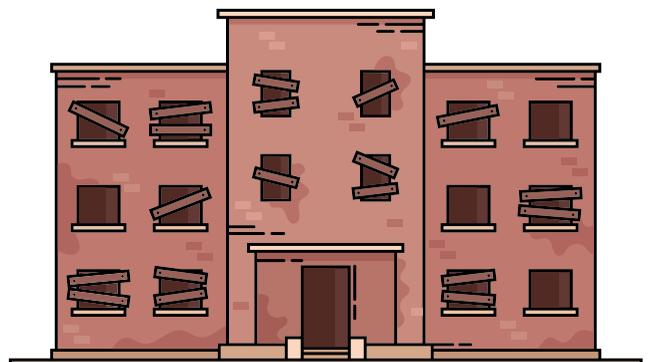
Anne-Geneviève Bütikofer
Managing Director
H+ Hospitals in Switzerland

"Digitalisation is important, but relationships still remain crucial"

Anne-Geneviève Bütikofer, director of the organisation "H+ Die Spitäler der Schweiz" (H+ Hospitals in Switzerland), explains in an interview her view on the subject of digitalisation in the healthcare sector and why strong brands are necessary there today as a differentiating feature.

Ms Bütikofer, according to the latest hospital and clinic barometer from H+, the number of patients who research the Internet before visiting a doctor or hospital is growing. Does this really lead to the desired outcome according to your survey?

Our survey clearly shows that there is a great need for information. This is attempted primarily through the official websites of hospitals and clinics. It also became clear, however, that patients almost everywhere trust that their doctors will refer them to a suitable health facility.

In your opinion, how should hospitals respond to this changed consumer behaviour? What do they have to offer the seekers?

It is important that users can easily find out about the range of services offered by a hospital. Furthermore, certain administrative steps, such as the possibility of online patient admission, should also be offered. The topic of "quality" is also becoming increasingly important. Here, however, we are faced with the challenge that the quality data are complex and difficult for laypersons to interpret. Therefore, we must try to break them down as easily as possible, without losing valuable information or leading to misinterpretations.

How can you measure the quality of treatment? Which criteria should be taken into account?

According to the Health Insurance Act, hospitals and clinics, whether in the fields of acute somatics, psychiatry or rehabilitation, must measure their quality and publicly report it. The hospitals meet these requirements with the nationally uniform quality measurements of the ANQ (National Association for Quality Development in Hospitals and Clinics) and thus contribute to transparency. The measurements and their results also promote the hospital's own quality efforts. The criteria and requirements vary depending on the measurement and are developed by technical experts.

With Spitalinfo.ch, H+ operates its own information platform. How do they differ from other offers?

Spitalinfo.ch is aimed not only at patients and their relatives but also at health professionals and other interested parties. We want to support users in their search for the right hospital by highlighting the services provided by the individual facilities. But also quality data are not neglected. In comparison to other platforms, we deliberately avoid rankings, as quality data are only suitable for comparisons to a limited extent. Spitalinfo.ch builds on transparency so that the user can form his own opinion and thus find the suitable hospital tailored to his needs.

"We want to support users in their search for the right hospital by highlighting the services provided by the individual facilities."

You know the importance of strong hospital brands from your work as a member of the board of directors of Insel Gruppe AG. What role does brand building play in healthcare today in order to survive in competition?

While the brand has not been so important in the health care sector for a number of years, especially in hospitals, the situation has intensified with increasing competitive pressure. A strong and trustworthy brand has a positive influence on the patients' greater room for manoeuvre when choosing a service provider. Therefore, all areas that contribute to the building of trust and thus to a positive image transfer must be recorded. This ranges from a uniform, differentiated language and appearance in the corporate identity and design, to measures across the entire keyboard of communication and marketing, including corporate social responsibility issues. Equally important for a brand are personnel issues such as employer branding, diversity and equal opportunity issues, and the opportunities that a company's employees have to reconcile their professional and private lives.

How does digitalisation change communication with patients and the role of hospital brands?

Despite increasing digitalisation, direct communication between healthcare professionals, whether nurses or doctors, remains one of the most important means in the doctor-patient relationship, or in the relationship between nurse and patient. Because communication, especially in one's own language – as has also been shown in past surveys of hospital and clinic barometers – is an important good for patients.

However, digitalisation in communications is increasingly simplifying the corresponding processes. For example, guests in the new bed house at Triemli City Hospital can use a multifunctional screen on the bed to directly place orders for their food and this information is then sent directly to the kitchen. At the Inselspital, for example, patients can already register online for admission to the hospital.

What should good patient relationship management look like today?

It should focus primarily on the patient. This means that all actions in a hospital must be directed towards the sick. The Lean concept, which is used by more and more hospitals and clinics in Switzerland, follows exactly this approach, with the extremely positive effect that both patients and employees are more satisfied.

According to various studies, Switzerland ranks rather in the midfield in terms of digitalisation in the healthcare sector. Will the introduction of the electronic patient record change this?

It will certainly contribute to the fact that something is moving in the area of digitalisation in Switzerland as well. But whether it will be the big driver for digitalisation is rather questionable in my eyes. Its goal is the exchange of important medical data between patients and service providers. But to achieve this, the electronic patient record would also have to be mandatory for all parties involved.

After all, technology is only one aspect of digitalisation; the attitude of employees and the processes are another. What role do you attribute to change management in the context of digital change?

In addition to optimising work processes, digitalisation also improves the quality of care and increases patient safety. But the step there should be accompanied by a change management system in addition to the modernisation of the infrastructure. Attitudes must change, fear of new technologies must be overcome, working methods should be reviewed and processes dematerialised. Digitalisation in the healthcare sector is an opportunity for hospitals, which opens up new opportunities overall. This process will affect all healthcare professions, for example through the use of robots or the strengthening of quality and patient safety through intelligent programmes and the optimisation of medical data flows. But without the support of employees at all levels, this is difficult to achieve.

Anne-Geneviève Bütikofer was elected as the new Director of "Swiss Hospitals" on 7 June 2018. She was also appointed to the OdASanté Board of Directors on 13 June 2018 and is its Chairwoman. The 45-year-old lawyer is very familiar with the Swiss healthcare system and has an excellent network. Since 2011, Anne-Geneviève Bütikofer has been Secretary General for the Swiss Medical Association (FMH).

From 2008 to 2011, she was Director General of Health in the Department of Economic Affairs and Health of the canton of Geneva and, before that, Head of the Cross-Border Cooperation Service for the Federal Department of Foreign Affairs (2005-2008) and Legal Compliance Manager for the toy manufacturer Hasbro (2001-2004). She has also worked as a lawyer in the Federal Department of Justice and Police and the Department of Justice, Health and Security of the canton of Neuchâtel.

Shifting from reactive to preventive medical care

TREATING SYMPTOMS

Reactive medicine involves a healthcare delivery system based on diagnosing an existing disease and finding a treatment for it. It is an acute care model that doesn't focus on preventing an illness from happening but reacts to the consequences after the onset of a disorder.

It is a perfectly effective system for the management of acute short illnesses which require a simple diagnosis and a fast treatment.

Reactive healthcare has been expensive and inadequate in the management of the highly prevalent chronic diseases, to which no ready cure is available. According to the World Health Organization (WHO), chronic or non-communicable diseases, such as diabetes mellitus, cancer or cardiovascular disease, currently constitute a major public health burden and are the leading cause of death worldwide.

According to Centers for Disease Control, chronic diseases, while largely preventable, directly affect the quality of life and are associated with significant economic costs, accounting for almost 75% of healthcare spending in the US alone.

In an effort to counteract the rising costs and limit the burden of today's chronic conditions, the industry has been shifting to a modern approach for care delivery, one that is focused on preventive and proactive measures with the patient's well-being and health as the ultimate objective.

Reactive medicine

Effective only in the management of acute short illnesses with a clear treatment.

Does not prevent the onset of a disease.

Ineffective in the management of chronic diseases.

High costs due to the high prevalence and the necessary long-term care of chronic diseases.

Fee for service approach prioritising the volume of patients.

For decades, the healthcare industry has depended on delivering clinical care as a reaction to an existing disease and detectable symptoms. However, with increasing healthcare costs and with the rise in patients' expectations, a shift in the approach to medical care delivery has been developing.

Medicine has been steadily moving from reactive to preventive, replacing a traditional fee-for-service and volume-oriented care system with a new and modern model that is value-based and patient-oriented.

EVALUATING RISK FACTORS

Preventive medicine is a healthcare system based on a model that identifies the risk factors and the early signs of a disease, thus preventing its onset rather than later addressing its symptoms.

Recent technological advances and the evolution of science research have permitted an accurate understanding of diseases and their risk factors, giving consumers and health providers the means not only to monitor a patient's health status but also to actively prevent the onset of diseases in healthy individuals. This is particularly of significance for the current aging and medically demanding population, burdened by the important increase of chronic diseases.

Consequently, it is perfectly possible today to prevent or delay the onset of many illnesses such as diabetes or cardiovascular disease, by simply adopting a proactive health approach which equally engages patients and healthcare providers.

From a consumer's perspective, this implies being active in managing one's own health by:

- Increasing physical activity.
- Following a healthy diet.
- Doing regular medical exams and vaccinations.

On the other side, the healthcare industry bears the responsibility of effectively managing patients' health by:

- Improving the availability of medical information.
- Encouraging research and investments in new technologies for early disease detection and prevention.
- Enhancing consumers' health outcomes and overall well-being.

Preventive medicine

Value-based and personalised model with a focus on consumers' interests.

Increase in life quality and expectancy.

Reduction in healthcare costs through disease prevention.

Emergence of new industries and improvement of workforce engagement.

Increase in patient retention rate and productivity.

Requires patient's interest in own healthcare and availability of medical information.

Can hugely benefit from new technologies.

Digital hospitals

Klavs Renerts, MD
Assistant Medical Doctor
in Neurology at the University
Hospital of Zurich

The iconic doctor with a leather suitcase, illegible handwriting and conservative views is being substituted by the first internet generation: the handwriting is still illegible, but it does not matter, as the tech-savvy millennials typewrite everything. The hospitals are in a transition period from a paper-based era to an electronic one. The ship of digitalisation has set sail, but it risks steering in to deep waters as medical professionals worldwide report of electronic health record systems (EHRs) eating away their most valuable resource – time.[1],[2] We should rethink the role of digital machinery in hospitals, to increase their efficiency and, most importantly, to advance the field of medicine. Being a medical resident at a university hospital, I humbly offer my personal point of view.

Eye-to-eye contact between the doctor and the patient is a precious commodity. It is continuously being bombarded by phone calls, direct messages and e-mails with inquiries ranging from simply prolonging a prescription to handling an urgent medical problem elsewhere. Such an environment is not always optimal for delivering sensitive news to a patient or contemplating a complex medical problem.

The good old saying "pics or it didn't happen" rings especially true for medicine, where each task, conversation, correspondence and medical decision needs to be documented. This is done to ensure continuity, as one patient may be treated by several different medical professionals.

The medical guidelines need to be constantly adapted, as a blossoming scientific scene is bringing out close to a million medical papers yearly.[3] Doctors are expected to be up-to-date. Because their patients sure are.

EHRs came with a promise of a single digital environment for streamlining the management of patients and making the documentation easier. It would also be a tool to order new examinations, prescribe drugs and reach other colleagues. Most importantly, it would give an oversight of medical practice at large, within and between different medical institutions.

However, it appears that EHRs have not made the doctor's life easier. Now, most of the doctor's time is spent in front of a computer and not in direct patient care, increasing work dissatisfaction.[1],[4]-[7] Some well-off hospitals even employ medical scribes – persons to handle the work with EHR so that doctors are free to communicate with the patients.[8] This seems peculiar, as digitalisation should make the hospitals more efficient. It appears to me that EHRs are the first place to search for potential improvement.

Until today, I have worked with three different EHRs and read about several others. Mostly it is a "one-size-fits-all" software. Hence, a function one clinic requires all the time might be hidden under ten layers of drop-down lists, just because other clinics need it less often. As medical data are sensitive and the security of the system is paramount, EHRs often offer little flexibility.

An alternative approach would be to create a modular EHR environment, where a single clinic in a hospital could mix and match from a range of professional "apps" and extensions to the base EHR. To this end, the software company running the EHR would have to provide an application programming interface (API) and open the environment for third-party developers. This requires a change of mindset, as software providers might be reluctant to let smaller players enter the field. Some EHRs, however, are already experimenting with specialised marketplaces containing apps from third-party developers. Such an environment increases flexibility and allows for user-driven evolution of the EHR.

EHRs could bring medicine into a whole new era by providing data for continuous self-improvement of the hospital. For example, in the old days, if a hospital wanted to battle the rate of infections acquired in the hospital, a labour- and time-consuming study needed to be carried out to assess the data. With an elegant EHR solution, a hospital would have a comprehensive view of all the applied treatments at its fingertips and could attempt to weed out any factors contributing to hospital-acquired ailments, thus reducing the costs and improving the healthcare.

I argue that EHRs could be capable of far more than they are today – with some creativity and imagination applied. An advanced system could take notes as the doctor communicated with the patient, saving hours of manual typing labour. It might not be a function all the clinics require, but some would surely be interested. I sometimes dream of a system handing me a "weather report" for a ward I oversee, highlighting suspicious changes and reminding about burning priorities.

Furthermore, the medical expertise (e.g. for recognising a rare medical condition) tends to concentrate in large hospitals, not always accessible to all the patients. With digital aid, knowledge, informed by the latest science, could be delivered even in remote areas. Although deep learning-powered systems for medical purposes (e.g. IBM Watson) are often talked about, their wide application has remained for years "just beyond the horizon".

Some might fear "doctors being replaced by the machine", but instead of pushing doctors aside, such a system could be the best imaginable assistant as well as teacher, tending to the specific educational path of the doctor. It could even provide insights that had slipped human knowledge before. If this sounds like science fiction, let me bring up the study where a deep-learning algorithm, trained on retinal images of 280,000 people, could predict their age, gender, blood pressure and smoking status. Previously, nobody knew that such information could be extracted from the back of a human eye.❾

Healthcare is already extending outside the hospital. As people become more accustomed to monitoring their health (smart watches, smart scales, smart everything), a vast amount of data is generated. Patients sometimes offer me read-outs from their smart-watches, but the data are too "noisy" for human interpretation. Properly analysed, however, such data could illustrate health trends (high blood pressures, sleep and movement patterns) and indicate problems even before they arise.

In a truly digital hospital, every employee is equipped with a software environment, complementing each other like Batman and Robin. The system has many players and undergoes continuous evolution, incorporating state-of-the-art medical knowledge. The patients, on the other hand, can participate in their health management, their smart devices providing useful information and being more than expensive toys. The digital system serves the humans, and not the other way around, and the doctors can provide the one thing a patient needs most – human connection. Creating such an environment involves medical, legal and digital communities working side by side.

Some of the mentioned digital solutions might seem utopian now, but so was Jules Verne's "From the Earth to the Moon" back in 1865, written just 102 years before the first human landed on the Moon. The first step is having a good imagination.

❶ Ehrenfeld, J. M. & Wanderer, J. P. Technology as friend or foe? Do electronic health records increase burnout? Curr. Opin. Anaesthesiol. 31, 357–360 (2018). ❷ Poissant, L., Pereira, J., Tamblyn, R. & Kawasumi, Y. The Impact of Electronic Health Records on Time Efficiency of Physicians and Nurses: A Systematic Review. J. Am. Med. Inform. Assoc. JAMIA 12, 505–516 (2005). ❸ Citations Added to MEDLINE® by Fiscal Year. Available at: https://www.nlm.nih.gov/bsd/stats/cit_added.html. (Accessed: 5th December 2018). ❹ Tai-Seale, M. et al. The Practice of Medicine. Health Aff. Proj. Hope 36, 655–662 (2017). ❺ Christino, M. A. et al. Paperwork Versus Patient Care: A Nationwide Survey of Residents' Perceptions of Clinical Documentation Requirements and Patient Care. J. Grad. Med. Educ. 5, 600–604 (2013). ❻ Sinsky, C. et al. Allocation of Physician Time in Ambulatory Practice: A Time and Motion Study in 4 Specialties. Ann. Intern. Med. 165, 753–760 (2016). ❼ Shanafelt, T. D. et al. Relationship Between Clerical Burden and Characteristics of the Electronic Environment With Physician Burnout and Professional Satisfaction. Mayo Clin. Proc. 91, 836–848 (2016). ❽ Mishra, P., Kiang, J. C. & Grant, R. W. Association of Medical Scribes in Primary Care With Physician Workflow and Patient Experience. JAMA Intern. Med. 178, 1467–1472 (2018). ❾ Poplin, R. et al. Prediction of cardiovascular risk factors from retinal fundus photographs via deep learning. Nat. Biomed. Eng. 2, 158–164 (2018).

Healthcare in numbers

2024
CHF 160.9bn

Global e-Health is projected to gross over CHF 160.9bn in 2024.

Source: maximizemarketresearch.com, 2017

According to a PwC report, healthcare will be more patient-oriented, team-based and cross-sectored. Digitalisation and automation are expected to alter the roles and careers of employees, due to which hospitals face a challenge of conducting continuous employee training to retain and attract employees.

Source: PwC

TOP 5 EUROPEAN TECH HUBS

According to Biocat, Barcelona is among the top five European tech hubs:

1. London – Scientific & Economic Capital
2. Munich – Big Innovative Companies
3. Barcelona – Biomedical & TIC
4. Berlin – attractive for entrepreneurs
5. Stockholm – allied health technologies

Source: Biocat

RISE ANNUALLY BY 3%
## 2040 SWITZERLAND

The cost of healthcare in Switzerland is projected to rise annually by 3% by 2040, while healthcare spending will be below 15% of the national economic output as compared to 11% in 2011.

Source: Credit Suisse, 2017
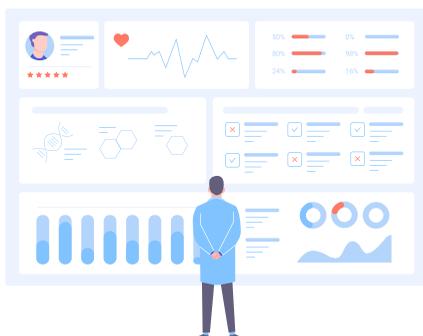
Unified electronic health record/exchange in Germany can generate an estimated potential value of CHF 7.14 billion.

Source: McKinsey & Company

75%
IN FAVOUR
OF TECHNOLOGY
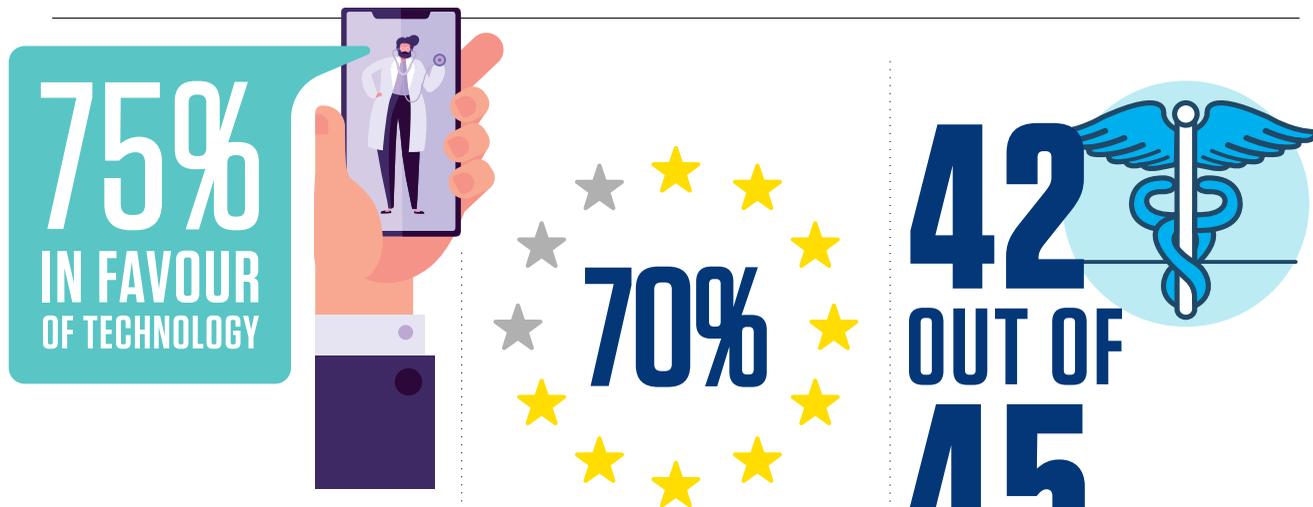
75% of under 40-year-old physicians are in favour of the integration of technology into e-Health. This includes electronic Health Records, e-consultation and remote administration of services through video conferences, among others.

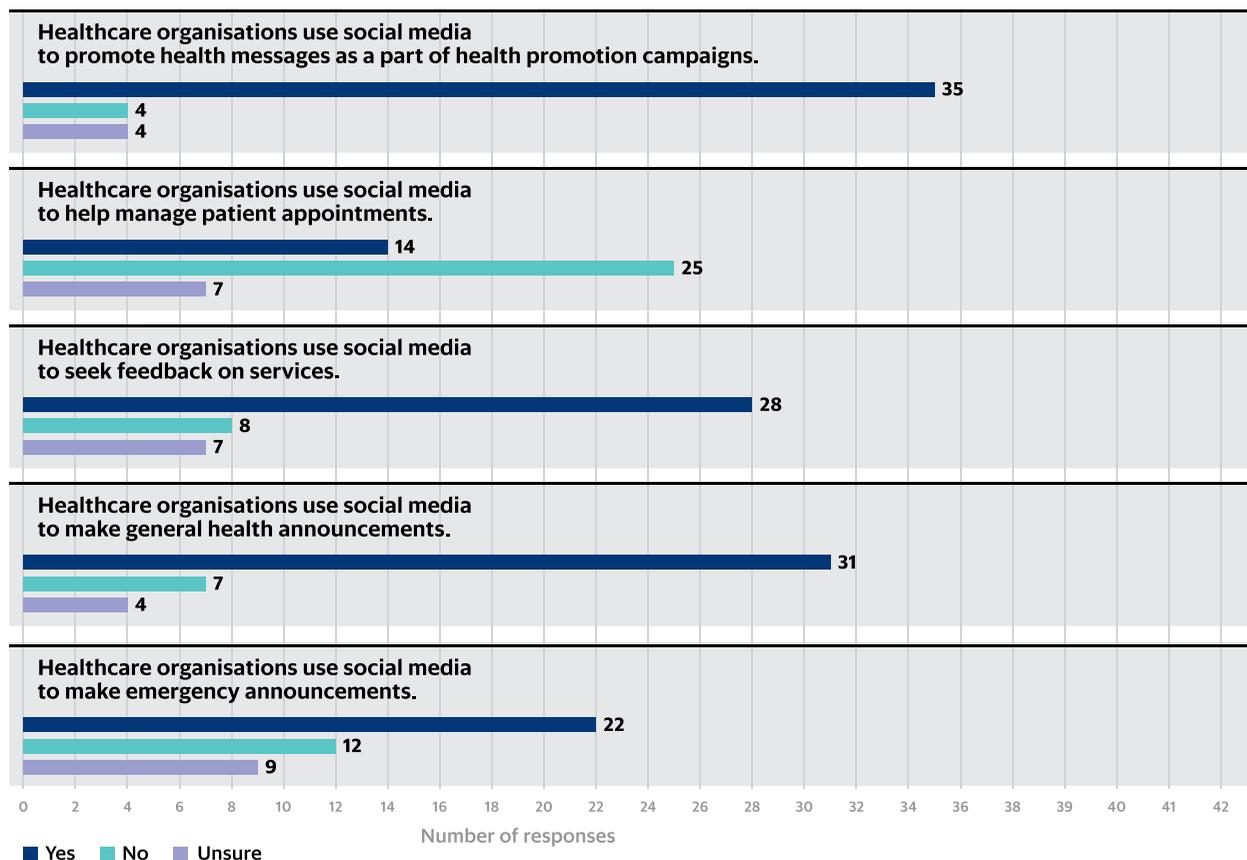Source: Study by KPMG and FMH in 2018. The Study sampled 30,000 physicians.

70%

According to WHO, 70% of member states in the WHO European Region have a national policy or strategy for e-Health.

Source: WHO, 2017

42
OUT OF
45

42 out of 45 of the WHO European Region member states surveyed have public funding available for eHealth programmes.

Source: WHO, 2017

Use of social media by healthcare organisations.

Healthcare organisations use social media to promote health messages as a part of health promotion campaigns.
- Yes: 35
- No: 4
- Unsure: 4

Healthcare organisations use social media to help manage patient appointments.
- Yes: 14
- No: 25
- Unsure: 7

Healthcare organisations use social media to seek feedback on services.
- Yes: 28
- No: 8
- Unsure: 7

Healthcare organisations use social media to make general health announcements.
- Yes: 31
- No: 7
- Unsure: 4

Healthcare organisations use social media to make emergency announcements.
- Yes: 22
- No: 12
- Unsure: 9

Number of responses

■ Yes ■ No ■ Unsure

Source: WHO, 2017

2022
CHF 500
million

12.4%

Telemedicine market revenue is projected to grow at 12.4% to reach CHF 500 million in 2022. The telemedicine services are set to involve the digitalisation of healthcare systems and processes.

Source: KenResearch, 2018

2018
CHF 650.7mil
GERMANY

Estimated revenue generated by eHealth business in Germany was expected to amount to 650.7 million Swiss Francs in 2018.

Source: Statista.com, 2018

2021
CHF 279.5
billion

The health technology sector is expected to reach CHF 279.5 billion by 2021.

Source: Deloitte, 2019 Global Health Care Outlook

Global healthcare spending is projected to reach 9.867 trillion CHF by 2022.

Source: Deloitte, 2019 Global Health Care Outlook

Growth of Swiss telemedicine is typically driven by the increasing prevalence of chronic diseases, public & private investments, the aging population and digital transformation.

Source: Ken Research, 2018

The healthcare system in Europe is moving towards shorter Average Length of Stay (AVLOS) and a shift from inpatient treatment to outpatient treatment, driven by the development of new treatment methods, protocols and equipment.
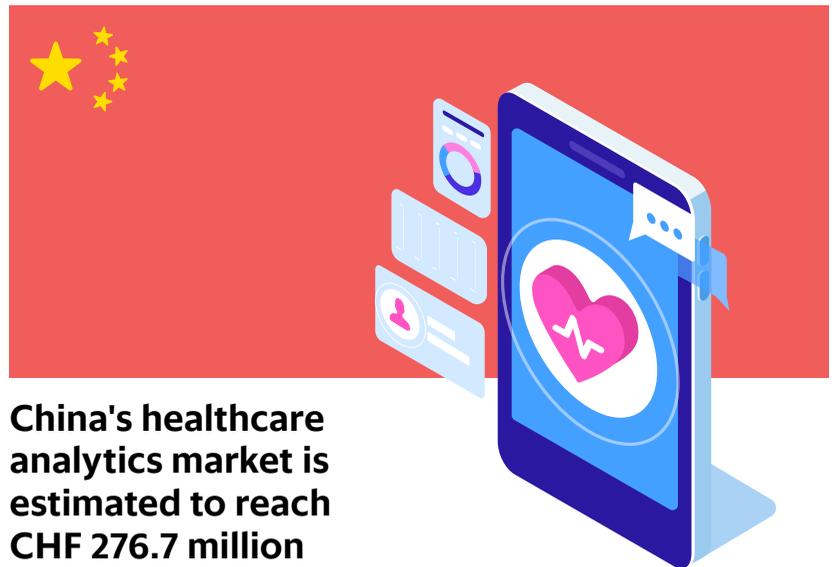
Source: Capio, 2018

The U.S. healthcare analytics market is growing rapidly and is forecasted to grow at a 12.5% CAGR over the period 2019-2025.

Source: MarketWatch.com, 2019

64%
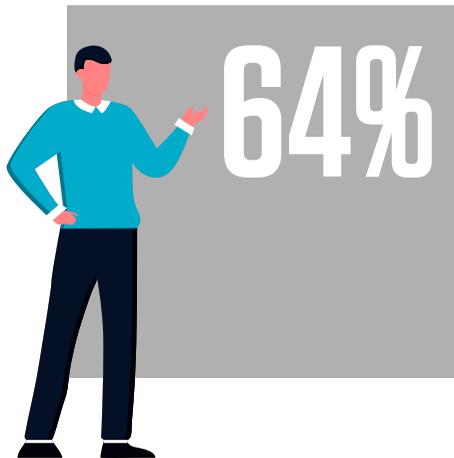
64% of consumers point to convenience and access as important benefits of virtual health.

Source: Deloitte 2018 Surveys of US Health Care Consumers and Physicians

China's healthcare analytics market is estimated to reach CHF 276.7 million by 2025.

Source: MarketWatch.com, 2019

According to CB Insights, "Across digital health, biotechnology, and the medical device sector, startups are finally bringing medicine into the 21st century." The trends to watch include intelligent drug design, skin-as-a-platform, blockchain-enabled hospitals, CAR-T, RNA and anti-ageing therapies, bioprinting and hand-held diagnostics.

Source: CB Insights, 2017

HEALTH CONFERENCES 2019

HEALTH EVENTS NO ONE IN THE INDUSTRY SHOULD MISS

AUGUST

12–13

7th International Conference on Medical Informatics & Telemedicine

Rome, IT

The 7th International Conference on Medical Informatics &; Telemedicine will take place in on 12–13 August in Rome, Italy.

The various topics to be canvassed are toxicity informatics, clinical informatics, pharmacist evaluation, drug informatics and patient assessments among other telemedicine invention technologies.

19–23

3rd China-Europe Innovation Forum on Smart Health and Privacy Protection (Smart Health 2019)

Leicester, UK

The Forum will offer talks, visions and perspectives from industry and policy-making organisations that will focus on Smart Health. Digital revolution, implanted innovative devices, personalised medicine, new technologies as well as the potential of smart health business for patients – these are the key topics of this conference. Discussions will also include much-needed talks about privacy protection and data security in medicine.

SEPTEMBER

13–14

Telemedicine, eHealth & Health Informatics

Singapore

The 2019 Telemedicine, e-Health & Health Informatics conference will be held at Holiday Inn Atrium, Singapore.

This conference is set to discuss the nature of healthcare informatics and its potential to improve the quality and efficiency of healthcare and technology to assist in remote monitoring and support for patients. There will also be a topic about current and future utilisation of health data and how to make it efficient and the current and modern tools for effective healthcare.

This 8th Telemedicine conference will bring together medical informatics researchers and practitioners from over 40 countries.

14–18

AHIMA19: Health Data and Information Conference

Chicago, IL

This year's AHIMA19 Health Data & Information Conference will be held in Chicago, Illinois. The conference will start on 14 September and end on 18 September.

Building from last year's health conference that took place in Miami, Florida, this year seeks to bring together more speakers, investors, researchers and industry players.

These experts will talk about the importance of health data and how practitioners can take advantage of the milestones brought about by technology.

16–17

3rd International Conference on Lasers, Optics & Photonics

Amsterdam, NL

The third International Conference on Optics-Photonics will take place on 16-17 September 2019 in Amsterdam, Netherlands.

The conference will bring together a mix of industry players and staff in academia to discuss the emerging issues around optics-photonics. Students and junior scientists will also have the opportunity to interact and network with established industry players and senior researchers.

OCTOBER

27–30

HLTH: The Future of Healthcare - The World's Largest Conference for Health Innovation

Las Vegas, NV

Las Vegas will host one of the largest health conferences on 27–30 October 2019 at the MGM Grand, Las Vegas. While the 2018 HLTH conference brought together 3,500 attendees from over 30 countries, the 2019 conference promises even more.

Some 5,000+ attendees will converge in Las Vegas. Over 325 speakers are already lined up for the HLTH conference, including Adam Boehler (senior advisor to the secretary, CMS), Lloyd Dean (President &; CEO of Dignity Health) and Meghan Callahan (VP, Healthcare Lyft Business).

The conference will discuss the future of healthcare even as WHO statistics show that over 45% of its member states have less than one doctor per 1,000 people.

NOVEMBER

11–13

EHiN, E-Health in Norway

Oslo, NOR

The biggest health conference in Norway is focusing on the digitalisation of the whole med sector. EHiN was founded by the Ministry of Health and Care Services and ICT Norway to put together experts across the field. The goal is simple: to create a platform of cooperation between the IT industry and the health sector. EHiN is a place where companies, organisations and state departments share their experience and knowledge. Main topics include innovation, data security, research, health design and more.

Let's look at some of the most interesting events and conferences in the field in the upcoming months.

The Internet of Medical Things

Why it matters
What to do about it

The Internet of Things is gaining momentum in medtech. What kind of new challenges could this area pose for established hardware companies?

Medtech companies traditionally manufacture highly technological, autonomous devices. The IoT enables those instruments to be connected together, and connected to instruments from other companies or even different industries.

Integration will be one of the most challenging aspects. Proper and easy integration of the vast numbers of devices is a market demand and necessary to keep key advantages.

8 billion IoMT devices

Predictions say that there will be 8 billion IoMT devices worldwide by the end of this year and up to 21 billion by 2020.

How can the industry profit from the IoT and connecting medtech devices to other industries?

First of all, the IoT means better, fact-based diagnosis. Data science allows us to analyse numerous sources regarding a patient's condition of illness or disease and recommend treatments or preventive action to a doctor. Thus, the doctor does not need to rely solely on his experience, but can assess and complement the outcome from a sophisticated computer-assisted analysis.

There are also other uses such as personalisation or remote healthcare. For example, the data from your smartwatch can improve diagnostics and help you receive more personalised treatment. Also, various sensors, cameras and devices can help with monitoring patients who are treated at home, allowing them to function more independently. There is a lot of space for new ideas and innovation.

Another IoT potential lies in much simpler visualisation of the health conditions of individuals, which can lead to greater motivation to live a healthy lifestyle and to better prevention of illnesses.

30%

Time-effectiveness during treatment. Healthcare plans of the future place a key responsibility on clinical IoT devices. Those wearables' data will speed up a clinician's assessment significantly by 2019. We're talking a time savings of up to 30%. Hospitals will start to rely on robots for the delivery of medication and supplies and as IoT-enabled biosensors.

Source: IDC Future Scape: Worldwide Healthcare IT 2017 Predictions

CHF 166.1 billion

Remote Healthcare
A revenue of CHF 166,1 billion is expected in the global smart healthcare market by 2020. Remote monitoring will play a prominent role in the future.

Source: Technavio

3.2 billion downloads

Health apps are in high demand now, as the download numbers show.

Source: mHealth App Economics 2017 report

The entry points

What are the questions and situations that start the innovation process in medtech companies?

Digitalisation, the Internet of Things, smart data and cognitive services are changing the medtech industry. Let's have a look at some of the situations, opportunities and questions.

Error reduction

A decrease in human error can be achieved by automation of devices and therapy records. This is relevant especially for hospitals and subacute care facilities.

Your hardware has become a commodity

Hardware is losing its importance in the medtech environment. It often slowly turns into a commodity and customers cannot distinguish market participants just by looking at hardware. On the other hands, the software, cognitive services and data used along with the hardware are becoming the important players. They can enhance your hardware solution and help distinguish your business from the competition.

Downtime of instruments and their predictive maintenance

Another problem that our medtech customers face is instrument downtimes. There are multitudes of complex instruments on the market and each of them needs a lot of maintenance.
As of now, predictive maintenance is getting more important in the area of medtech and in the industry in general. What you can do is to analyse the health status of an instrument (for example, by creating a digital twin), predict its potential future failures and fix situations even before they happen.

You are unsure what data to collect and analyse

In medtech, there are three types of data worth collecting: medical data (substances that your device measures in blood and urine), user data (either how people use your device, or in the case of personal healthcare, what they do in their everyday lives that influences their medical results) and technical data (the status of the device itself). Based on our predictions, major innovations will happen at the intersection of these three areas.

Regulations as an innovation starter

One challenge that many of our customers face is the need to make huge efforts to submit a new drug – from the regulatory point of view. An innovative approach they can take is to substitute some of the studies they have to carry out with data analytics. Besides running their own studies, medtech companies can use data available on the market or in academia to prove that a certain drug or medicine is effective for a particular disease.

A new business model has entered the field – and the expectations of customers or patients have changed with it

High customer value can be created through data – if a competitor manages to introduce a new business model based on data science, other companies will need to follow.

Wearables

By 2021, the yearly revenue of the health-related wearables market will be worth $17.8 billion (Source: Tractica report, 'Wearable Devices for Healthcare Markets'). Manufacturers are planning to include the next generation of specialised wearables such as hearing aids, skin patches, smart contact lenses or implantable wearables in the existing markets of heart monitors, sleep or step trackers and smart glucometers.

Connectivity

The trend of connectivity will bring more and more devices and data sources together and create pressure to innovate. In the past, all medical devices were standalone – as opposed to most of the future medical devices, which will be interconnected.

Personal data

From the end-user or patient perspective, connectivity and data management will play a big role too. The more data sources I can combine in my medical profile as a patient, the more interesting it gets. Combining different data sources and creating new information will give patients broader perspectives, open new treatment options and spur innovation.

Reimbursement and personalised healthcare

Another example that leads to innovation in medtech is the pressure of reimbursement. Medtech companies don't get reimbursed for medicine and drugs that don't have any effects on individual patients. This creates a new trend and strategy for many companies to offer personalised healthcare. Through this, they can make sure that if a patient takes their medicine, it really fits their personal genomic type.

Monitoring patients remotely

Remote patient monitoring (RPM) is already helping to monitor vital statistics and increase prevention in senior living healthcare, where it has proven to be highly effective. RPM is about collecting and transmitting patients' real-time data to their caregivers, or to doctors or nurses who are monitoring these patients from a different location.

Saving costs through the Internet of Things

Real-time data transmission will allow patients to be discharged from hospitals and be transferred to less expensive long-term facility care faster and more efficiently. Shifting the healthcare industry from reactive to preventive will provide substantial cuts to medical fees as well.

Objective reports

Access to precise, recorded reports on nervous system levels means that healthcare providers don't have to rely on subjective patient reports. Instead, they can objectively evaluate device data and prescribe a patient's therapy more efficiently.
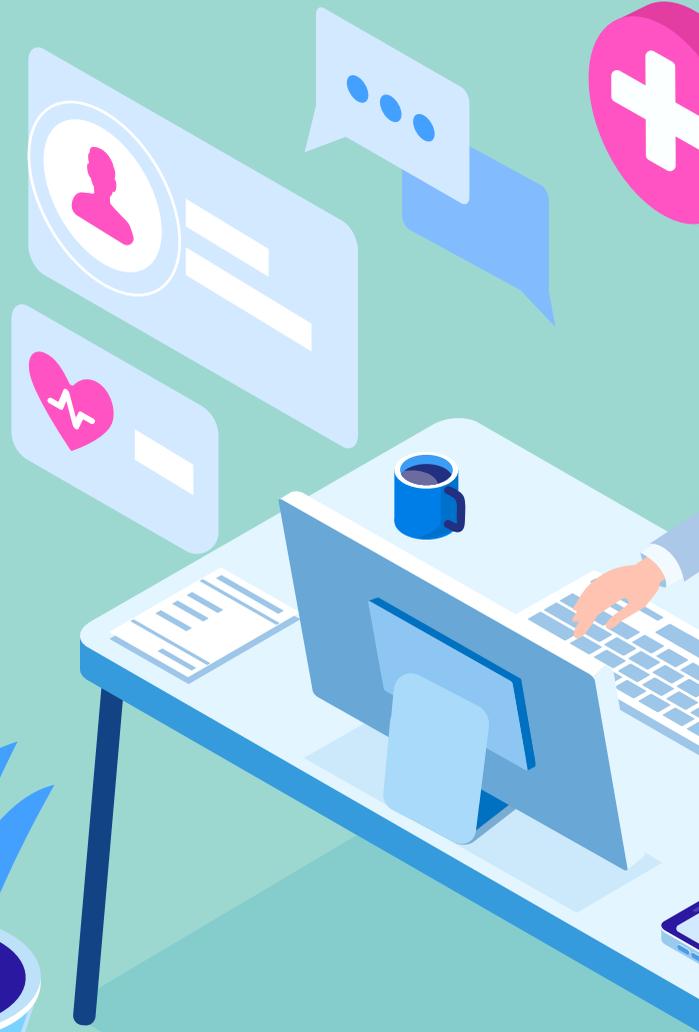
New direction of healthcare

Connectivity

A tale of modern medicine

Angus Long
Senior Consultant in software project management, specialising in medtech

Imagine this. The year is 1982. John, a patient with chronic heart disease, walks into a GP office. Because he is taking the drug warfarin to thin his blood, he needs monthly blood tests. John sees his doctor, they chat about the weather and their families while the doctor takes a blood sample and checks up on John's overall well-being.

"The results will be back from the lab in 10 days."

- the doctor says -

"We will call you if there is anything. See you in a month!"

Let's jump to the present time...

Agnes, another patient taking warfarin, is at home. An alert on her smartphone tells her today is her monthly test. She is, however, in no hurry to get to the doctor.

Instead, she pulls out a device that is no bigger than a typical smartphone. She pricks her finger, dabs a bit of blood on a strip and feeds it in to the machine. The results pop up on the device monitor after only a few moments. Shortly afterwards, she receives a call from her GP.

"I saw that your latest reading is a bit out of the normal range. Come in tomorrow and we will see if you need to adjust your medication."

- says the doctor, who has already received the result from Agnes' device via a secured internet connection.

Although these two people are fictional, the way the healthcare industry has changed is not.

The way healthcare is provided nowadays has completely changed with new approaches, new technologies, new mindsets. A big part of this change are medtech companies that develop and deliver healthcare devices that connect patients, doctors' offices and hospitals seamlessly.

How are they doing it and what are the challenges they have to address along the way?

Technology is at the forefront of development

There are a few tipping points that have formed healthcare into what it is today.

Ignaz Semmelweis linked cleanliness to disease reduction; Wilhelm Conrad Roentgen accidentally discovering X-rays; and now we can also add digitalisation to the ranks of important tipping points in the history of the healthcare industry.

In the most recent decade especially, the healthcare industry has seen many technological advancements. Some of the most notable advancements have been:

- **Electronic patient records (EPR).** Although EPR are not a staple in every hospital yet, more and more hospitals across the world are digitising their patients' records for easier access and better traceability. In Norway, paper prescriptions were abolished in 2013, thereby connecting all the GP offices with every pharmacy in the country. This eliminated medication abuse and also paper waste.

- **Mobile devices and connectivity.** Wireless devices are making the jobs of health practitioners and patients easier. With smartphones, tablets and medical devices all connected to the central system of a hospital or a doctor's office, it becomes easier to check on healthcare processes on the go and access and send information more freely.

- **Remote monitoring tools.** Monitoring patients' health at home can reduce costs and unnecessary visits to the physician's office. Many remote monitoring devices have the ability to send data to the doctor, thereby providing them with a better overview of their patients' health. The rise in popularity of such devices has not only been driven by convenience; patients have also been demanding a more active role in their own healthcare.

Challenges of the industry

❶ A lot of regulatory demands

Regulations are often a driving factor in the medtech industry.

Typically, before a project even begins, there needs to be a plan in place that clearly demonstrates how a device or piece of software will be developed. Once the product development is underway, any changes from the original design need to be carefully documented and every change to the way the product works has to be traceable.

However, all this documentation has a purpose. In case of an audit, it should be easy to trace back every step of the project to show that the finished product is indeed as it's supposed to be and that it is safe to use.

As much as this ensures the compliance and safety of the project, it also creates some challenges from the project management perspective. Additional to the resources needed to carry out the project, extra resources are needed to document it.

A few past projects in which we used the agile methodology have been about point-of-care IT, where we worked on developing software that connects medical devices to the medical record systems. From experience, ensuring good documentation of an agile project is possible as long as we as the executing organisation have the right expertise, in the form of the ISO 13485 certification and adherence to other standards such as IEC 62304, together with the right experience, in terms of skilled employees.

❷ Resistance to change within the organisation

Some medtech companies are experiencing varying degrees of resistance to change, especially when an agile methodology is introduced. There is often fear of increased risk in a project.

The main detractors of the agile methodology tend to be the regulatory and the quality departments of the company. However, agile development of medical devices is possible – in fact, some regulations encourage iterative development. Medtech companies where the regulatory and quality departments work in a solution-oriented way can realise the benefits of agile and still comply with the regulations.

Together with the previous point, this brings us to the final, and perhaps the biggest, challenge faced by medtech companies.

5 LIFE-CHANGING TECHNOLOGIES IN PERSONAL HEALTH

People want to have more control over their health – both to prevent it from deteriorating and manage it when it does. Fitness tracking technology has made people more aware and more interested in their health, which now has inspired a new wave of health-related technology that range from simple preventive gadget to equipment that can save the lives of those who live with chronic illnesses.

1. Activity monitoring

Wearable sensors and mobile apps have taken a step further from merely tracking your activity. Nowadays you can monitor your sleeping habits, heartbeat, blood flow and get recommendations for how long to wait before exercising again for optimal recovery, all by wearing a simple watch-like device.

Most of such devices connect to a smartphone and the cloud, where the data is processed by an algorithm to present you with a holistic picture of your health. The growing accuracy and the availability of such measurements is enabling more and more accurate predictions of future diseases.

2. Smart pillbox

A study done by Frank Roger Defanti e Souza and Carla da Silva Santana from the University of São Paulo looked at how older adults, especially those with cognitive and age-related challenges are managing their medication regimes. They found that over time and with more than three medications involved, it gets harder to stick to a routine, and adherence rates can be as low as 27.8%.

3. Reproductive health/ fertility trackers

In recent years, many companies have worked on apps that use the Fertility Awareness-based method (FABM) to plan or avoid a pregnancy. In addition to general knowledge about the female menstrual cycle, some solutions base their calculations on body temperature or hormone concentration in urine, while others collect several data points during sleep.

4. Implanted electrical stimulators

The most known electrical stimulator is perhaps the pacemaker, which helps millions of people with bradycardia and heart block. However, there are other important electrical stimulators on the market.

Because the vagus nerve acts as a direct connection between the brain and most of the critical organs, stimulating it has been a recognised way to treat drug-resistant epilepsy, depression and even obesity.

5. Injury prevention and recovery

A number of technologies are tackling the problems of injuries in professional sports. One of the most significant issues professional athletes face is lengthy pauses or even premature end of their career due to injuries.

To prevent injuries and better plan for rest periods, wearable technologies are used to capture biomechanical data about the strain put on joints and body parts when a particular movement is performed. The wearable technologies can often connect to a smartphone where insights are displayed. This data can further be used to better plan training and optimise game performance for each player.

Proper recovery is said to be almost as important as the workout itself.

There are devices on market that, for example, increase blood circulation to reduce muscle soreness with the help of electrostimulation, which a study from the Queen Mary University of London found to be more effective than acupuncture or regular rest.

These are just a few examples of personal health technologies, but the trend they help to highlight is clear: people are taking a bigger part in managing their own health, and it's becoming easier and easier.

The global digital health market is growing fast and the number of companies entering the health and medical wearables space will only continue to grow. This part of the health industry does not only enable self-management of health and well-being, it also has cost-saving potential by minimising unnecessary services, improving medical diagnosis, and increasing patient time with those who genuinely need it.

Boom of startups

Ava Women

The startup Ava, based in Zurich, is one of those companies that took the potential of technology in healthcare seriously with their fertility tracking device. The company melded together hardware development with advanced analytical software to diagnose various measurements in women's bodies to help them keep track of their fertility cycles. The company uses big data and artificial intelligence.

Limmex

Another Swiss company that has taken wearables by storm is Limmex. The startup created an emergency smart watch that enables you to send an instant message in case of need to your contact persons. No need for apps or a smartphone – the alarm message is triggered by pushing a button.

❸ Getting products to the market fast enough

Medtech companies are not only competing with each other. They also are indirectly compared to consumer electronics companies.

It all starts with expectations.

Updates to consumer electronics are being pushed to market quicker and quicker, which raises the expectations consumers have of all electronics. In the end, medtech companies have problems with getting products fast enough to market. Solving this challenge is not easy.

On one hand, the medtech companies are feeling the pressure of delivering on the expectations, but on the other, they have to make sure that the products are safe and compliant with the regulations.

Opportunities for the future

Technology has helped healthcare to get where it is today, and it can continue to do so in the future.

We see two technological areas that can bring more connectivity and efficiency to the healthcare industry: cloud services and AI.

Cloud computing has the potential to deliver cost efficient and secure access to information.

Most cloud services, such as Microsoft Azure, Amazon or IBM, offer platforms that enable:

- **Security:** maintaining the confidentiality of patient information is important.

- **Scalability:** as the information bank grows, all of it can be stored in the cloud.

- **Connectivity:** patient information can be shared easily, and different medical devices can be connected to the cloud in order to upload the results directly.

Accessibility of the patient data can also help a lot in using AI to make diagnostics easier.

There are many projects around the world where AI and machine learning are applied to data analysis of patient data.

For example, there is an AI tool on the market that can scan patient's medical record together with relevant guidelines, best practices, and medical journals and textbooks in a matter of minutes, and evaluates medical evidence, and displays potential treatment options ranked by level of confidence, always providing supporting evidence.

As an example of potential of such diagnostic tool, there is a case from Japan. A woman suffering from leukemia was not responding to treatment. The doctors turned to this tool, and after just 10 minutes, the AI identified the correct type of leukemia that the woman was suffering from and suggested the necessary treatment.

This is still, however, more part of the future than the present.

AI and machine learning are often talked about in the media for the obvious reason of being an attractive topic. These technologies do hold a great potential, both for medicine and for other industries; however, more research and investments are needed before AI autonomously makes diagnose and proposes treatments.

What we are seeing today, however, is AI and doctors working together, where the doctor makes the final decision with the help of AI.

Another challenge that needs to be addressed for the AI to reach its full potential is access to the data.

With the privacy regulations ramping up, getting good data is likely to be a big issue. There is still little clarity about how and how much data companies are allowed to collect and use. The scepticism people have towards handing over their data also needs to be addressed, especially in light of multiple scandals surrounding the misuse and sale of data.

But think about this: if your medical data could be used to eventually find a cure for many types of cancer, would you be willing to share it and maybe help thousands of people?

Data security, regulations and medtech

Software development cost reduction – even under regulatory compliance

Medical device and diagnostic laboratory equipment manufacturers now face stricter regulatory compliance requirements. The increase in costs jeopardises market success. To achieve a more competitive cost structure, companies are relocating software development and/or software maintenance and using low-cost country sourcing.

In a recent case, our customer allocated software development locally and in a high-wage country in order to keep it close to the marketing and sales departments. Their teams were hard to scale as a result of a local war for talent and restrictive costs. Our goal was to lower the costs of software engineering and enable scalability while keeping the processes in full compliance with regulations.

We relocated all development and maintenance work to shoring countries using the ERNI infrastructure, processes and know-how, while managing to maintain a high-quality interface with the local customer through on-site ERNI staff.

Results:
– Cost decrease of up to 30%
– Team scaled up – up to 5 software engineers per month/per team
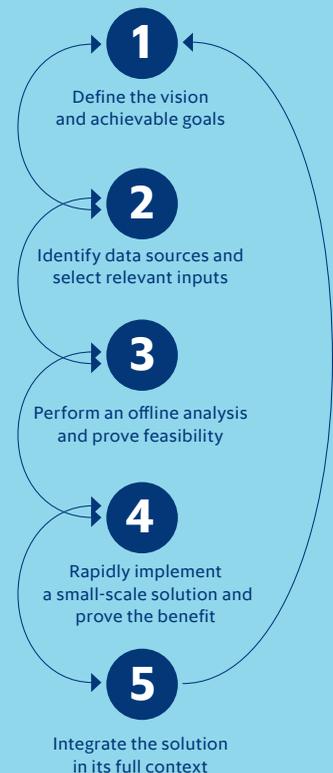– Quality of delivered software is stable/not affected

Approaches to data projects

What data is worth collecting and from what type of source? Not every data point is beneficial in achieving the goal of a project. By limiting the amount of collected data, our customers are able to reduce storage costs and keep high-quality data only. It's much easier to integrate additional sources when you have a good data structure.

In the next step, an offline analysis to prove the feasibility of the proposed concept can be performed. Does it work in real life? Does it fit into a customer's processes? After feasibility is proven, we promptly implement a small-scale solution. Our consultants collect feedback to see the first benefits of the approach and to prove them to the customer.

The final stage is to roll out the full-scale solution.

1 Define the vision and achievable goals

2 Identify data sources and select relevant inputs

3 Perform an offline analysis and prove feasibility

4 Rapidly implement a small-scale solution and prove the benefit

5 Integrate the solution in its full context

It is not just securing the transmission and storage of data against hacks that is important. Here are some easily missed security pitfalls:

Hoarding data

The amount of data produced and acquired is often greater than what is actually needed for the analysis. Therefore, it's important to decide which data is relevant to keep and how long to store it.

With an infinite hoard of data, it's much more difficult and less efficient to identify the useful part. Added security and regulatory measures for redundant data make efficient filtering even more crucial.

Data integrity

There is a need to collect and store accurate and consistent data: in other words, data integrity. A compelling amount of data can still be corrupt and useless for users, or dangerous for patients. This possibility cannot be neglected. For example, many users of fitness monitoring bracelets complain about inaccurate data output such as their heart rate measurement being off by tens of beats.

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Human meets tech

Nearshoring project in digital health

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The healthcare business poses several challenges. Some of them are unique for this specific field. Others apply for every growing innovative company. Acquiring enough workforce and skilled employees in this regulated and data-sensitive field can be especially challenging.

You can solve this by assigning the workforce via an external partner. Still, establishing such a partnership can be demanding as well.

Digital automation and transformation in the healthcare industry is in the scope of many software development projects. This is so because of the benefits it brings. One must keep in mind that the sophistication of the technology alone does not guarantee success.

The solutions for the healthcare industry are not pieces of advanced tech. They serve real people who have real problems. These solutions have the potential to save lives. Developing stronger health systems requires good human connections and trust between solution providers and their partners.

Nearshoring offers the cultural and geographic proximity that fosters those strong relationships and thus efficient outcomes.
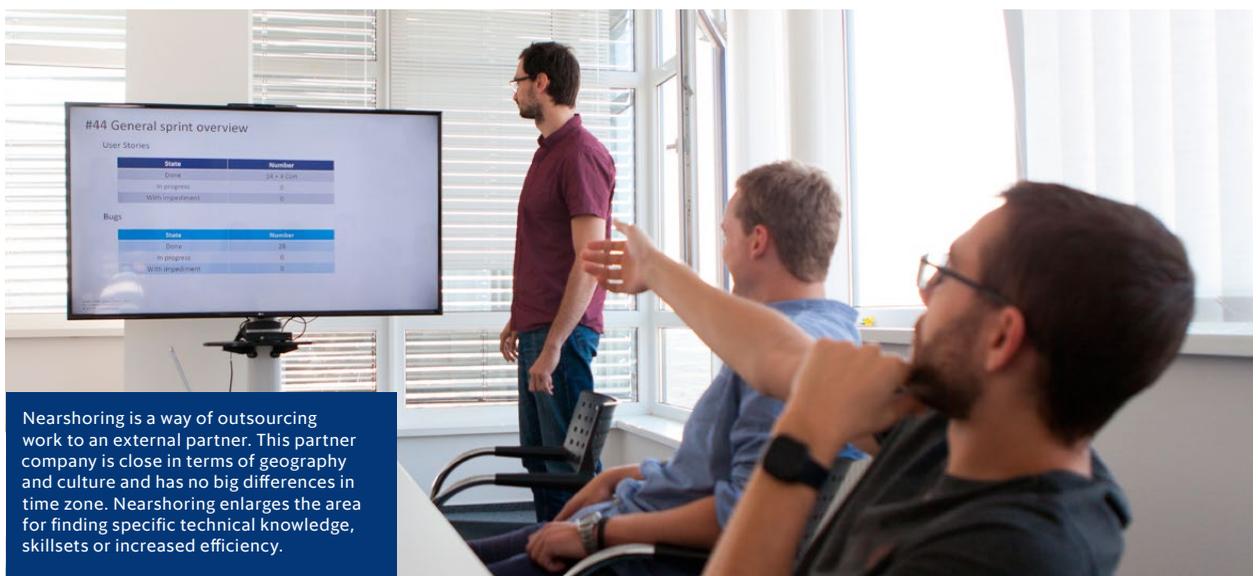
Nearshoring is a way of outsourcing work to an external partner. This partner company is close in terms of geography and culture and has no big differences in time zone. Nearshoring enlarges the area for finding specific technical knowledge, skillsets or increased efficiency.

Nearshoring offers new possibilities for companies.

Within outsourcing, distributed teams deliver the tasks. Agile software development can bring such teams closer together. Iterative development and improvements are key for high product quality, transparency and good collaboration.

When you decide on nearshoring, the major benefits you can get are:

– **Hiring flexibility.** You can sign a contract for a specific task or a project. If you are unhappy with the partner you've chosen, changing is easier than with an in-house team.

– **Access to talent.** Easier access to specialised trained and certified professionals – even to those who may not be available in your country.

– **Diversity in the team:** Diversity is good for covering all required skills. It brings different approaches and points of view. The variety of personalities (education, age, cultures) fosters creativity and brings more ideas.

– **Act quickly on market opportunities.** Some trends or market opportunities cannot wait. In such cases, hiring an in-house team is not an option. It can be more time-consuming and riskier than nearshoring.

– **Increased focus on the core of your business.** Nearshoring can give you the necessary time to improve the core of your business. Your partner supplies the supporting parts.

– **Good collaboration.** With modern technology, distributed teams are no longer an issue. Online meetings, video conference calls and chat tools are easy to schedule with teams in a similar time zone. Due to close travel distances, you can even hold important workshops or meetings face to face, on site.

– **Higher responsiveness and quicker turnaround time.** Being close enables in-time communication. You can resolve issues and answer questions faster.

– **Cost savings.** In general, nearshoring is costlier than offshoring. Yet nearshoring saves the costs and hassles of hiring in-house professionals, which can turn out to be an expensive thing to do.

Nearshoring minimises cultural, social and linguistic issues. But it does not take them away completely. For example, within Europe, one can still find significantly different cultures just within a few time zones of each other. Thus, some cultural nuances still need to be overcome. During the setup phase, face-to-face meetings and team building activities can help to build good relationships in the team.

A nearshore team also still needs more agile planning than an in-house team. You also need to make sure the communication is flowing well.

4 steps to start a nearshoring project

There are a few things your company needs to consider before the project with your nearshore partner starts.

– **Make sure you have stakeholders on board.** Ensure that the key players working with your nearshore partner side by side are on board. Otherwise, getting anything done will be difficult.

– **Assign a Scrum Master.** Each project needs an individual as the focal point throughout the entire project lifecycle. It should be clear whom to talk to when day-to-day operational issues arise.

– **Define the scope of the project.** Explain the desired outcome and double-check with your partner that you are on the same page. Using the Scrum framework can help with this. We will talk about this later in the article.

– **Build trust with your nearshore partner.** In the introduction, we emphasised the importance of trust in a nearshoring project. This is important throughout the whole project lifecycle. Yet it begins in the starting phase.

Spend a lot of time together during the start-up phase. Do team building activities, pair programming or some work on site together. Continue to meet often afterwards. Remove barriers for easy online communication. Try using online messaging tools like Slack, Skype, Appear.in, etc.

Online tools enable communication with coworkers. Thanks to nearshoring, time-zone and cultural differences don't have to be a challenge anymore.
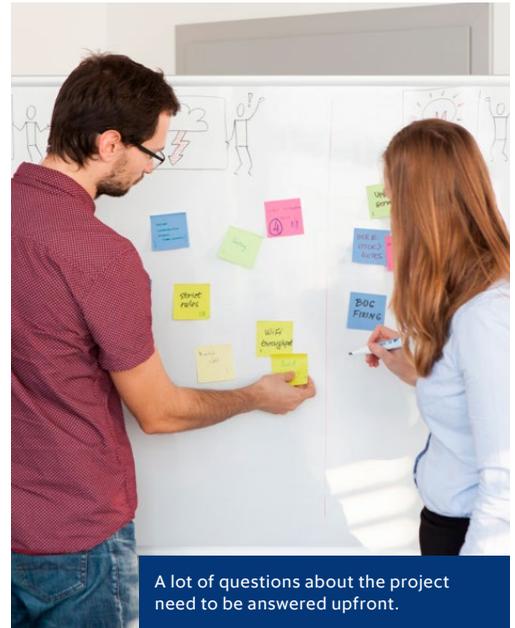
A lot of questions about the project need to be answered upfront.

It can also be smart to have support during the start-up phase on both sides. This makes it much easier to set up everything needed for smooth collaboration and reach out for help.

And of course, honour deals and hold people accountable both in your organisation and at the nearshore location.

Be agile to succeed with nearshoring

The advice to "build trust with your nearshore partner" might sound intuitive. However, when it comes to implementation, many questions arise.

How often should you meet in person? How frequent should the meetings happen? What should be on the agenda? Who should be present? How should we organise the work?

We tackle these and many other questions by following Agile. Our projects use different agile frameworks based on their needs and setup, like Scrum.
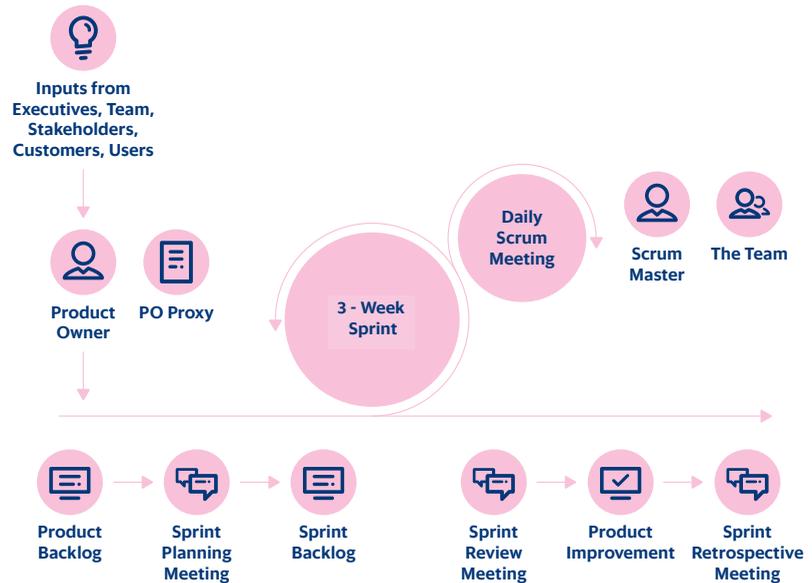
The timeline of a Scrum iteration
The Scrum framework suggests that you execute projects in a series of iterations, called Sprints. Each Sprint lasts between one and four weeks. During this time you create a releasable product Increment.

Step 1: Plan your Sprint. Each Sprint starts with a planning meeting. The plan for the next Sprint is a result of the Scrum team collaboration (Product Owner, Development team and Scrum Master). Together they decide what they will do during the next iteration and how they will do it to achieve the Sprint goal.

Step 2: Synchronise. During the Sprint, the team meets each day. this is called the daily Scrum meeting (max. 15 minutes), where we synchronise about progress and plan for the day. We also discuss possible impediments which we need to remove to achieve the Sprint goal. This frequent alignment optimises team collaboration and eliminates the need for additional meetings. It also promotes quick decision making and improves the shared level of knowledge.

Step 3: Review. At the end of each Sprint, we hold a Review meeting. Their team presents the Product Increment, the result of the Sprint work, to stakeholders. Feedback from the audience is the key element of the review. It helps the Scrum team to recognise if the development is going in the right direction.

Step 4: Adapt. The Retrospective meeting is an opportunity for the team to think about the last Sprint. It helps also to discover elements which helped or blocked them with regard to work, process, tools and relationships. It is also a place to share feedback about themselves. We keep the good things and identify improvements to put in place in the following Sprint. This is what helps the team to get better with each Sprint.

Inputs from Executives, Team, Stakeholders, Customers, Users

Product Owner | PO Proxy | 3 - Week Sprint | Daily Scrum Meeting | Scrum Master | The Team

Product Backlog → Sprint Planning Meeting → Sprint Backlog | Sprint Review Meeting → Product Improvement → Sprint Retrospective Meeting

Working in a Scrum enables you to be flexible. When it comes to changes, you learn throughout the process and incorporate the knowledge into future efforts. It also creates closer relationships within the team.

A few specific tips for working with the Scrum methodology:

– Give the team the possibility to give feedback about both bad and good things. The daily Scrum meetings and Retrospectives are suitable for them. This is how you discover early warning signs of potential issues.

– Cultivate communication. Provide the teams with webcams, dedicated rooms for video conferences and other tools that make talking to each other easier. Enforce visual communication as a lot of emotions will show better than through voice or text.

– If possible, organise face-to-face meetings. Encourage team building activities and unofficial events. People can get to know each other better. It's easier to work with people to whom you have a personal connection.

– Acknowledge the performance of both parts of the team (internal team members and also team members from nearshore). This combats the "us" and "them" attitude.
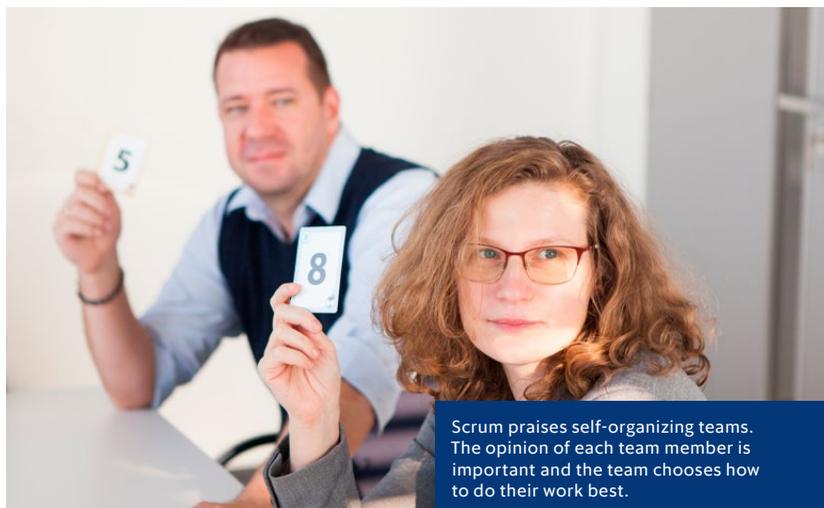
Scrum praises self-organizing teams. The opinion of each team member is important and the team chooses how to do their work best.

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