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ECONOMIC AND SOCIAL STUDIES

NEXT HEALTH

a new way to navigate the healthcare ecosystem

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Contents

Summary

To date, the main focus of the healthcare system has been on illness, but now, the focus is increasingly shifting towards health. The technical progress that has been made—particularly in terms of the increasing amount of data that is now available—makes it possible to identify potential problems so quickly that they can be dealt with before they even become an illness.

Human and artificial intelligence working together have the potential to significantly increase quality in both medicine and productivity, thereby reducing costs. However, in order for this to happen, the various actors and stakeholders in the healthcare system need to work together more intensively and in a greater spirit of partnership. This is particularly true when it comes to joint use of data. The more cooperative the approach to data sharing, the greater the amount and quality of data available in the system, and the better the results.

These developments will also change the position of patients in the healthcare system and how they see their role. The more frequently they come into contact with the healthcare system while they are healthy, the more their behaviour will come to resemble that of consumers. Even the hierarchical distance between doctor and patient will shrink or perhaps even disappear completely, for the simple reason that both parties will be taking advice from smart assistants when making decisions. Therefore, instruments that have proven useful in consumer research will also begin to be used in the healthcare system—for instance the "customer journey" method. Over time, greater transparency will also provide a clearer picture of the price–performance ratio.

Decisions about which medication or surgery is the right one can have serious consequences. Therefore, the tools that service providers and patients use to help them navigate the healthcare landscape need to be better and more intelligent than those they use to choose the right detergent.

Despite increasing digitalisation and the recent advances in telemedicine, the healthcare system will continue to incorporate analogue, static elements. The coming decades will be characterised by the coexistence of analogue and digital solutions, but with a continuous shift in the digital direction.

At the moment, it is still very easy to remain stuck in the old healthcare system narrative. This is why the change must be measurable and tangible. New partnerships and models of cooperation must therefore place great emphasis on the communicability of the progress made. This is the only way the desired spillover effects can be achieved.

Baseline situation

What is health, and how much of it do we want?

"Stay healthy" became something of a standard way of saying goodbye for many during the coronavirus crisis, and staying healthy is increasingly becoming one of the central concerns of society. Health permeates all areas of life: healthy eating, healthy homes, healthy working, healthy travel, healthy ageing and healthy finances. Is our perception of health actually "healthy", or could it be veering towards pathological?

Health, "wellness" and well-being cannot be reduced to a simple formula. There is no overarching theory of health and no universally accepted definition of it. Instead, we have a plethora of different and sometimes contradictory concepts of health. However, the way we define health depends on what we do in order to achieve it, where we look for the causes of illness, and how we treat those causes. More data means more possibilities: new, better treatments that are more efficient, precise and cheap—but the sheer volume of data also increases complexity. This complexity is a challenge for us and can overwhelm our powers of imagination. As we do more and measure more, our mental picture of health and what makes us healthy becomes ever hazier.

This has led to a crisis of vision: we know less and less about what we really want. It has also led to a crisis of measurement: what exactly do we measure when we measure health?

What is our perception of health?

Health problems are always information problems, too. The success of a treatment depends on whether the illness has been correctly diagnosed and whether it is treated with state-of-the-art tools and methods and according to the latest scientific knowledge. Even seemingly clear-cut cases (such as a broken arm) can be misdiagnosed, resulting in the use of incorrect treatment methods. What is more, the overwhelming majority of medical cases are far more complex and uncertain than that.

Today, the greatest challenge that medical specialists and their patients[1] face in most cases is not that they have too little information, but that they have too much.[2] What they measure, how they search for information, and how they select the relevant information and process, interpret and verify it determines the course of treatment. Furthermore, the problems inherent in assessing illness become even greater when it

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[1] In this study, depending on the context, various terms may be used instead of the word "patient", which has been used up to this point. The term "patient" carries clear connotations of disease (which is not present in the case of prevention, for instance) and it also denotes a hierarchical relationship: it evokes a person who is suffering from an illness being given a medical service. Increasingly, neither of these aspects apply to the actual situation, or they apply only partially. The parallel use of the terms patient, client, user, consumer and customer reflect the multifaceted nature of people in the healthcare system.

[2] Furlow, B. (2020): Information overload and unsustainable workloads in the era of electronic health records. The Lancet. Online: https://www.thelancet.com/journals/lanres/article/PIIS2213-2600(20)30010-2/fulltext

comes to assessing health. Which kind of health status and health progression is desirable for whom? Who needs to make an effort to ensure that this condition is achieved and which tools should they use? Who should be ultimately responsible for setting definitions, making decisions and implementing decisions, and in what circumstances? Should it be the patient, their relatives, the physician, the healthcare system, the state or the courts? After all, machines are continuously getting better at supporting us in dealing with the flood of information that we need to process, but some fundamental problems still remain.

> **Too much information leads to confusion:** Too much choice causes confusion and impairs decision-making. For example, if you Google "symptoms of COVID-19", you will receive 40 million hits without any information about whether the documents found are relevant. There is no global review platform for healthcare services like there is for hotels, airlines or smartphones, no TripAdvisor for hospitals and medical practices. At the moment, the simplest way to reduce the complexity of the decision is to rely on the opinions of other people, such as friends and/or experts.

> **As the quantities of data increase, algorithms increasingly make decisions instead of experts:** The more data we have, the less useful it is to rely solely on expert human knowledge, and the more we need to rely on machines that can process and decipher huge amounts of data from various sources. Therefore, patients now frequently have to decide not only which experts but also which algorithms they trust—and whether they even have faith in a physician that does not work with AI at all.

> **The more complex the system, the more trust is needed:** The more humans make decisions with the help of networked machines, the more complex the system becomes. It increasingly resembles a black box that we understand less and less and that we are obliged to trust blindly to an extent.[3]

> **Technological advances and hypernetworked infrastructures create more complexity than the system can handle:** According to the anthropologist Joseph Tainter, overcomplexity causes the dysfunctions of a system to increase faster than the benefits. At what point does the healthcare system reach an optimum state? Is it when the entire population has access to good, reliable healthcare, or is it only when all illnesses can be controlled with high-tech medicine? How do we know that our healthcare system has not already been over-optimised and that any additional complexity introduced by technology or new treatments will not create more costs than benefits for society?[4]

> **Each answer raises at least two new questions:** The paradoxical consequence of scientific advancement is that as knowledge increases, so does our awareness of what we do not know. From the telescope, to tomography to the decoding of the structure of DNA, each answer has led to more questions. New knowl-

[3] The cardiologist Eric Topol said: "Everybody would like explainable #AI, no black box algorithms in medicine. But we don't even know why planes stay in the air!"

[4] Tainter, J. (1988): The collapse of complex societies. Cambridge University Press, Cambridge.

edge about the human immune system has opened up new potential avenues to pursue in terms of better treatments, but it has also raised many new questions that no one had thought of before.[5]

> **Computer chips are constantly becoming quicker and cheaper to develop (Moore's Law). The opposite is true of drug development. It is becoming slower and more expensive (Eroom's Law):** In other words, the amount of time and effort needed to develop new medicines is constantly increasing. This is in contrast to the exponential progress that has been made in other technological fields. It can therefore be said that the pharmaceutical industry has essentially inverted Moore's Law.[6]

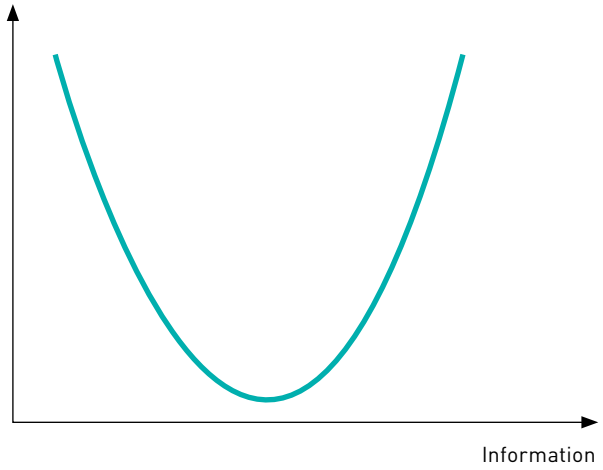
[5] Kelly, K. (2008): The expansion of ignorance. The technium. Online: https://kk.org/thetechnium/the-expansion-o/

[6] en.wikipedia.org/wiki/Eroom%27s_law

Six contexts related to the crisis of vision and measurement

Too much information leads to confusion.

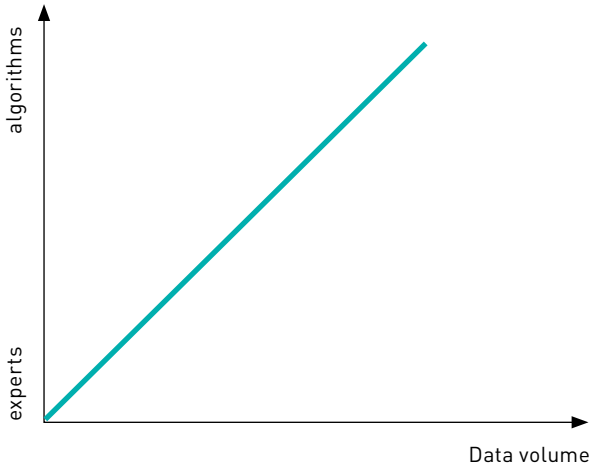
Confusion



Source: Own illustration

As the quantities of data increase, algorithms increasingly make decisions instead of experts.

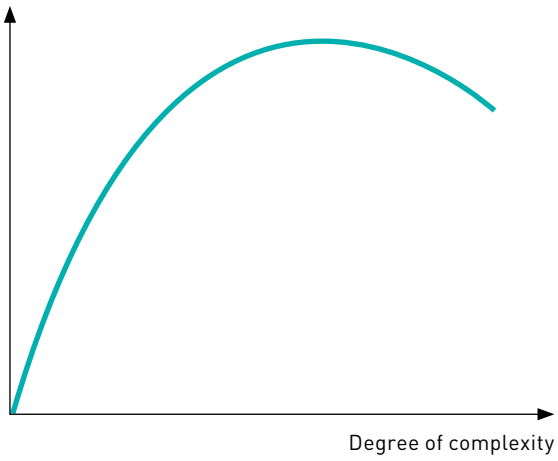
Decisions made by



Source: McAffee, A. (2013): The path to better decisions. Online: https://ross-dawson.com/blog/future-work-better-decisions-supported-computers-professionals/

Technological advances and hypernetworked infrastructures create more complexity than the system can handle.

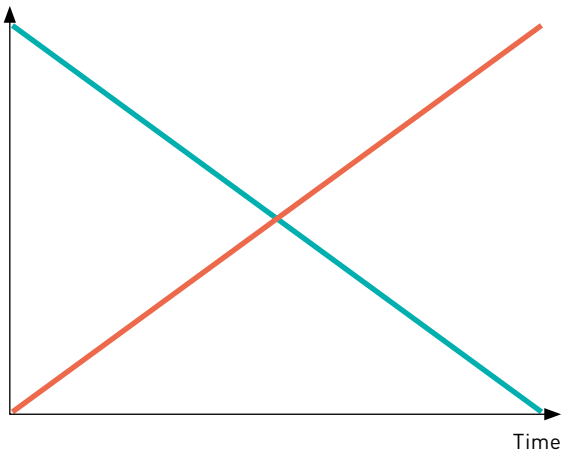
Benefit of the complexity



Source: Tainter, J. (1988). The collapse of complex societies. Cambridge university press, Cambridge.

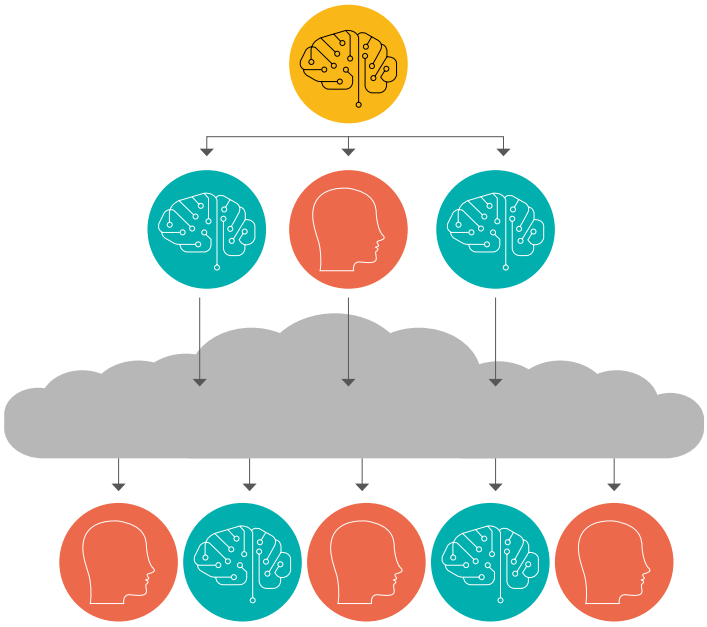
Computer chips are constantly becoming quicker and cheaper to develop (Moore's Law). The opposite is true of drug development. It is becoming slower and more expensive (Eroom's Law).

Number of new medications per investment
Performance of computer chips



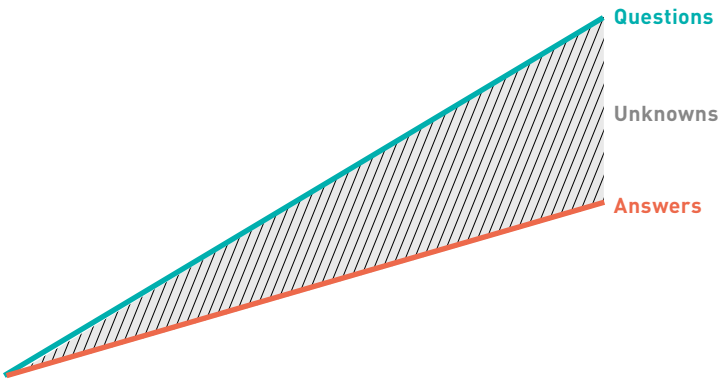
Source: en.wikipedia.org/wiki/Eroom%27s_law

The more complex the system, the more trust is needed.



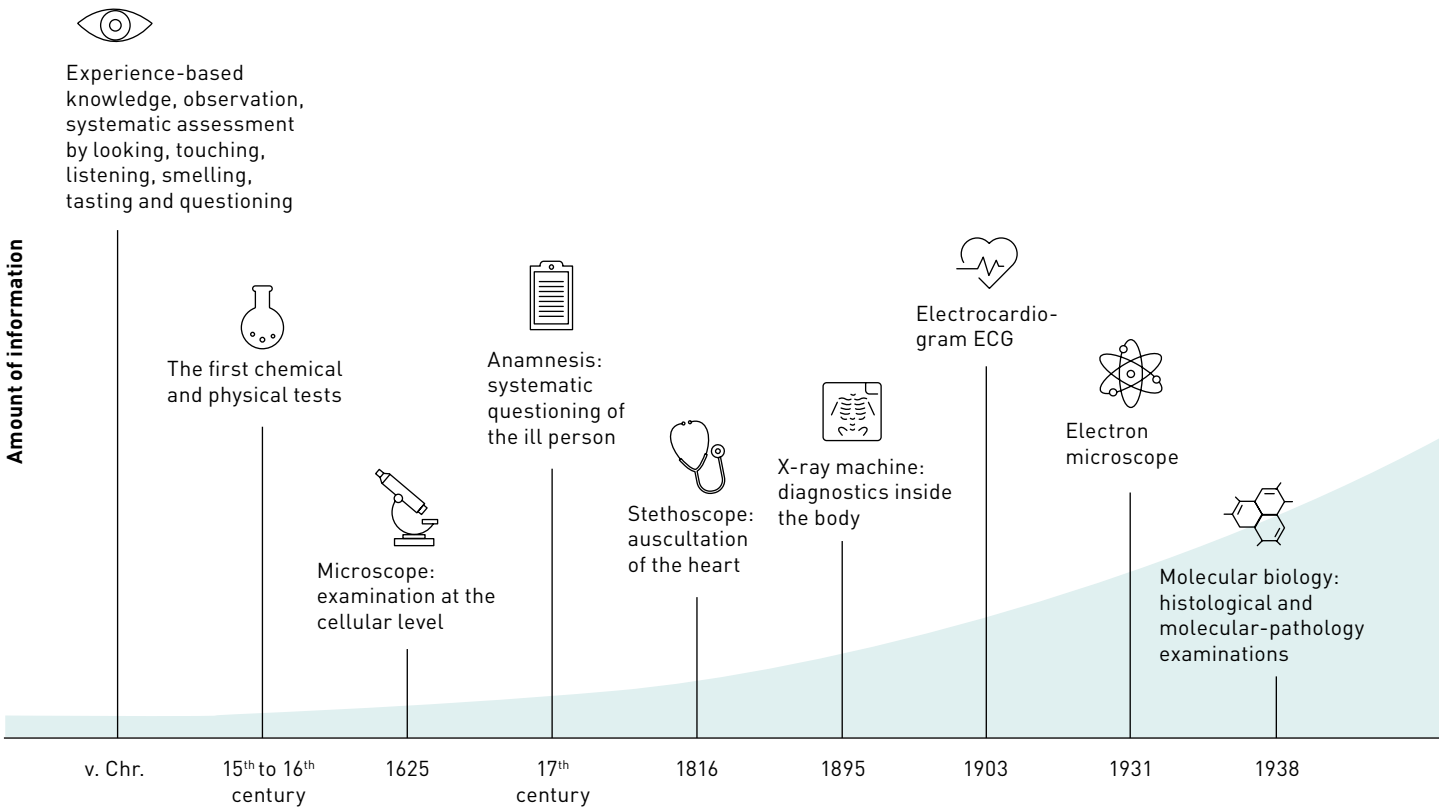
Source: Own illustration

Each answer raises at least two new questions.

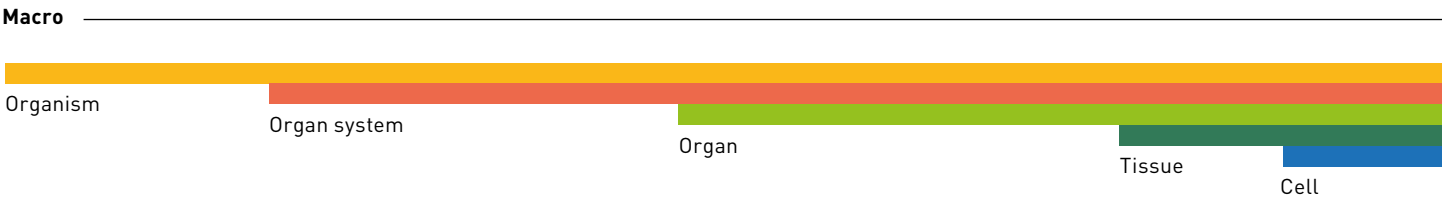


Source: Kelly, K. (2008): The Expansion of Ignorance. The Technium. Online: https://kk.org/thetechnium/the-expansion-o/

How is health measured?



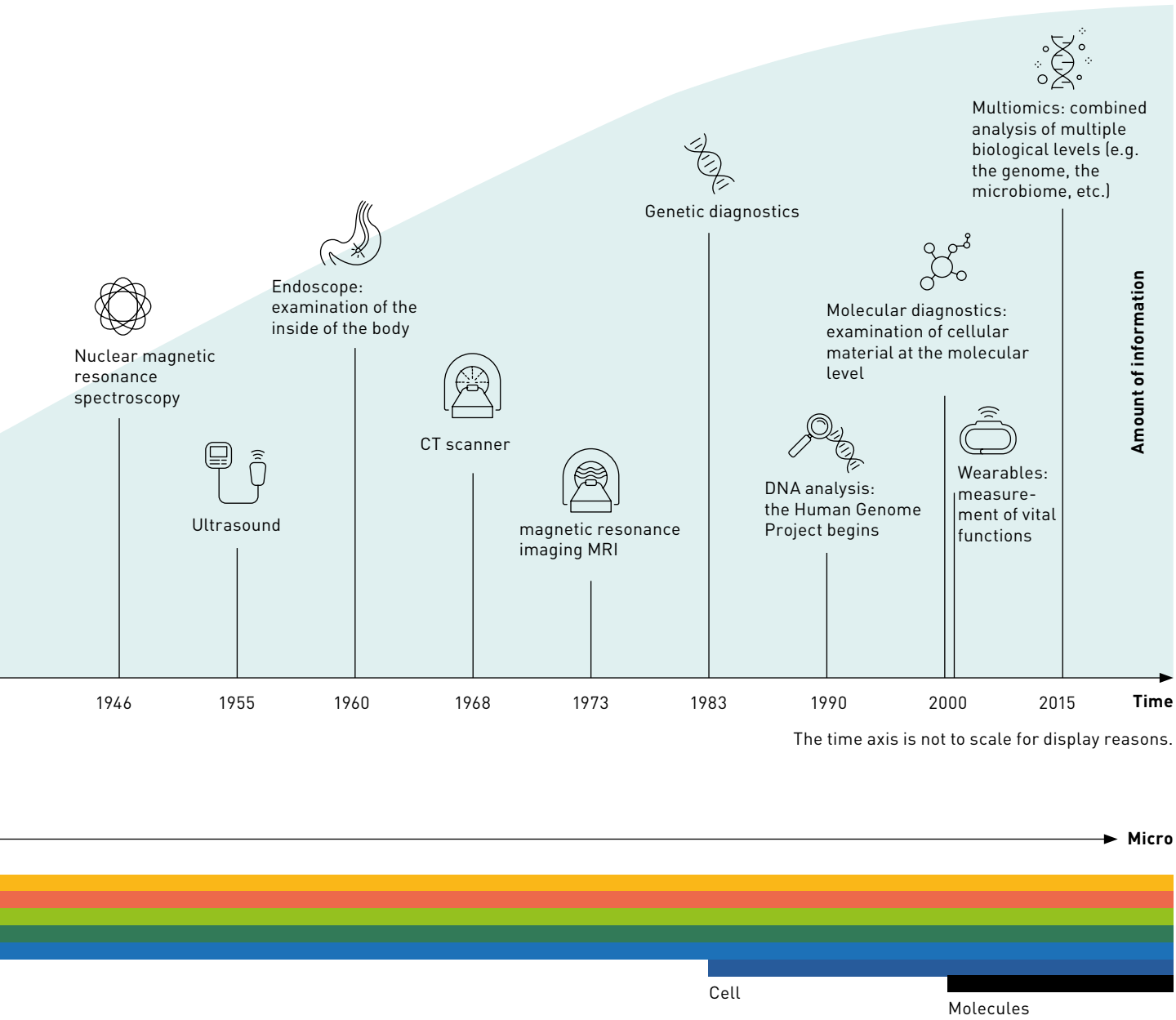
ORGANISATIONAL LEVELS OF AN ORGANISM—FROM THE MACRO TO THE MICRO LEVEL



Source: Own illustration

What do we measure when we measure health?

Our capabilities in terms of measuring individual and collective health are increasing rapidly. The measurement methods are becoming both more diverse and more subtle and precise, and the measuring instruments are becoming cheaper—often they are now available as simple smartphone add-ons suitable for personal use. The illustration above shows the historical development of health-related measurements on and in the human body. The number of data points that we can collect on an individual's health status is growing exponentially. However, without the help of navigational tools and artificial intelligence to help identify which information is relevant, not only laypeople, but also experts will be lost among these mountains of data. The experts—whether they are human or artificial intelligences—can only see a snippet of reality. They cannot see the greater whole.



The time axis is not to scale for display reasons.

Health takes priority over other concerns such as the economy or data protection, but how do we measure the success of a healthcare system?

> Can a society be considered successful if people live the longest possible lives—i.e. if life expectancy is continuously increasing?
> Or should we only count the number of years we live without any significant impairments?
> What if people live longer without any significant impairments but the number of people with chronic illness and people's susceptibility to these illnesses are constantly increasing?[7] Most of the people who have died from coronavirus had pre-existing conditions—they were not healthy and were mostly over 80 years old.[8]
> Is a high physician-to-population ratio a factor in success?
> Should we take a positive view of a reduction in the number of hospital beds and a transition to more outpatient treatment?
> How much is the health of a person worth? Is it ever acceptable to attach a numerical value to human lives as the Environmental Protection Agency does in the USA—10 million US dollars per human life?[9] Or is health truly priceless, meaning that continuously rising costs should not be a factor in decision-making?
> Should we strive to ensure that healthcare costs stop rising, or that they only rise moderately? Or do we have to accept Eroom's Law[10], according to which drug development is becoming slower and more expensive over time, despite technological progress?
> Which moral values should the healthcare system be based on? Should everyone be treated equally? Who or what should decide the fairest way to distribute scarce resources such as ICU beds? The price? Chance? Experts? Or even artificial intelligence?

The same issue applies to quantifiable values—there is no indicator that can claim to reflect the quality of a healthcare system particularly accurately. The table below shows the most common indicators used to measure the quality of a healthcare system and its values in Switzerland, the United States and the Netherlands.

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[7] cf. studies by Eileen Crimmins, e.g. Crimmins, E. M. (2004): Trends in the health of the elderly. Annual Review Public Health, 25, 79–98.

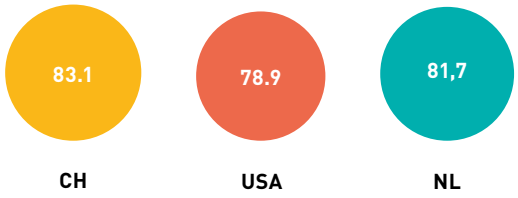
[8] This statement reflects current knowledge at the time when this study was published (July 2020).

[9] ft.com/content/e00120a2-74cd-11ea-ad98-044200cb277f

[10] en.wikipedia.org/wiki/Eroom%27s_law

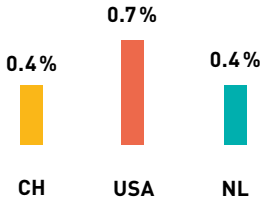
Comparison of health indicators

AVERAGE LIFE EXPECTANCY
Years



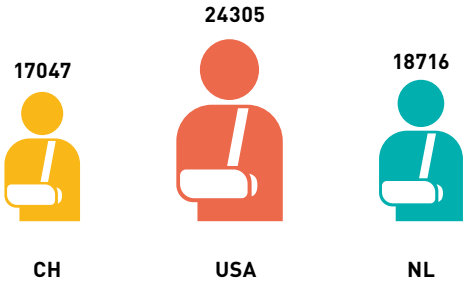
Source: ourworldindata.org/health-meta

INFANT MORTALITY
Deaths before the age of 5 years



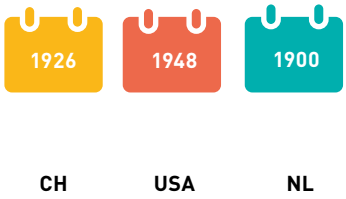
Source: Ibid.

Disability-adjusted life years (DALYs)
Healthy years lost per 100,000 population years



Source: Ibid.

DISEASES OF CIVILISATION
Year in which smallpox was eradicated

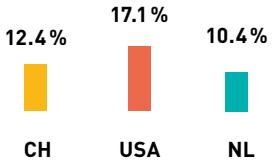


Source: Ibid.

LIFE SATISFACTION
Scale from 0 to 10 in the World Happiness Report

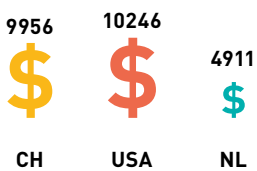
Source: Helliwell, J., Layard, R., Sachs, J., & De Neve, J. E. (2020). World happiness report 2020. New York: Sustainable Development Solutions Network. Online: happiness-report.s3.amazonaws.com/2020/WHR20.pdf

HEALTH COSTS
Health expenditure as a percentage of GDP



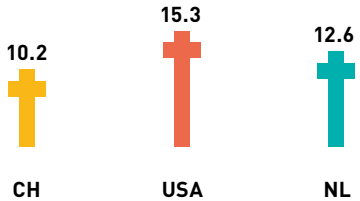
Source: data.worldbank.org/indicator/SH.XPD.CHEX.GD.ZS

HEALTH COSTS
Health-related expenditure in USD per inhabitant per year



Source: Ibid.

SUICIDE RATE
Suicides per 100,000 population



Source: de.wikipedia.org/wiki/Suizidrate_nach_L%C3%A4ndern

No data, no health: digital challenges for the healthcare system

The challenge of diagnosis—how does AI learn causality?

Over the course of less than a decade, computers have become impressively good at diagnosing disease. Despite this achievement, however, artificial intelligence still has some glaring weaknesses. AI systems do not understand causality. They understand that some events are associated with other events, but they do not know which root causes produce which effects.

"Big data…tends to gloss over or ignore anomalies…[It] tends to be far more focused on correlation rather than causation, and as such ignores examples where something doesn't follow what tends to happen on average. It's only by exploring anomalies that we can develop a deeper understanding of causation."

Clayton M. Christensen[11]

If you want to understand how the world works, you have to understand cause and effect. Why are things how they are? What will happen if I do this or that? Correlations only tell us that certain phenomena go together. Only causal relationships can explain why a system is the way it is or how it could develop. This is a major problem in medicine—a field many variables can be connected with one another. To diagnose a disease, we need to know which conditions cause which symptoms, and to treat an illness, we need to know the effects of various medications or lifestyle changes. In order to find answers to such tricky questions, we either need to conduct observational studies with very strict rules or we need to carry out randomised, controlled clinical trials.

Such studies create large amounts of medical data, but the data is distributed across multiple different datasets, which means that many questions are left unanswered. If one dataset shows a correlation between obesity and heart disease and another shows a correlation between vitamin D deficiency and obesity, what then is the relationship between vitamin D deficiency and heart disease? In most cases, another clinical study will be needed to find this out.

To date, AI applications in the healthcare sector have mainly been focused on developing algorithms that can predict diseases such as cancer. A new generation of causal algorithms could make it possible to identify the factors that cause cancer and then use this knowledge to develop new medications and predict who would benefit from receiving these medications.[12]

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[11] Christensen, C. (2020): Disruption 2020: An Interview With Clayton M. Christensen, MIT Sloan Management Review. Online: https://sloanreview.mit.edu/article/an-interview-with-clayton-m-christensen/

[12] Sgaier, S., Huang, V. & Charles, G. (2020): The case for causal AI. Stanford Social Innovation Review. Online: https://ssir.org/articles/entry/the_case_for_causal_ai

The challenge of treatment—the potential of the digital twin

"We, the actual consumers, are the shadow of the personified simulations of ourselves."

Benjamin Bratton[13]

Since the 1990s, researchers in the fields of social science and natural science have been using computer simulations to help answer questions such as: "What causes war?" "Which political systems are the most stable?" "How will climate change affect global migration?" The quality of these simulations is limited by how well modern computers can mimic the complexity of our world—and they are not very good at it yet. But what if one day, computers were powerful enough and their simulations were complex enough to produce "people" in the form of code, and each simulated person were as complex and dynamic as their physical original?

The more data becomes available, the better machines will be able to read us, resulting in more accurate digital models or digital "twins" of a person. If the quantity of data is large enough and if it is used in conjunction with software that is capable of learning, quantity should eventually convert into quality. In future, digital twins could form the basis of data-driven, personalised medicine. In this scenario, treatment would first be tested on the model (in silico) and only afterwards would it be given to the original (in vivo). Thijs Defraeye, who is developing a digital model of the skin at Empa (Swiss Federal Laboratories for Materials Science and Technology), said: "In medicine, people dream of complete in silico doppelgangers, which predict how a person will age or how an artificial joint will wear in the body."[14]

"With digital twins, in healthcare, you can evaluate different scenarios and treatment options; you can combine personal and medical data to provide real-time intervention and prevention", explains Ger Janssen, Head of the Digital Twin department at Philips. "We're looking not just at cardiology but also oncology, pulmonology and neurology. A digital twin of the human body is the ultimate goal."[15]

Real-time modelling should make it possible to control and predict the course of a treatment. Real people feed the digital models with personal physiological, social and environmental data and the models are adjusted in a dynamic manner. In this way, it will be possible to simulate the effects of various interventions and medications and test alternatives without putting any strain on the (real) body.

The best-known example of this technology at the moment comes from the automotive industry: every Tesla has its own digital twin. The physical vehicle continuously sends data to its digital "alter auto" via sensors. If the door of the vehicle is rattling, the system will prompt the user to download software that will adjust the

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[13] Bratton, B. (2016): The Stack. On Software and Sovereignty. MIT Press, Massachusetts.

[14] netzwoche.ch/news/2019-07-05/schick-den-avatar-zum-arzt

[15] Purdy, M., Eitel-Porter, R., Krüger, R. & Deblaere, T. (2020): How Digital Twins Are Reinventing Innovation, MIT Sloan Management Review. Online: https://sloanreview.mit.edu/article/how-digital-twins-are-reinventing-innovation/

door's hydraulics. And because Tesla collects information about the performance and usage of each of its vehicles, its engineers are also able to aggregate the data and use it to create updates that will improve the performance of the specific line of vehicles in question. This process also helps engineers and designers to understand which aspects cannot be improved through software updates alone—data which is key to achieving major leaps in innovation for the next version of a product.[16]

For the moment, digital twins of whole human beings remain a dream, but there has been some progress in that direction: for instance the "Living Heart"—the first realistic model of a human organ.[17] Digital twins are also used in research. In future, computer-generated models will increasingly make it possible to skip in vitro experiments and animal testing, which will make research faster and cheaper.[18]

For users, a digital twin could act as a kind of personal coach. The benefit would be that they would constantly gain better data and new insights into themselves. Their understanding of themselves would constantly improve, and they would get better at determining what they should do or stop doing. The Israeli historian and bestselling author Yuval Noah Hariri believes that in the future, we would do well to listen to external algorithms rather than our feelings because algorithms have a better picture of the context and the consequences of actions and would be able to protect us from short-term impulses that we would regret acting on later.[19]

The challenge of economics—can Baumol's cost disease be cured?

Even though technology is getting cheaper and more and more processes are being automated, costs in the healthcare system are not going to go down. At least, this is the diagnosis of the situation according to the "cost disease" theory posited by the American economist William Baumol. The reason for this is that more highly complex and sophisticated healthcare technology requires more highly qualified physicians, nurses and other healthcare staff. But in many areas of the healthcare system, the productivity of such staff cannot be increased without decreasing the quality of care. Any attempt to speed up the work of surgeons carries the risk of a botched surgery. For this reason, productivity remains constant, but salaries still rise in line with salaries in other sectors where there is much greater potential for rationalisation.[20]

Digitalisation may offer at least a chance to combat the cost disease, and perhaps even to cure it. This is because when algorithms and experts work together, this creates many opportunities to increase both the quality of services and work productivity. Figure 3 shows a common phenomenon that demonstrates this. Thanks to technological advances, tasks that could previously only be carried out by experts

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16 ibid.

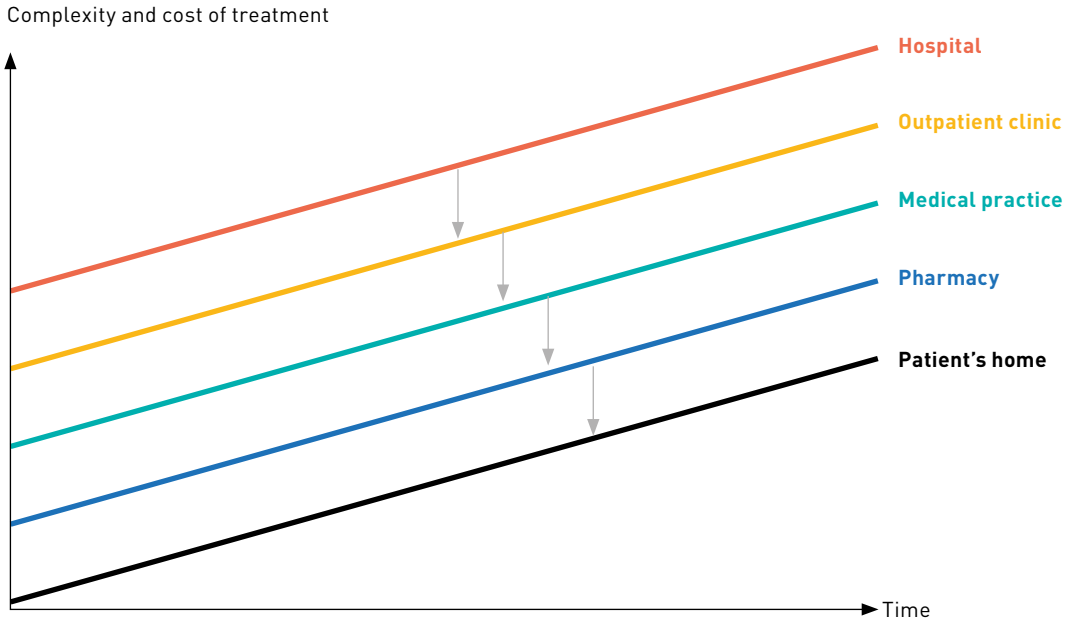
17 cf. 3ds.com/products-services/simulia/solutions/life-sciences/the-living-heart-project/

18 cf. Sim4Life by Zurich Med Tech: zmt.swiss/

19 Harari, Y. N. (2016): Homo Deus: A brief history of tomorrow. Random House.

20 Baumol, W. J. (2012): The cost disease: Why computers get cheaper and health care doesn't. Yale university press.

Disruption in healthcare institutions



Source: based on Christensen, C. & Bohmer, R. (2000): Will Disruptive Innovations Cure Health Care? Harvard Business Review, Online: hbr.org/2000/09/will-disruptive-innovations-cure-health-care

can now be performed by less qualified staff in a less specialised setting without necessarily decreasing the quality of care, which in turn leads to an increase in the productivity of the healthcare system.

The COVID-19 crisis has made it glaringly obvious how easily our picture of the world can be shattered and how quickly a pandemic can paralyse the economy and bring society to a standstill. We can measure more than ever before thanks to greater access to data, but what we aim to do with that data is increasingly unclear.

To what extent can we trust epidemiologists and virologists who, as experts within their field, usually only attempt to describe a highly specific portion of our reality, but now in this context are clearly attempting to some extent to describe the "greater whole" of society and the economy in their narrow, model-based prognoses—thus inevitably producing distortions? Over the last few decades, we have constantly broadened our definition of what is possible in terms of health and have increased our expectations of the healthcare system across all stakeholder groups. Which of these new possibilities will remain possible in the future? And what new options might there be?

Health problems are always information problems, too. And health solutions are always information-based solutions. The future of the healthcare system will largely depend on which information systems are used. Important aspects of this include:

> What is measured in individuals and in society as a whole
> How data is processed and shared
> How people and machines work together
> How artificial intelligence continues to develop
> Which tools patients use to navigate the healthcare system—e.g. Google or a symptom checker
> Whether we trust the algorithms.

Transition from simple to complex to data-rich services

Simple service	Complex service—industrial model	Complex service—data-rich
100% automation	0% automation	Automation of individual work steps within complex work processes
AI, deep learning	No AI, deep learning	IQ (human intelligence) + AIQ (artificial and human intelligence) + EQ (emotional intelligence) Continuously learning from each other
Productivity increases	Productivity remains stable or decreases	Productivity increases
Costs decrease, salaries increase	Costs increase, salaries do not decrease (reduced motivation)	Costs decrease, wage bill decreases
Market model	Public spending ratio increases continuously, calls for move towards a market model	Quality increases, more time for specialists to do more of the right things—to prioritise what is important

Source: Based on Baumol, W. J. (2012): The cost disease: Why computers get cheaper and health care doesn't. Yale university press, London.

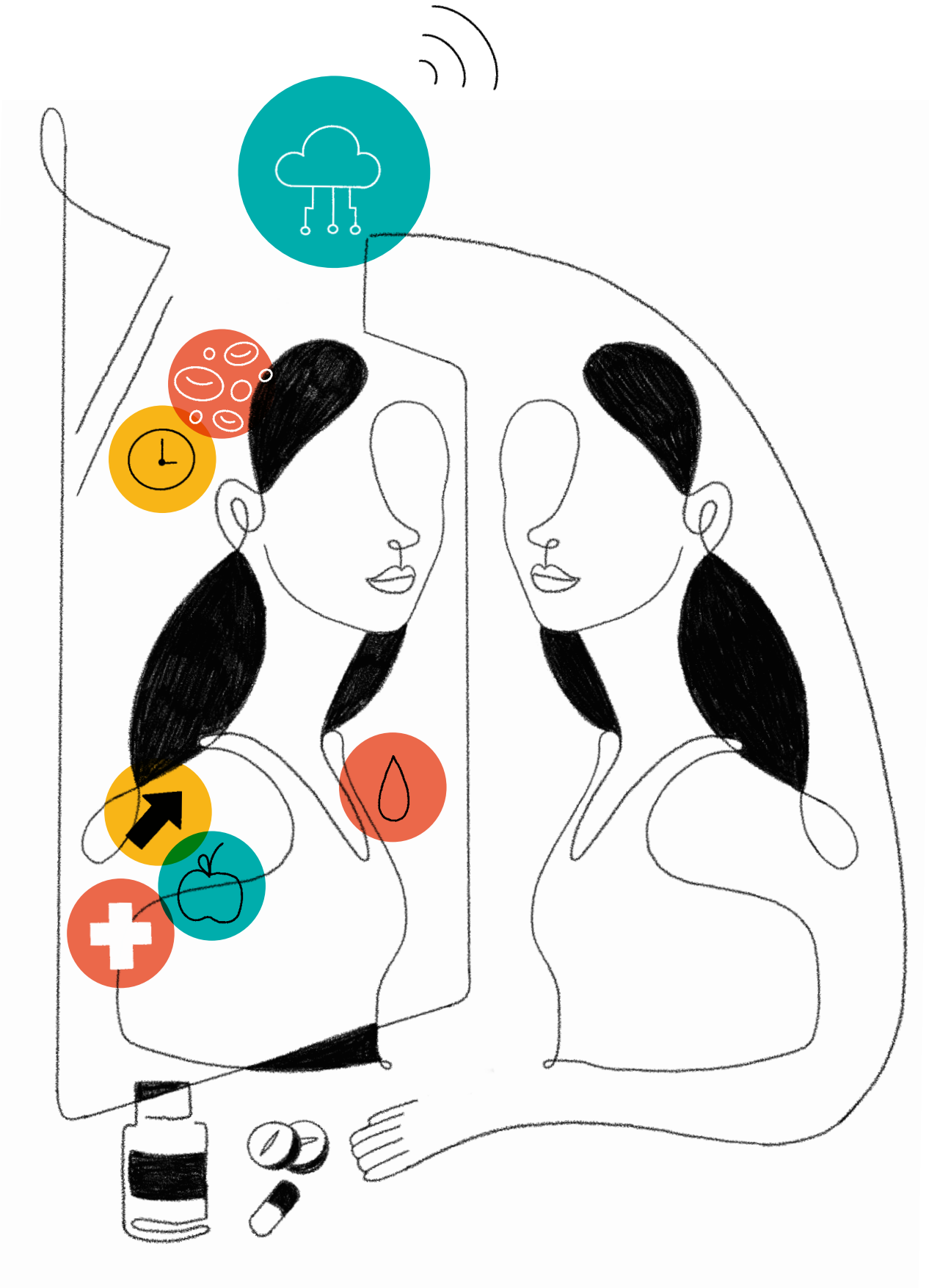
Key takeaways

> The focus of the healthcare system is moving away from dealing with illness and towards producing health. This will transfer the power to define relevant concepts in the healthcare sphere from institutions (who want to treat illness) to individuals (who want to feel healthy).

> Exponential increases in the amount of available health data and measurement and analytical tools will lead to huge improvements in disease prevention—problems will be identified and dealt with before they have the chance to develop into illnesses.

> The extent to which the ever-increasing amounts of available data will lead to increased quality will depend on how the data is handled. The more stakeholders in the healthcare system cooperate in sharing data, the better the results will be.

> Human and artificial intelligence working together have the potential to significantly increase quality in medicine as well as productivity—thereby reducing costs.



Six shifts in the healthcare system

A lack of new narratives

"The real crisis of our times, of my generation, is not that we don't have it good, or even that we might be worse off later on. No. The real crisis is that we can't come up with anything better."

Rutger Bregman[21]

Narratives are stories people tell to explain what is going on around them. They are thought models we use to interpret current events and we accept them as self-evident. These stories need not be true in order to have an effect. One such unquestioned assumption is that more is better: more health expenditure/more doctors will lead to more health, and more data will lead to better decisions.

For years, discussions about the future of the healthcare system in Switzerland have centred around the same old arguments and narratives, and there have been no substantial changes to the underlying structures or processes. Thanks to digitalisation, the healthcare system is becoming qualitatively better, safer and more efficient—and this has been achieved without any changes to the underlying structures. For this reason, despite the many studies and conferences on the digital revolution in healthcare, most experts do not see a pressing need for transformation.

The responses from a survey of experts by the Gottlieb Duttweiler Institute in November 2019 (see Annex) indicate that while experts acknowledge that technological change is happening, they are neither enthusiastic nor optimistic about it. In principle, they are open to new technological developments and see potential in them, but they are reluctant to take the plunge into the new and unknown by creating new markets for new customers. Instead, the focus is purely on developing further what is already in place, for instance by improving existing products or increasing efficiency—doing more with less. All in all, it appears that ambitions remain modest, and scepticism, moralism and indifference still prevail.

One long-term goal, many paths

The long-term goal of the healthcare system appears to be clear, and to be recognised by all stakeholders: to provide a long and healthy life for all people. Exactly how we can reach this goal and what the systems needed to reach it should look like—this is where the various stakeholders involved in the healthcare system are divided.

Because the various stakeholders have different visions of the potential paths to the common goal and of the underlying complexity of the healthcare system, the system as a whole will not change completely. Instead, there will be significant, fundamental changes in individual elements of the system, known as "shifts". These shifts will create new possibilities, new configurations and new relationships. So what are the most important and fundamental changes taking place in the healthcare system? Following we describe six key shifts.

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[21] Bregman, R. (2017): Utopia for Realists: And how we can get there. Bloomberg Publishing, London.

Shift 1: digital accessibility

Today	Future
Expert-oriented, treatment of people who are ill, hospital context, doctor's office	Democratisation, consumer context, wellness, prevention, empowerment

Digitalisation is making it possible for more people to access better health information. The hope is that digitalisation will make it possible to identify diseases and health risks more quickly and provide more targeted treatment. Nowadays, an app is often sufficient for an initial diagnosis. This means that anyone can check their health using their smartphone. They can do it anytime and anywhere, without the need for a doctor's appointment.[22]

"Democratizing what we already have would be a much bigger bang for your buck than improving what we have in many areas."

Glenn Cohen, Harvard Professor and leader of the project on precision medicine.

[22] Szpiro, G. (2020): Dr. Handy – das Smartphone weiss medizinischen Rat. NZZ am Sonntag. Online: https://nzzas.nzz.ch/wissen/dr-handy-das-smartphone-weiss-medizinischen-rat-ld.1533182

Shift 2:
health 24/7

Today	Future
Inpatient care. Treatment and consultation take place on-site at the practice, with a scheduled appointment	Mobile, virtual, on-demand, telemedicine. Primary treatment and consultation take place online in real time, In-home healthcare

COVID-19 has given telemedicine a boost. Medical treatment became mobile. It was no longer tethered to a medical practice, hospital or pharmacy. It could take place anywhere: at home, at the supermarket, at work, at the airport or at school. It is becoming easier and easier to collect data in a decentralised manner, consult medical specialists online and order medications directly. In more and more cases, an in-person visit to a medical practice is being reserved for severe illnesses and emergencies.

Thanks to smart technology, telemedicine could increasingly be used even in emergencies in the future. It is even possible that more and more health-related irregularities will be detected without the affected person feeling unwell. For instance, cardiac arrhythmias could be identified based on photos or on biodata from a smart watch.

There will be a shift in the distribution of tasks among service providers and patients. Digitalisation will make it possible for patients to undergo even complex diagnostics and treatments from home in a decentralised manner. They could carry out the necessary diagnostics or treatments by themselves or with the help of relatives or nurses.

For patients, a DIY approach means more self-determination, but also more responsibility. This often goes hand in hand with uncertainty and a feeling of being overwhelmed.

Shift 3:
from silo to network

Today	Future
Silo, linear treatment process, analogue patient records	Networks for treatment and diagnostics, swarm learning, digital patient records

The digital universe is producing unprecedented amounts of data. This brings many advantages, but also some fundamental challenges for businesses and for research. Scientists and experts now have a growing corpus of data they can draw upon and attempt to extract knowledge from. The quality of their results depends very much on what data flows into the system, and how it is analysed, interpreted, evaluated and consumed. How do humans and machines generate insights from this data? And for what purposes? How is the data validated? How are errors corrected and who has access?

The development of the healthcare system will in large part depend on the architecture of its IT systems, on how and where data is collected, and on how knowledge is extracted, augmented, networked and distributed. In addition to the unanswered technical questions, there is also the question of trust.

For instance, Human Dx[23] is a self-learning, diagnostic tool that constantly improves itself. It uses the collective intelligence of thousands of physicians together with artificial intelligence to compile and classify specialist medical knowledge from various sources. This tool uses machine learning to help physicians select suitable medical treatments.

In addition to technical security and data protection issues, trust in the system will also depend in large part on how transparent it is, who programs it, and how access to the data is distributed. An open system with transparent filtering techniques, feedback loops and peer reviews will inspire more trust than a closed system. For example, if a manufacturer of insulin provides a diabetes app, this app will be more likely to recommend taking medication in the case of unfavourable blood glucose values. However, an app that is not affiliated with any manufacturer may say: “Eat more healthily, get more exercise and consult your doctor!”

Whoever has more data will have better products and will therefore be able to win more customers. This means they will be able to collect even more data, learn more quickly, attract more talent, and then develop even better products and thus have greater success. A wealth of data comes from sharing data. What matters is: how is this wealth of data distributed? Who gets a share? The more complex the system and the less we understand it rationally, the more social and emotional factors come into play when building trust.

[23] humandx.org/

Shift 4:
prevention over intervention

Today	Future
Acute intervention in the case of illness, generic	Prevention based on health monitoring, forward-looking, personalised

As early detection capabilities improve, the focus will shift from people who are ill to healthy people and those with chronic illness. The consumer context will become increasingly important for communication, interaction and prevention. Clinical and medical contexts will lose importance relative to this. Increasingly, the focus will be on well-being and wellness rather than on medicine.

In future, the continuous collection of health data will improve early detection, with the result that more people will seek medical advice before they get ill. These new early detection techniques will open the door to a change in the system akin to the old Chinese custom of only paying the doctor for as long as you are well.

In terms of early detection, vitals are not the only data that is exciting and relevant. Consumer data is equally essential. Many health risks that are closely correlated with behaviours can be extrapolated from user data on smartphones. For example: how often the person uses social media, shopping, gaming or dating apps. This sphere of life, known as the "behaviourome", encompasses all behaviours of a person or group. Our capabilities in terms of recording and decrypting this sphere are continually increasing thanks to new tracking and analysis technologies.

Shift 5: healthstyle

Today	Future
Focus on medication (such as sleeping pills)	Focus on behaviour (behaviour change) and healthy lifestyle

Every day behavioural data will become the linchpin of medicine. This data will form the basis for the development of new, personalised treatments and for new tools used to control and manage individual health.

In future, medication-based treatments will increasingly be backed up—or even replaced—by digital behavioural tools. For example, sleeping pills or antihypertensive medication could be prescribed along with an app that measures sleep.

As people begin to attach more importance to prevention, the significance of a healthy lifestyle will come into the foreground. People who read a book every week[24], go jogging regularly[25], brush their teeth every day for more than two minutes[26], drink two coffees a day[27], etc. live longer. The results of many individual studies can now be linked and verified better than ever before, which makes it easier to measure what constitutes a healthy lifestyle. Health awareness will gradually extend into more consumer areas, and thus become even more present in our lives. The wellness industry is currently ahead of the game in this respect: regulations are less strict in this sector, enabling it to normalise the tracking of all types of health data. People used to monitoring their data regularly will soon expect that automatic, real-time monitoring will be extended beyond things like sports shoes into areas such as the effectiveness of medication—for instance antihypertensives. Treatment is thus becoming digitalised for various physical and mental illnesses, which is known under the term «digital therapeutics».[28] One example of this trend is Sleepio: a prescription behavioural therapy for sleep disorders available from the App Store.

[24] Bavishi, A., Slade, M. D., & Levy, B. R. (2016): A chapter a day: Association of book reading with longevity. Social Science & Medicine, 164, 44–48.

[25] Lee, D. C., Pate, R. R., Lavie, C. J., Sui, X., Church, T. S., & Blair, S. N. (2014): Leisure-time running reduces all-cause and cardiovascular mortality risk. Journal of the American College of Cardiology, 64(5), 472–481.

[26] dentalairforce.com/evidence-suggests-one-way-live-longer-clean-teeth-better/

[27] Loftfield, E., Cornelis, M. C., Caporaso, N., Yu, K., Sinha, R., & Freedman, N. (2018): Association of coffee drinking with mortality by genetic variation in caffeine metabolism: findings from the UK Biobank. JAMA internal medicine, 178(8), 1086–1097.

[28] Makin, S. (2019): The emerging world of digital therapeutics. Nature, 573(7775), 106.

Shift 6: ageless ageing

Today	Future
Living better with illness. Shift in focus from lethal to treatable, chronic illnesses	Ageless ageing—living better and avoiding disease. Delaying biological ageing and therefore age-related diseases

The elixir of eternal youth remains a distant dream—one that may never come true. However, a limited version of it that targets specific age-related diseases could become available within a few years.[29] A breakthrough in anti-ageing medicine would change everything.

Despite all this, even the miracle of futuristic medicine has its limits. There is also a contrasting trend: an increasing awareness and acceptance that we are not immortal and that there is a need to reduce the use of high-tech medicine towards the end of life: "Life after 75 is not worth living." —Ezekiel Emanuel, Oncologist and Medical Ethicist.[30]

In the coming years, the way long-term illness is handled will change our individual relationships with the healthcare system. Instead of stalling death for longer and longer in an attempt to banish it from life, we will make it a central focus of society once again. New rituals for dealing with death are springing up. The return of mortality as a central focus of society raises difficult moral questions rather than simple financial ones. In the coming years, the way long-term illness is handled will change our individual relationships with the healthcare system.

[29] Li, Y., Jiang, P., Paxman, J. et. al. (2020): A programmable fate decision landscape underlies single-cell aging in yeast. Science, 369(6501), 325-329.

[30] Hallarchive, S. (2019): A doctor and medical ethicist argues life after 75 is not worth living. Technology Review. Online: https://technologyreview.com/s/614156/a-doctor-and-medical-ethicist-argues-life-after-75-is-not-worth-living/

Key takeaways

> The digitalisation of medicine will make the healthcare system more democratic (for example through greater individual control) and more omnipresent (for instance through telemedicine and app-based medicine).

> An increased focus on prevention will decrease the importance of medication and increase the significance of managing individual behaviour.

> The growing complexity of data-rich systems will result in a need for mechanisms that serve to build and justify trust in the system. The systems in the best position to do this will be open, transparent one in which people and machines work together.

How patients become consumers

"We've all been seduced by the deep discounts, the monthly automatic diaper delivery, the free Prime movies, the gift wrapping, the free two-day shipping, the ability to buy shoes or books or pinto beans or a toilet all from the same place. But it has gone beyond seduction, really. We expect these kinds of conveniences now, as if they were birth rights. They've become baked into our ideas about how consumers should be treated."

Franklin Foer[31]

The iPhone brought about a fundamental change in the world. It changed how we communicate, how we inform ourselves, how we entertain ourselves, how we work, how we shop, how we get around, how we navigate, and even how children do their homework. The digital economy now offers incredible services that the consumers of the very recent past could only dream of, and in some cases could not even have conceived of.

Smartphones have transformed the customer into king, dictator and slave all in one. The customer is king because they have extremely convenient access to a wealth of high-quality medical and treatment information for free. The consumer behaviour of the last few years has taught us that consumers are extremely receptive to convenience, all forms of comfort, simplicity and solutions that make everyday life easier. The consumer is a dictator because they are no longer prepared to wait and want to have everything now—plus they want it to be simpler, better and cheaper. Furthermore, their options for making their displeasure at poor service known are increasing—if rather slowly. The consumer is a slave because they increasingly depend on machines that make decisions for them and manipulate them.

The digital revolution has brought many benefits for the consumer: easier access, greater choice and tailor-made solutions. Smartphones are educational tools first, and technological tools second.[32] The experiences that consumers have had with digital consumption will increasingly be applied to the management of the healthcare system.

Patients increasingly see themselves as consumers, which is leading to a dissolution of the distinction between patient and consumer. The patient is becoming a part of the consumer. But how do we define consumer and how do we define patient?

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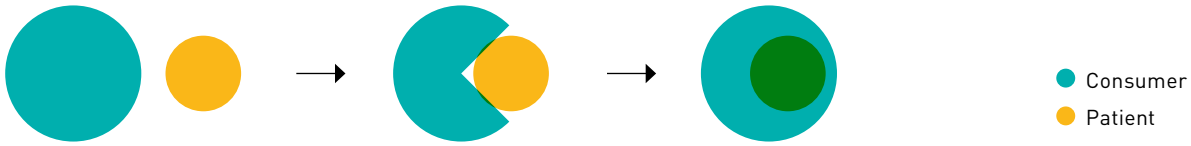
[31] Foer, F. (2014): Amazon Must Be Stopped. New Republic. Online: https://newrepublic.com/article/119769/amazons-monopolymust-be-broken-radical-plan-tech-giant

[32] For more information on the data selfie trend shaped by smartphones, cf. Bosshart, D., Frick, K., Kwiatkowski, M. & Thalmann, L. (2018): Wellness 2030. GDI Gottlieb Duttweiler Institute, Rüschlikon. S. 25–29.

The transition from patient to consumer

CONSUMER EATS PATIENT



PATIENT Unbundling of mainly inpatient services in static silos	**CONSUMER** Rebundling of mainly outpatient services in a dynamically organised ecosystem
Access is hierarchical/restricted	Access is democratic/guaranteed
Pricing and performance are not transparent	Pricing and performance are transparent
Choice is limited	Customised, tailor-made choices
Treatments are tied to a location	Treatments are delocalised
Limited availability	Guaranteed availability

Source: Own illustration

This new awareness among users brings with it new expectations of service providers in the healthcare sector:

> Empowerment: consumers want more control and transparency when it comes to their health
> Connected life: services provided on-demand, anytime, anywhere
> Personalisation: expectation that individual needs and special circumstances will be perfectly understood and anticipated
> Convenience: treatments should fit into people's lives seamlessly
> Digital natives use apps to manage their health. Use of and access to smart devices is a must
> Well-being: willingness to spend more on health, well-being, beauty and emotional support is constantly increasing
> Clean medicine: a desire for "natural" medicine without side effects

Healthy people who want to optimise their well-being will want to be able to access healthcare services via the same channels they use for other services, and with the same level of convenience. They will want to be able to search for and book a health club in the same way they do for a hotel. Furthermore, if they have undergone a screening examination, they will not understand why they hear nothing from their physician for ten days thereafter when online shops give them almost hourly updates on how their order is progressing.

As in the sphere of consumption, the smartphone will also be the most important interface with the customer in the healthcare market. This will drastically change the relationship between users and providers of healthcare services. Health will increasingly become a digital service akin to online shopping or mobility: quality-controlled, on-demand, user-defined.

The products on Amazon and the music on Spotify are not necessarily any better or cheaper than other products, but they are much easier to access than what is offered via the traditional channels, plus these systems get to know our tastes and needs better over time. Whoever manages to make access to healthcare services as easy as access to hotels or restaurants on TripAdvisor will have a decisive competitive advantage.

Next practice in healthcare starts with the customer experience. Providers that manage to integrate what they offer into their customers' lives seamlessly and conveniently will have the most success. This will allow them to build a close relationship with customers, cultivate deep trust, and gain a wealth of knowledge about them.

How are the relationships between consumers and service providers changing in the new ecosystems?

The Swiss healthcare system is not centralised. The direction in which it will develop will depend on the decisions of many different stakeholders—stakeholders who have very different functions, tasks, resources, interests and expectations that may complement, strengthen or contradict each other.

We focus hereafter on consumers and patients because we believe that they play a key role in the value creation network within the health economy and that service providers continue to consistently underestimate their importance.

We also believe that new interfaces will become established between service providers and service users via technology (such as smartphones, wearables or smart assistants), and that these interfaces will fundamentally change the relationship between supply and demand. In a way, the healthcare sector is gaining a new operating system.

When you change the relationships between stakeholders, you also change their behaviour. For example, when we feel ill, we will no longer run straight to the doctor. Instead, we will first consult the AI doctor and take a test at the pharmacy.

The personalisation of health will increasingly make the consumer the linchpin because personalised prevention and treatment will require personal data. You can only offer a personalised analgesic if you have precisely measured and thoroughly understood the patient's individual intolerances and life circumstances. To achieve this, information on individual preferences and behaviour will become more and more important in addition to biological data. Traditional patient records only systematically record biological data (such as blood tests or the genome). They usually do not include behavioural data or consumption and dietary habits. This will change as personal smart devices gather ever more behavioural data in real time. The amount of data gathered will increase rapidly because we go to the supermarket far more often than we go to the doctor. This would mean that a provider of personalised diets, for instance, would learn much more about a person far more quickly than their doctor would.

New tech companies are establishing themselves in the space between patients and providers of

Key takeaways

> The more frequently people come into contact with the healthcare system while they are healthy, the more their expectations and behaviour will come to resemble those of consumers.
> Convenience is a key factor in consumer decisions. It is also set to become more important in the healthcare system.
> The roles of both users and providers of AI systems and digital assistants are becoming increasingly important. This new digital equality between user and provider is closing the hierarchical gap between doctor and patient—or eliminating it completely.
> In the healthcare sector, health protection may outweigh data protection in extreme situations. In such cases, the question is not whether data should be accessed, but rather how. Global experiences of the use of data during the COVID-19 crisis will help determine future best practices in this area.

medical services. They collect, aggregate, process and store data. The better these companies know their customers, the more able they are to offer them personalised, tailor-made services and support them in staying healthy.

Dynamic developments in data privacy and patient data

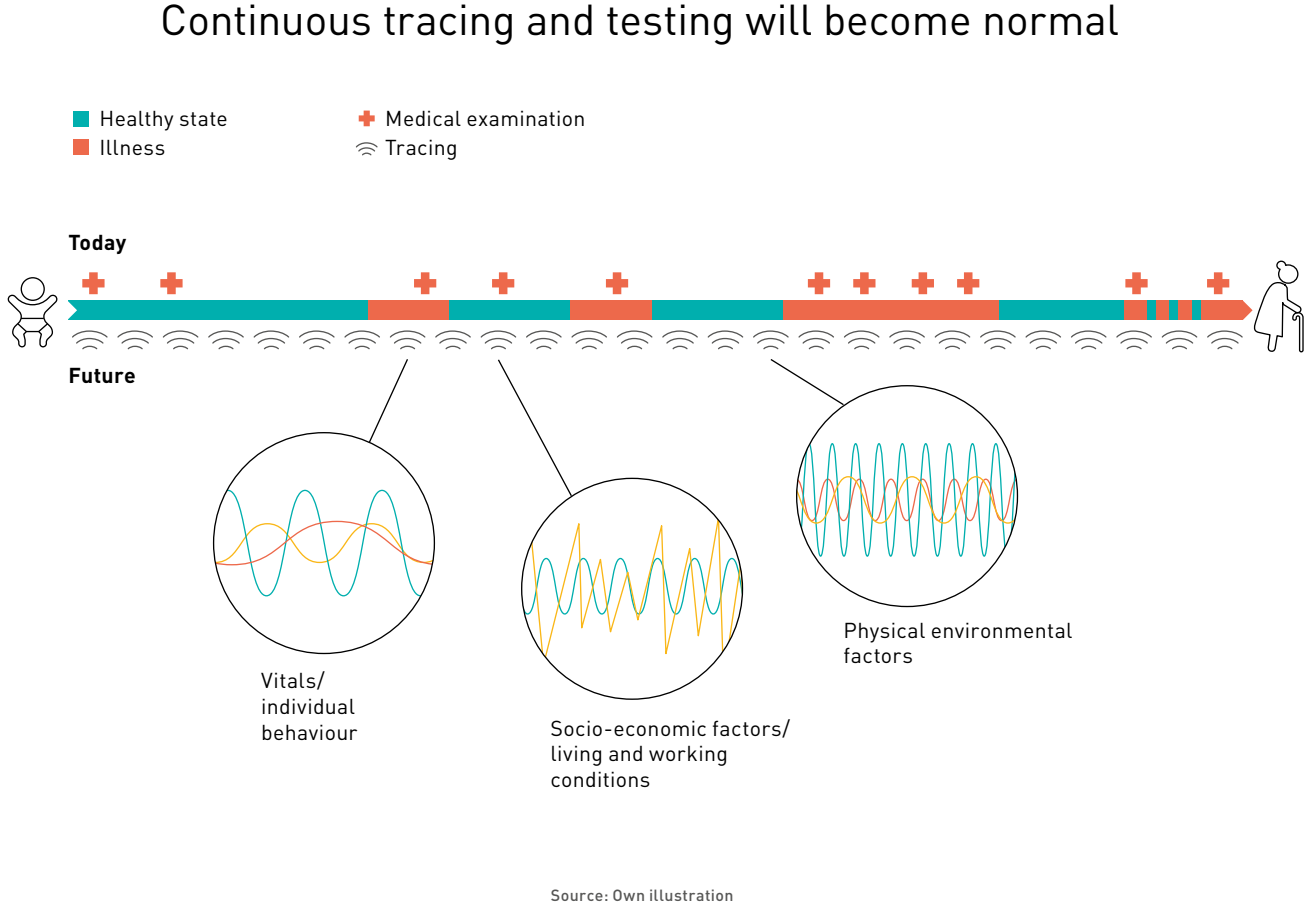
The new, smart interfaces and the expansion of ICT infrastructure will drastically change the relationship between consumers and medical service providers in the coming years. Platforms will become a key interface and will have a direct relationship with users. This relationship may be based on services, payment and content, or it may be a relationship based purely on regular use (such as non-logged-in users on Google).

Who is driving this development, who profits from it and who pays for it remains to be seen: should it be the state and public health institutions? The market and private individuals? Civil society/the voluntary sector? Or the tech industry? As in other areas of business where there are many different stakeholders with different interests (such as mobility or tourism[33]), there is often great controversy and conflict in the healthcare system when it comes to how data is used and under what conditions. In this context, the privacy argument is often used not only out of a desire to protect consumers or patients, but also out of a desire to avoid changing the status quo.

COVID-19 also put a spotlight on this topic. It became clear that it can be justified and in the public interest to access individuals' biodata and health data—in this instance to prevent infections and thus an epidemic. The discussion was not about whether this should be done, but rather how—for instance how a coronavirus tracing app should function and how it should be designed. The experience that various states across the globe are gaining in weighing up protection of the individual against the interests of wider society will determine future best practices in this area. However, what proves to be best practice will depend on how the pandemic progresses.

[33] For more information on the privacy discussion in the tourism industry and perspectives on an open data approach, cf. Samochowiec, J., Kwiatkowski, M. & Breit, S. (2019): Unterwegs mit smarten Assistenten. Ein Szenario zum Reisen der Zukunft. GDI Gottlieb Duttweiler Institute, Rüschlikon.

The paths through the health landscape of the future



Source: Own illustration

Customer journeys—how patients will navigate their way through the health system

Sometimes you are healthy, sometimes you are sick, and sometimes something in between. That has always been the way of things. This is not going to change any time soon. What will change is how we deal with it as individuals. The rise of the new and growing digital class along with the increasing use of sensors in and on the body and in public spaces is making it easier to monitor vital signs and behaviour (e.g. exercise, nutrition). It is also becoming easier to measure the effects of socio-economic factors and environmental conditions on health and then incorporate the results of these measurements into

diagnosis and treatment. In some situations, the permanent recording of such biodata will not just be permitted, but actually mandatory. The border controls and quarantine restrictions that sprang up in response to the COVID-19 pandemic have given a first glimpse of this. Accordingly, health interventions will no longer happen at clearly defined moments, but rather throughout life, all the way from birth to death. For the individual user, this will result in completely new ways to navigate the healthcare system.

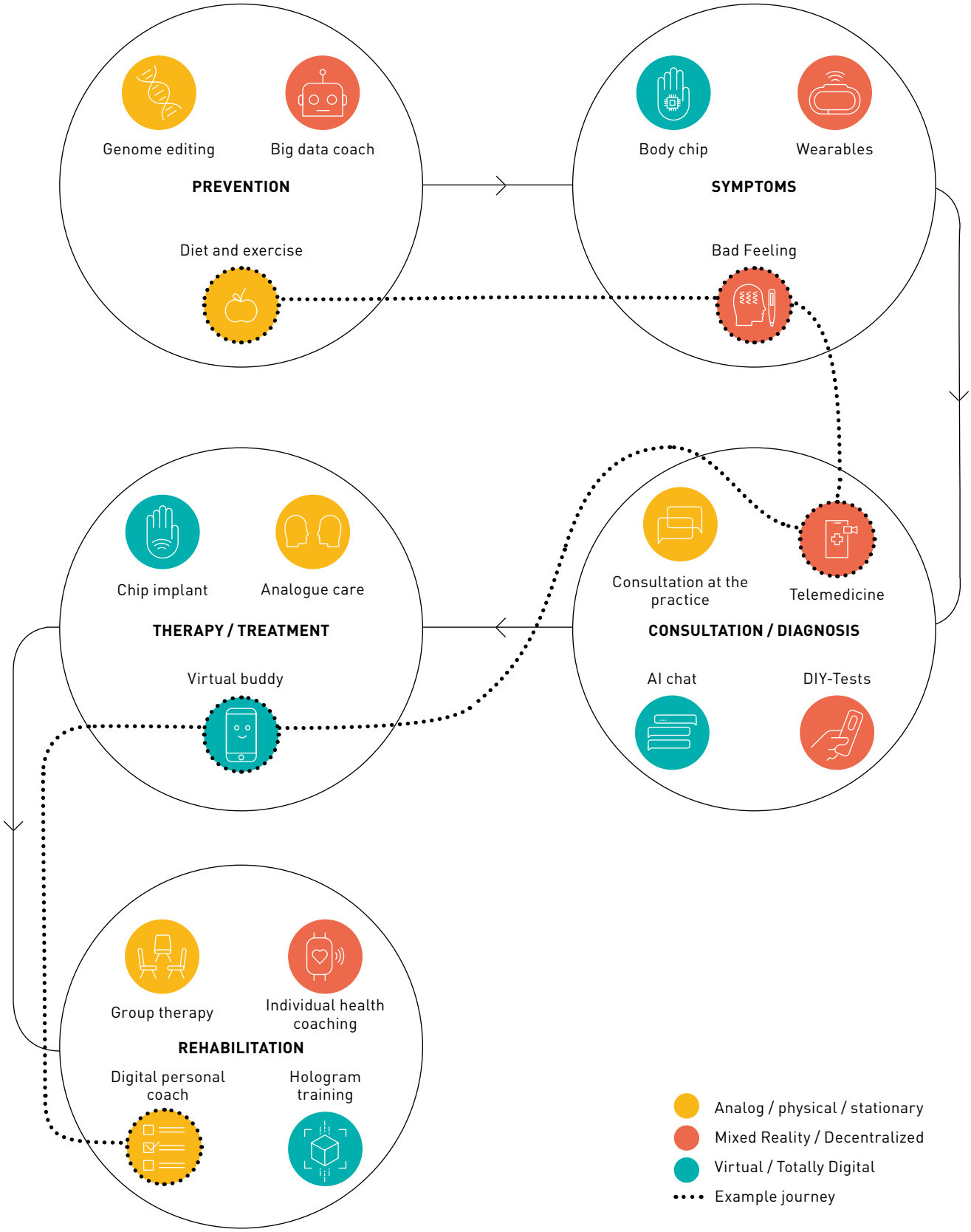
As an example of the new possibilities opening up in the healthcare sector, the following pages show some possible paths that patients may take before they decide on a particular treatment. For the sake of clarity, we have limited ourselves to the level of the individual's health status here. However, in the medium term, models that also take socio-economic factors and environmental conditions into account will become increasingly important[34]. The concept of a "customer journey" has been borrowed from the sphere of marketing. Denoting a process made up of individual steps leading to a purchase decision, it comprises all the points of contact between a consumer and a product or service. Below, we have selected five different diseases of varying severity to demonstrate the customer journey.

The central theme of all the examples below is that in future, patients will have a greater selection of treatment options to choose from at every stage of illness. This makes it possible for them to forge their own tailor-made path through the healthcare system.

Today, treatments tend to be analogue. Tomorrow, there will be more hybrid analogue/digital treatments, and further down the line, they will become increasingly digital and virtual in nature. We will not see wholesale change over the next few years. Instead, new options will appear gradually. Therefore, for a certain amount of time, various modes of treatment will co-exist. The recent changes in how we pay for things are a good analogy for this. Today, it is theoretically possible to avoid using cash completely because you can pay by credit card, with a smartphone or even with a chip in your hand. However, digital money has not yet replaced physical money completely. Things will unfold in a similar way in the healthcare sector. The result will be a greater choice of types of treatment. However, simply because there are various options available, it does not by any means follow that everyone is capable of using all available options at all times, or is willing to do so. Aspects not taken into account in these illustrative examples but that may influence how a journey develops include pricing structures, societal acceptance, ethics, regulatory requirements, (financial) incentives and intrinsic (economic) interests. The journeys set out below are not an exhaustive list, but only examples. They are primarily based on medical and technical feasibility.

[34] Health is also a public good. Quality of life and happiness indices or rankings of regions in which people live longer and healthier lives (blue zones) are becoming a key factor of success in terms of competitiveness among regions.

Customer journey—diabetes

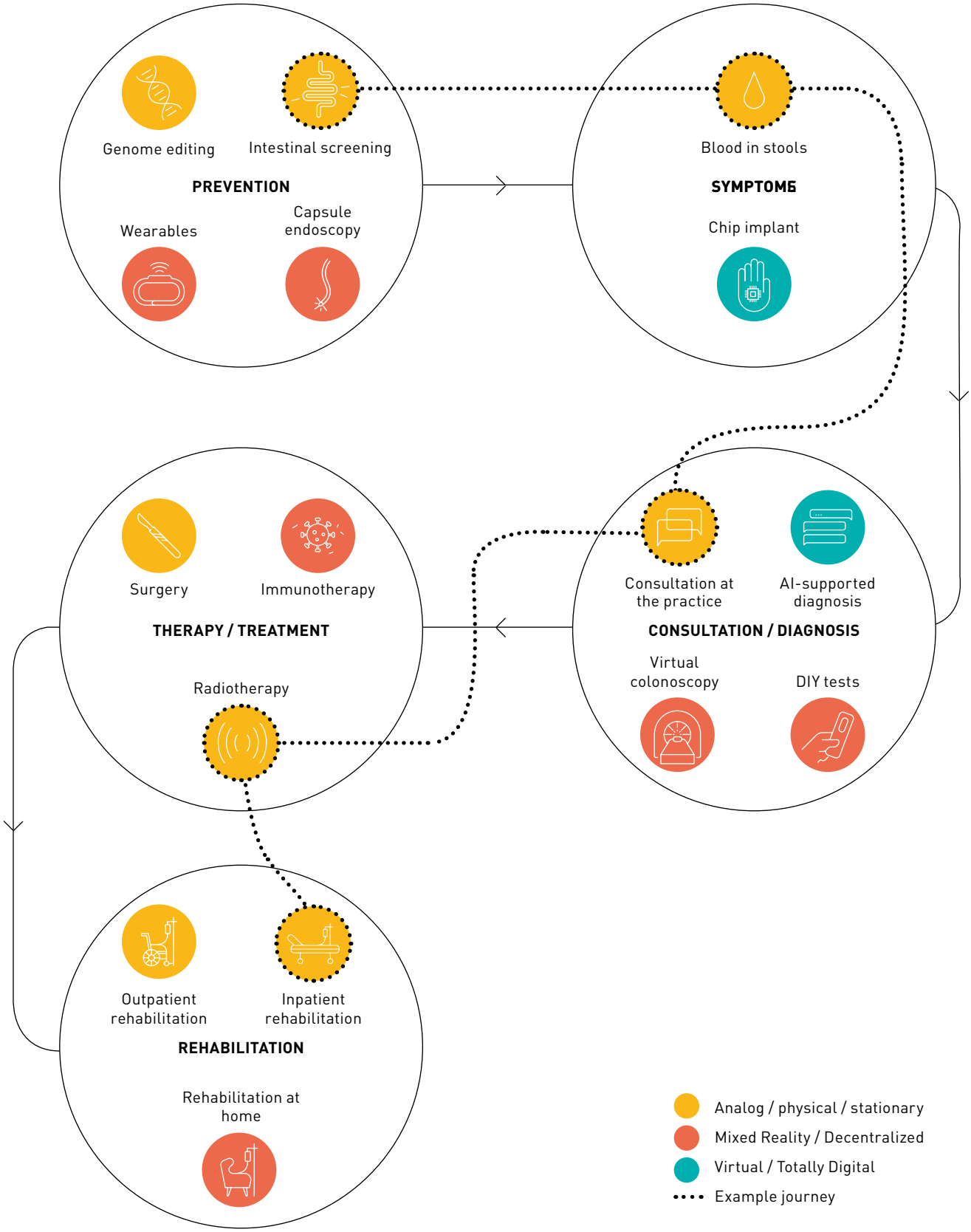


The journey on the left side shows a selection of decision options during the course of the disease, which are described in detail in the table on the right.

Diabetes	Prevention/everyday	Symptoms	Consultation/ diagnosis	Therapy/treatment	Rehabilitation/ aftercare
Analogue/ in-person/in-patient	Balanced diet and regular exercise	Subjective feeling of malaise: thirst, frequent urination, tiredness, etc.	In-person consultation with a physician	Blood glucose levels are measured manually	Tailor-made training programmes
	Manipulation of genes before birth to prevent disease occurring	Feedback from people who know the patient	Diagnostic tests in the presence of medical staff	Care provided by specialist healthcare professionals	Social support via group therapy
	Customised immuno-therapy and pharma-cological therapy				Customised health coaching as support for behavioural change
Mixed reality/ decentralised	A personal digital health coach for support with a personalised diet and exercise regimen	Wearables: constant measurement of vitals leads to early detection of symptoms.	Telemedicine: a digital, decentralised consultation with a physician		An implanted chip provides data to a virtual chef that prepares food for a specific diet.
	Wearables: continuous measurement of vitals to detect any negative changes in lifestyle and provide appropriate tips for everyday life accordingly		Decentralised consultation: consultations and investigation of symptoms in phone box-like medical practices		Personal digital health coach to support improvements in everyday behaviour
	Cultivation of new hybrid organs— stem cells and new technologies become the pancreas 2.0.		DIY tests: diagnostic tests performed by patients themselves in a decentralised manner and verified by the physician in a remote consultation.	If necessary, a robot pharmacy delivers test kits and medications via drones.	
Virtual/ completely digital	Body chip: continuous measurement of vitals to detect any negative changes in lifestyle and provide appropriate tips for everyday life accordingly	Body chip: constant measurement of vitals to detect symptoms early.	Appointments are scheduled via virtual assistants, which also deal with medical history taking before the appointment and prioritisation.	Chip implant: treatment is handled by a chip implant. The implant administers a customised course of medication.	Hologram training with a virtual buddy
				Constant measurement of blood glucose values via a plaster in order to provide tips for lifestyle changes	
				Virtual buddy for interactive psychological support	

Source: Own illustration

Customer journey—colon cancer

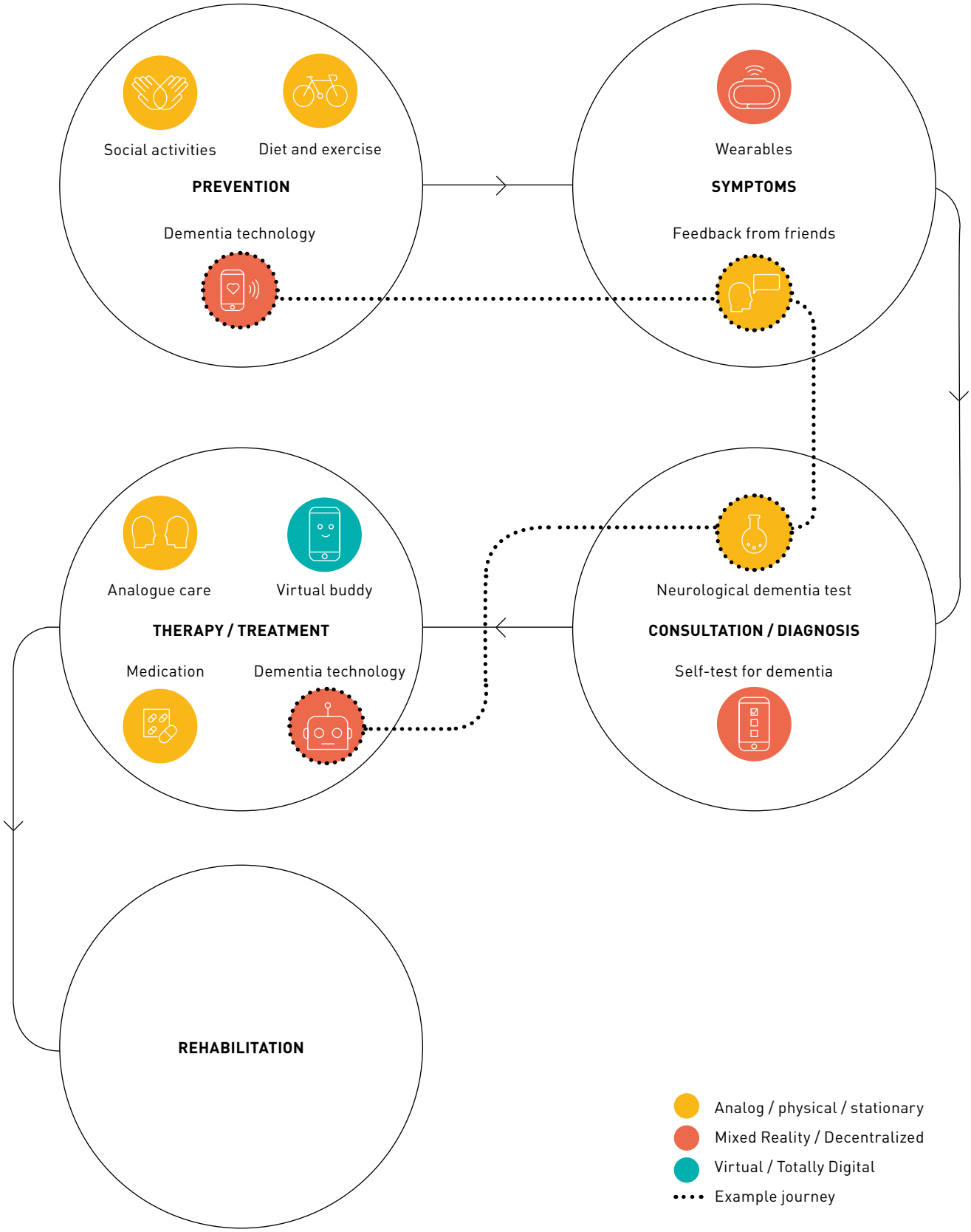


The journey on the left side shows a selection of decision options during the course of the disease, which are described in detail in the table on the right.

Colon cancer	Prevention/everyday	Symptoms	Consultation/ diagnosis	Therapy/treatment	Rehabilitation/ aftercare
Analogue/ in-person/inpa-tient	Balanced diet and regular exercise	Subjective feeling of malaise. Blood in stools, unexplained weight loss, loss of appetite, etc.	In-person consultation with a physician	Discussion of the case in a real-world tumour board	Outpatient or inpatient rehabilitation
	Intestinal screening (e.g. colonoscopy)		Diagnostic tests in the presence of medical staff	Removal of the tumour through surgery and radiotherapy	
	Genome editing before birth using CRISPR		Interpretation of the results by a physician		
Mixed reality/ decentralised	Wearables: continuous measurement of vitals to detect any negative changes in lifestyle and provide appropriate tips for everyday life accordingly		DIY tests: diagnostic tests are carried out by the patient themselves in a decentralised manner and verified by a physician through a remote consultation (e.g. liquid biopsy).	Suspicious findings: digital support for at-risk patients	Outpatient or inpatient rehabilitation
	A personal digital health coach for support with a personalised diet and exercise regimen	Screening for highly specific indications	Telemedicine: a digital, decentralised consultation with a physician	Discussion of the case in a virtual tumour board	Hospital@home provided by specialist health professionals (not doctors) using portable digital equipment
	Capsule endoscopy: in the case of high risk, regular endoscopies can be carried out independently as a preventative measure using a capsule endoscopy procedure.		Decentralised consultation: consultations and investigation of symptoms in phone box-like medical practices	Regenerative measures (e.g. activation or introduction of stem cells)	
			Virtual colonoscopy	Activation of the body's self-healing capabilities through radiotherapy or immunotherapy	
Virtual/ completely digital	Wearables: continuous measurement of vitals predicts the develop-ment and observation of symptoms in advance	Chip implant measures disease markers	Instant monitoring detects degenerative processes	AI assesses the risks and establishes treatment strategies.	Virtual buddy for interactive, biopsychosocial support
			AI-supported diagnosis		

Source: Own illustration

Customer journey—dementia

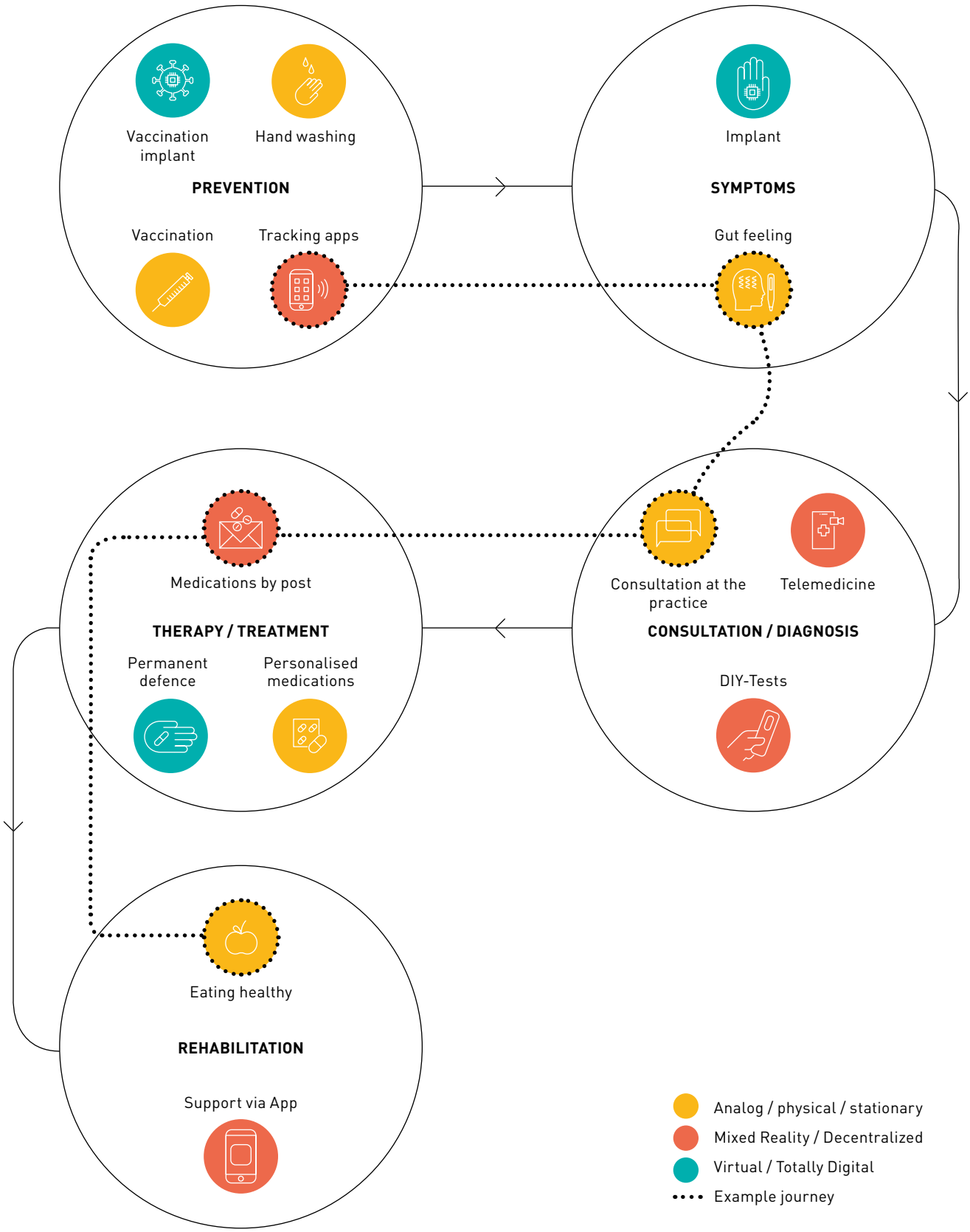


The journey on the left side shows a selection of decision options during the course of the disease, which are described in detail in the table on the right.

Dementia	Prevention/everyday	Symptoms	Consultation/ diagnosis	Therapy/treatment	Rehabilitation/ aftercare
Analogue/ in-person/ inpatient	Encouraging exercise and a variety of mentally-challenging activities	Subjective well-being	In-person consultation with a physician	Care and support from carers, family, friends and community	
	Social activities	Feedback from friends and people who know the patient	Neurological dementia test in the presence of medical staff	Medication, but a) personalised and b) continuously dose-adjusted according to changes in health status.	
Mixed reality/ decentralised	Monitoring of vitals via dementia technology (e.g. via a smart-phone): it will be possible to detect disease or disease risk faster thanks to AI and analysis of neurocognitive capacity.	Measurement by wearables: constant measurement of vitals to detect symptoms early.	Telemedicine: audio or video call with a physician	Assistance and support via dementia technology	
	Digital dementia test every five years after the age of 60		Self-test for dementia	Care provided by healthcare professionals (not physicians) at home	
			Telemedicine: a digital, decentralised consultation with a physician		
Virtual/ completely digital			Chat with artificial intelligence	Virtual buddy for interactive, biopsychosocial support	
				Robo-nurses	
				Virtual reality to promote neuroplastic learning	

Source: Own illustration

Customer journey—influenza

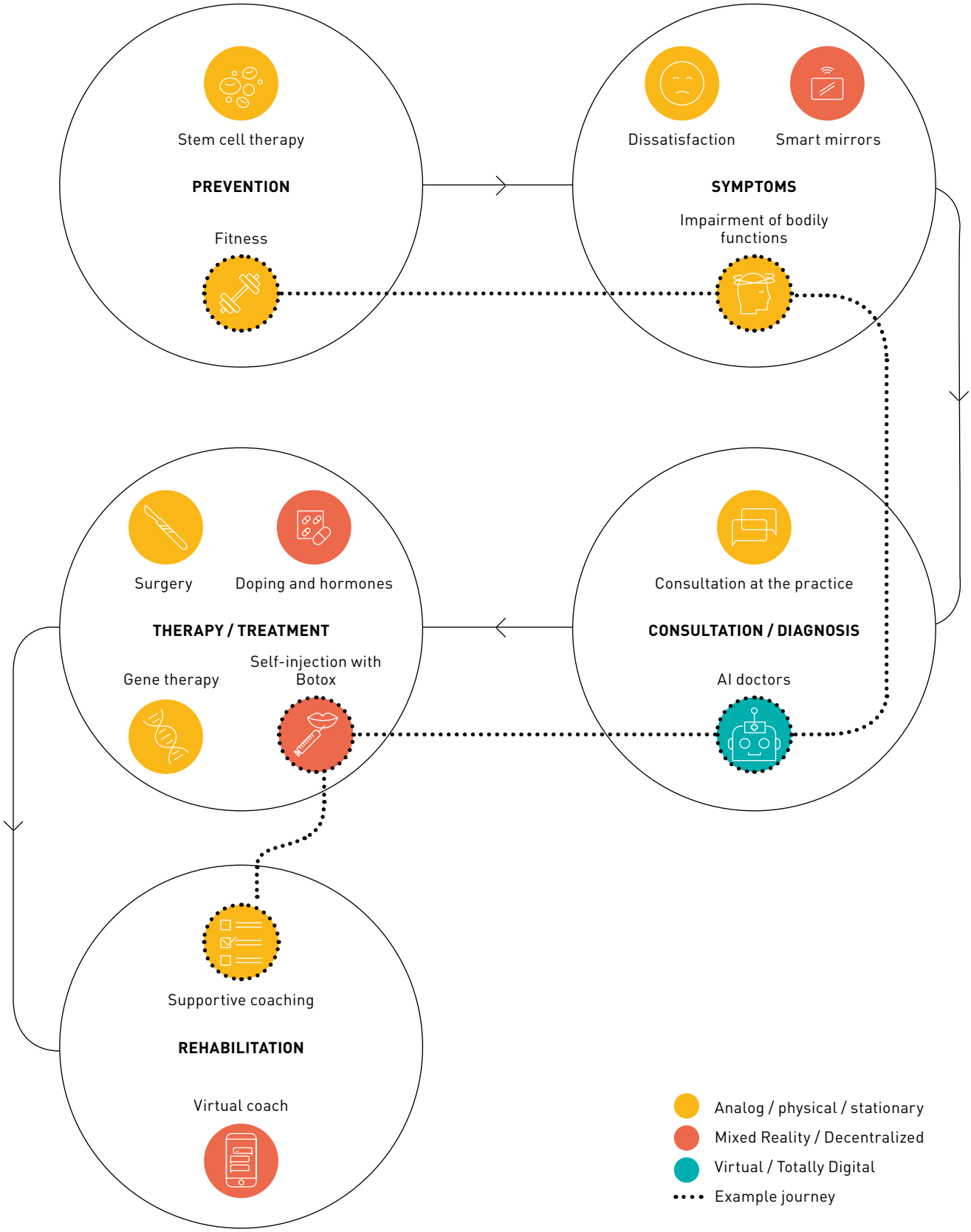


The journey on the left side shows a selection of decision options during the course of the disease, which are described in detail in the table on the right.

Influenza	Prevention/everyday	Symptoms	Consultation/ diagnosis	Therapy/treatment	Rehabilitation/ aftercare
Analogue/ in-person/ inpatient	Healthy eating, plenty of exercise, hand washing, wearing a protective mask	Subjective feeling of malaise: fever, etc.	In-person consultation with a physician	Medications obtained in pharmacies or similar pick-up locations	Healthy eating, plenty of exercise, hand washing, wearing a protective mask
	Vaccination	Feedback from friends and people who know the patient	Measuring fever	Personalised medications: customised medication types and doses	
	Antibody pills administered after a high-risk situation in order to better control and shorten the course of the disease		Diagnostic tests in the presence of medical staff		
Mixed reality/ decentralised	Tracking and tracing apps	Wearables: on-body monitoring detects symptoms.	Diagnoses can be determined using at-home DIY tests and confirmed in a subsequent video consultation with a physician.	Medication arrives by courier	Digital support via app
	Flu is eradicated				
Virtual/ completely digital	Permanent defence: the vaccination implant is capable of reacting to unknown pathogens immediately and sending an alert about them.	Implant: on-body monitoring detects symptoms.	Chat with artificial intelligence	A robot pharmacy delivers test kits and medications via drones	
				The permanent defence implant strengthens the body's defences and self-healing capacity (so that a bout of flu only lasts two days)	

Source: Own illustration

Customer journey—enhancement



The journey on the left side shows a selection of decision options during the course of the disease, which are described in detail in the table on the right.

Enhancement	Prevention/everyday	Symptoms	Consultation/ diagnosis	Therapy/treatment	Rehabilitation/ aftercare
Analogue/ in-person/ inpatient	Physical activity	Physiological reasons (e.g. impairment of bodily functions)	In-person consultation with a physician	Surgical procedure carried out by a surgeon, such as an external adjustment to match a beauty ideal	Supportive coaching with a focus on self-improvement, nutrition, exercise and lifestyle changes
	Critical thinking	Psychological reasons (e.g. a desire to match an aesthetic beauty ideal)		Gene therapy makes it possible to alter physical appearance without surgical procedures.	
	Stem cell therapy: personalised in vitro fertilisation				
Mixed reality/ decentralised	Logging out of social media	Smart mirrors give beauty tips.	Telemedicine: audio or video call with a physician or psychologist	Taking hormones independently	Digital coach with a focus on self-improvement, nutrition, exercise and lifestyle changes
			Robotic plastic surgery	Self-administered doping	
				Self-injection with Botox	
Virtual/ completely digital		Instaface: creation of an optimised digital self	Digital consultation with an AI doctor to take physical measurements	Digital twin: virtual procedure carried out on the digital twin	

Source: Own illustration

A GPS for health

In future, consumers/patients will have greater freedom and opportunity to decide for themselves how they want to get or stay healthy. Yet for many questions about health, there are no clear answers. There are no treatments without risks and side effects. The result of this is that for these questions of health, having more information does not decrease uncertainty, it increases it.

We naturally experience uncertainty as something negative and strive to reduce it, even if these efforts come at a cost. Research has shown that people are calmer and less agitated when they know that they will receive an electric shock than when they know that they have a 50-percent chance of receiving an electric shock.[35]

Uncertainty is multifaceted. There are many types of uncertainty and many ways to deal with it, both cognitively and emotionally:

Probability: not only do you not know what will happen, but you also do not know how likely each result is. For example, what is my level of risk relative to others in my group in reality?

Ambiguity: there are various treatment options, including ones that counteract each other, and researchers do not know which of them really work, or even which may make the problem worse.

Complexity: the relationships between many diseases are very complex because they depend on various factors and individual circumstances whose interactions are difficult for laypeople to understand.

These uncertainties also exist when people make consumer and financial decisions. The difference is that decisions in these areas typically have less serious consequences than when a person has a serious illness and has to make decisions about that. Since most health-related decisions have to be made in a context of uncertainty, taking a user-centric view of the healthcare system logically leads to the use of a set of instruments similar to those deployed for consumer decisions.

One such instrument is the aforementioned customer journey approach. Here, the physician does not have the final and only say in health-related decisions. Rather, there are many different paths that the patient can choose and multiple ways to deal with the situation. Patients can select their journey in a variety of ways:

> They can trust to luck or base their decision on their own personal assessment of the advantages and disadvantages of the individual options (rational choice)
> They can base their decision on the recommendations of other patients with the same condition (random copying due to being overwhelmed by the options or due to a reluctance to put in extra effort)
> They can take advice from a human expert (targeted focus on selected experts)
> They can take advice from a smart assistant/AI

[35] Menon, G. & Kyung, E. (2020): When more information leads to more uncertainty. Harvard Business Review. Online: https://hbr.org/2020/06/when-more-information-leads-to-more-uncertainty

The larger the variety of options, the more likely it is that we will copy others in a random manner—we unconsciously notice what others are doing and what treatments they use.

A person who is poorly informed and feels unwell will first try their luck with an aspirin or a cup of camomile tea. The second option that requires only a little effort is to take your lead from others in similar situations—for example people who have the same food intolerances as you do.

A "GPS" or smart assistant takes on the burden of thinking on our behalf and makes it easier for us to arrive at an informed decision. Smart assistants or navigation systems can also process various data sources and even take the experiences of other patients into account.

In the past, there was a shortage of health information, but nowadays there is a surplus. From the point of view of the patient/consumer, the biggest challenge is getting healthy quickly and gaining an overview of their treatment path. They do not simply want to know what is wrong: they really want to know what their options are for getting healthy again quickly. What they need is something like a navigation system or a GPS for health that will allow them to compare the various paths and make their way through the jungle of options in a targeted manner.

GPS navigation has various advantages over other types of specialist digital guides:

> GPS navigation always puts the user at the centre.
> It shows various routes to the desired destination with various means of transport.
> You can focus only on the street and fade everything else out, or if you need to, you can have the map show specific points (such as a restaurant or service station).
> You can also see which paths are used most often and view evaluations of individual intermediate milestones on the route.
> You can also see where you are on the map—whether you are moving away from your destination, taking a detour or getting closer to your destination.
> You can see the wider context and zoom in on the fine detail without losing sight of the bigger picture.
> You can have the GPS show you the fastest route, but you can also choose to go a different way if you want.
> You are warned when a route may be difficult and when you may need a guide to reach your destination.

The more detailed the map, the more it is used and the better it gets. In principle, it is possible for a GPS to misdirect and manipulate users—for instance by only highlighting service providers within the provider's own network—but a navigation system that only shows half of the available service stations and restaurants will never catch on. Therefore, with a GPS, even if you are a member of one specific network, you can still see alternative treatment paths or options provided by others. Patient networks can also make each other more transparent in terms of who takes which paths.

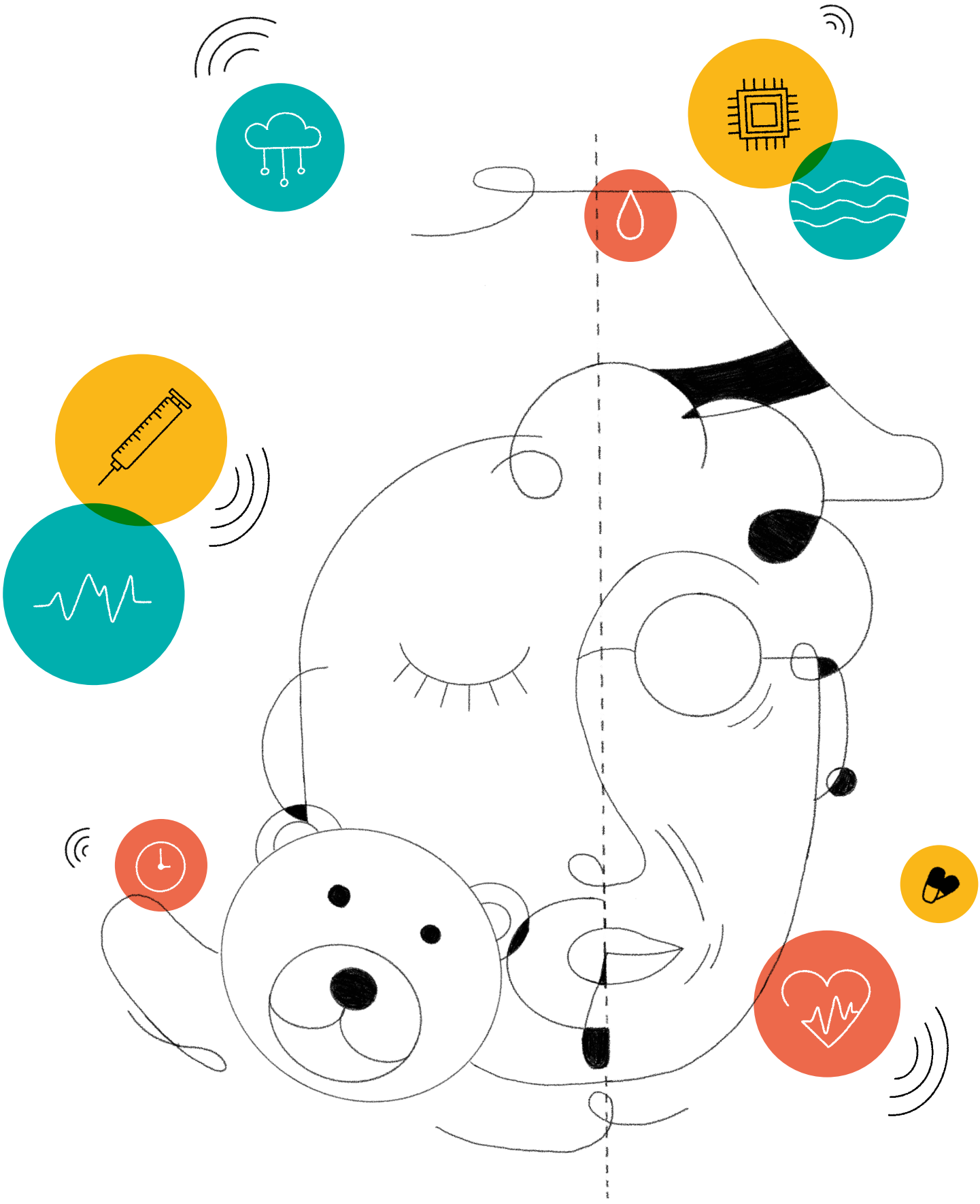
As soon as it is possible to make both patients' and service providers' lives significantly easier through digital services, this new type of practice will quickly become common and privacy issues and regulatory issues will fade into the background. Once you have tried a GPS device, you will not go back to using a paper map.

Key takeaways

> The more patients transform into consumers, the better the tried-and-tested instruments used in consumer research will suit healthcare applications. The customer journey method is well suited to use in continuous processes where consumers have room to decide their course of action—and this is the situation in the case of customised paths through the healthcare system.

> The greater the users' scope for decision-making, the more important the decision-making tools become. The tasks of these tools are similar to those performed by navigation systems for travellers. The era of the doctor having the final and only say is well and truly over.

> The better a navigation system works, the more it is used and the more data it generates. This in turn makes it more able to learn, which makes it more effective, and so on. This positive reinforcement effect means that once a patient GPS has been established, it will likely proliferate quickly and improve itself even more quickly.



Next practice in healthcare: cooperation as a springboard to transformation

"You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete."

Buckminster Fuller

The first thing that digital technologies have changed with regard to the healthcare system is what customers and patients expect from it. They want all services to be available on-demand. They want these services to be perfectly tailored to their individual needs and they want them to integrate seamlessly into their lives. The second change brought about by digital technologies is the opening up of new paths through the system in terms of how and where healthcare services and treatments are provided.

Once such new path through the Swiss healthcare sector is sketched out below. This path takes a platform-based approach, akin to those of Facebook, Amazon or Uber. It is not only global monopolies that can benefit from such an approach. National, smaller, heterogeneous and highly regulated markets can all apply the same principles. It would be possible to use a platform to create a new ecosystem for the Swiss healthcare sector that truly adds value for all stakeholders.

Unconnected data is less valuable. Therefore, without the exchange of data between organisations, service providers will not truly be able to personalise their services and consumers will not be able to independently choose their own path to health. As an analogy: it is not enough for a hotel or a region to have a good reservation system but then fail to make their offerings searchable and comparable across regions or on a national or international level, or to fail to make this easy. At present, health data is distributed across many different systems. Everyone knows something about us, but they do not know what the others know. We need new structures that will make it possible to link data from different systems and radically simplify transactions between various parties.

The aim should be to leverage network effects in the healthcare sector, since it has been shown that these effects generate added value by facilitating the exchange of data. We need an open, learning system for digital health. Innovation requires cooperation: individual stakeholders acting in isolation cannot benefit from network effects and cannot learn fast enough. The system feeds on the data that we share through the network.

For an ecosystem to link various stakeholders in the healthcare system, it would need to:

1. Create clear added value for patients by making it easy for them to find relevant treatments and get well faster

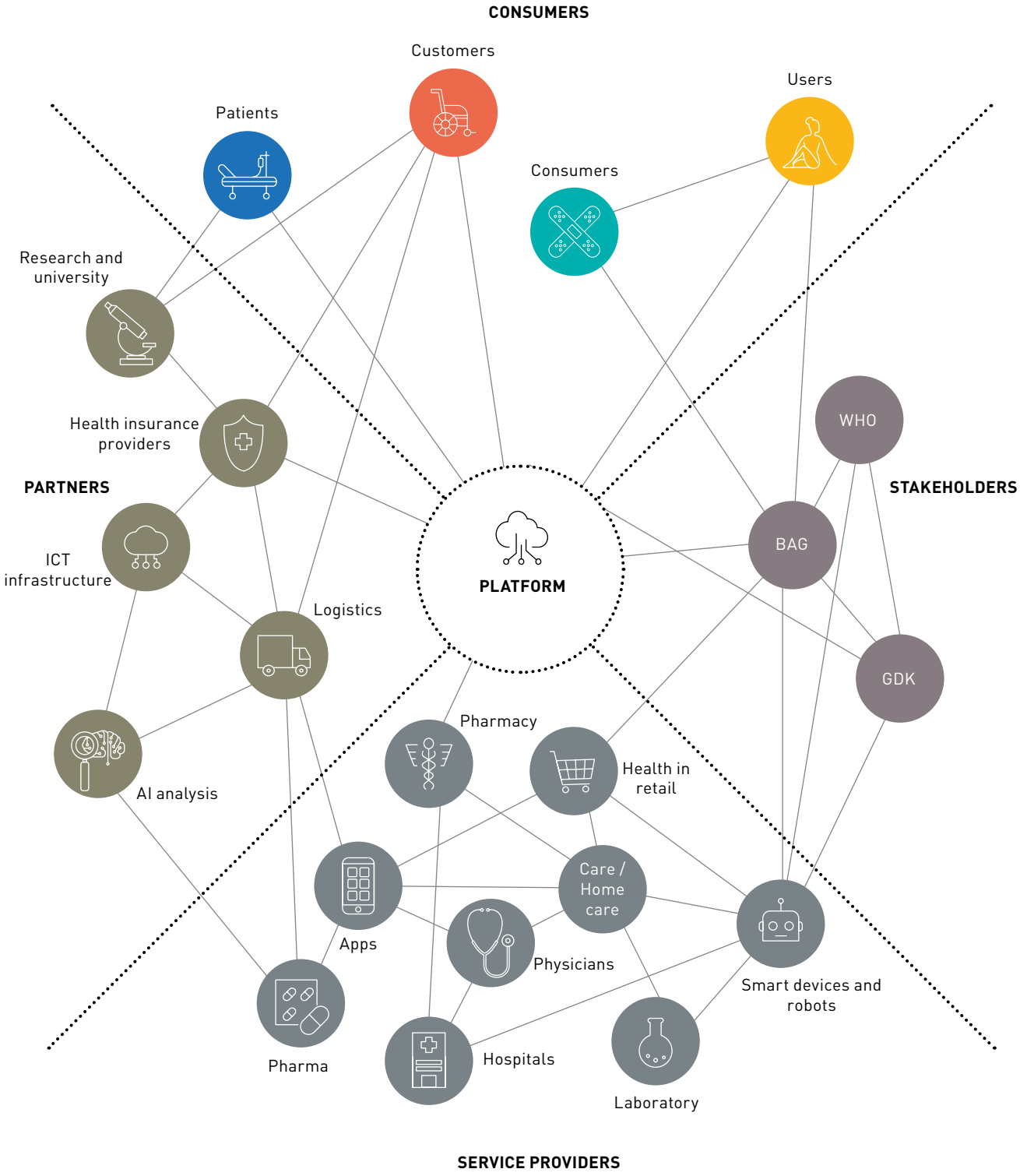
2. Generate new knowledge for service providers—knowledge that they would not have without the network and that will allow them to improve and personalise their services

3. Provide researchers and start-ups free access to relevant data to allow them to develop new digital healthcare services and drive innovation forward.

It needs to be easier and cheaper for service providers to use a shared digital network for their operations than to build their own.

Customers need to be able to access all digital healthcare services from all the various providers by logging in only once. The network

Model for an independent platform that will make it possible to exchange data between various parties in a reliable manner



strengthens itself. When more people share their data, it becomes possible to develop better products and services, which in turn motivates more customers to use such products and services.

Ecosystems link medical data (from the healthcare system) with patient-generated data (tracking data). Linking various technological components and data sources makes it possible to provide effective patient care and improves the functioning of the healthcare system.

Patient-generated data is fed back into the healthcare system to improve patient care and help patients navigate the system better.

It is now technically possible to network health data without violating people's rights to privacy.[36] However, this technical shift needs to be accompanied by a shift in mindset. Customers' expectations and needs have to be understood. We need a vision of how we can make their lives drastically easier.

The way that digitalisation has played out in other business sectors has clearly shown that if existing stakeholders do not undergo this shift in mindset, then newcomers from outside the sector will introduce and impose it. Examples of this include the disruption of the media industry by Google, of the music industry by iTunes, and of the hotel industry by Airbnb.

There is a potential gateway to such customer-oriented disruption in healthcare: a healthcare navigation system (see: "A GPS for health"). Whoever manages to map out personalised pathways through the healthcare system for customers, show them the available options and present decisions to them in a tangible, easily understandable way may quickly become the tool of choice—and may thus quickly downgrade service providers to mere suppliers. Therefore, in Switzerland, for today's stakeholders, the question is not so much: "Should we take a customer-oriented approach or stick with the status quo?" But rather: "Should we do customer orientation the Amazon way or should we do it based on rules designed specifically for a Swiss healthcare ecosystem?"

For such an ecosystem to be trusted, the way in which roles are distributed is crucial. In this context, the question of ownership becomes extremely important. Unlike a natural ecosystem that is driven by the unseen hand of the genetic code, this type of ecosystem must be shaped and cultivated. To achieve this, there will have to be an umbrella organisation that involves as many stakeholders as possible without being dependent on any one of them. This umbrella organisation could be a large technology company (such as Google, Apple or IBM), or it could be a national group of service providers, a patients' association, a regulatory authority or an independent non-profit organisation.

Digital markets are multi-dimensional and the relationships between the various stakeholders can take many forms. The model presented hereafter should provide a better idea of the relationships within a platform and of the roles of each of the stakeholders.

[36] en.wikipedia.org/wiki/Privacy_by_design

Structure of the new ecosystem

Platform operators	Stakeholders	Partners	Producers	Consumers
Governance	Interested parties and people affected	Service providers	Service providers	Service users
An alliance that carries the vision forward and ensures that the ecosystem exists, develops and thrives	Stakeholders have a special interest in the success of the ecosystem because the externalities and effects of the ecosystem influence them directly.	Partners facilitate, cultivate and improve value creation by having a close relationship with the product and functioning as mediators, connecting links and infrastructure providers.	Producers who offer their products and services via the ecosystem	Users who want a simple, convenient way to access the products and services of the ecosystem
Examples of possible forms of ownership				
An open alliance of various stakeholders in the healthcare sector...	Federal government, cantons...	Key partners for ICT infrastructure and services, the scientific sector, the research sector...	Service providers, hospitals, physicians, pharmacies, the pharmaceutical industry, laboratories, insurance companies, home care services, app developers...	Patients, consumers...

Cicero, S. (2016): Von Business Modelling zu Plattform Design. Platform Design Toolkit. Online: platformdesigntoolkit.com/platform-design-whitepaper/#wp

The focus is on:
1. The users who supply the raw material for the system (their data) and want to have access to the best possible options for their individual health needs in exchange

2. An independent transaction system that makes the exchange of data between all stakeholders much easier and more efficient

3. Facilitation of learning and of the further development of what is on offer based on behavioural data and real-time feedback

An ecosystem needs diversity to function properly. It is not made for there to be a single "winner". In national, highly-regulated markets, cooperation is more important than hegemony. The ecosystem concept should strengthen the connections between national, cantonal, public and private stakeholders so that all benefit (win-win).

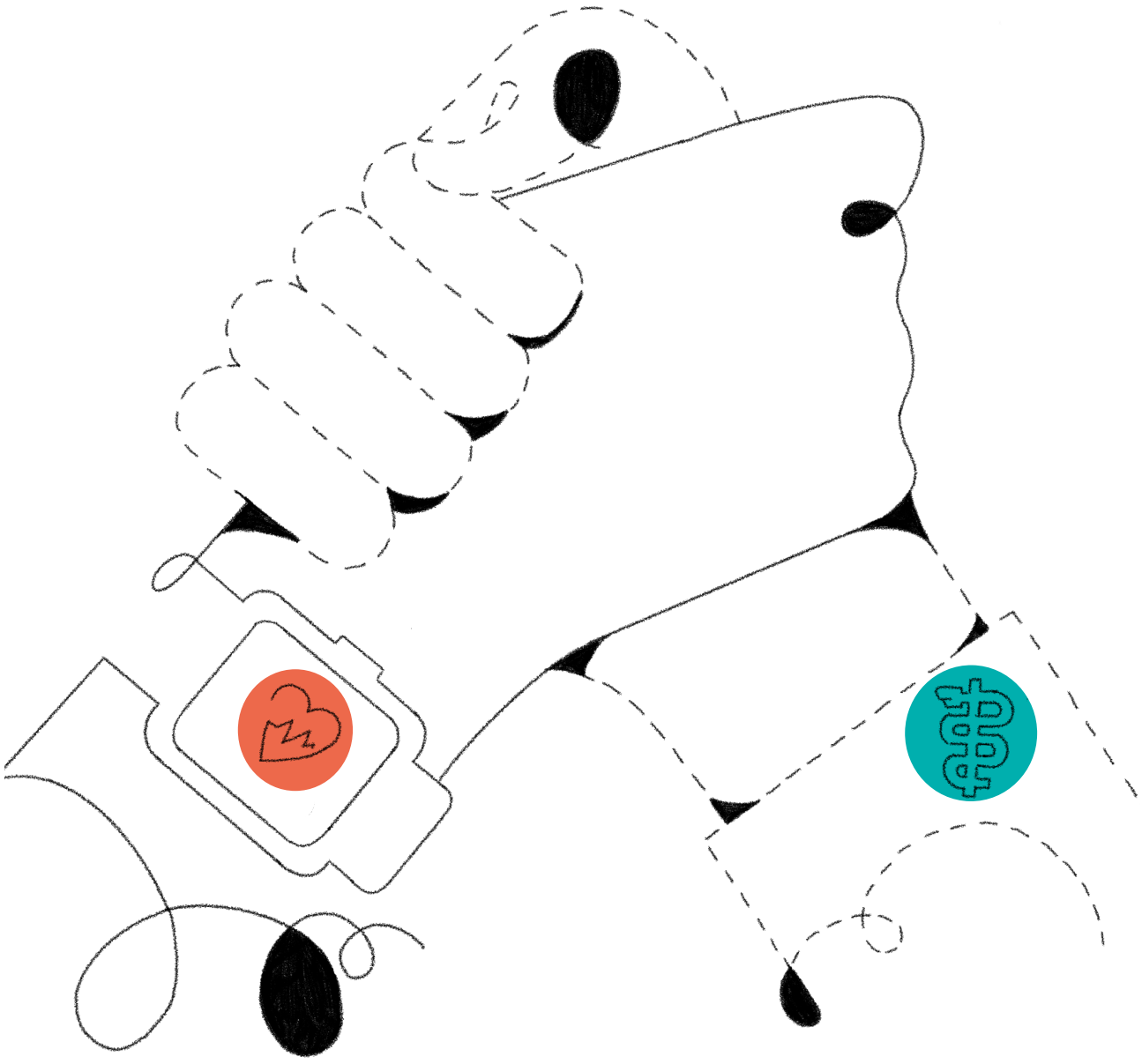
> All stakeholders share all data and knowledge with all of the others.
> This makes it possible for all to learn and improve.
> As each of the elements of the system gets smarter, people get healthier, the system gets more efficient and costs go down.
> Profit can be used to develop better treatments.
> We learn faster and get better at getting better.

The building blocks are there, but they are not sufficiently interconnected or patient-focused, which means we are not making the most of them. The digital health services that manage to attract the most patients will collect the most data and will therefore (with the help of AI functionality) be able to offer superior solutions. It is the customer experience that makes the difference.

Whoever manages to leverage this type of health ecosystem—one that is consistently patient-oriented and focuses on the customer experience—will be able to bring the Swiss healthcare system to a whole new level, making it a pioneer of smart, decentralised healthcare.

Key takeaways

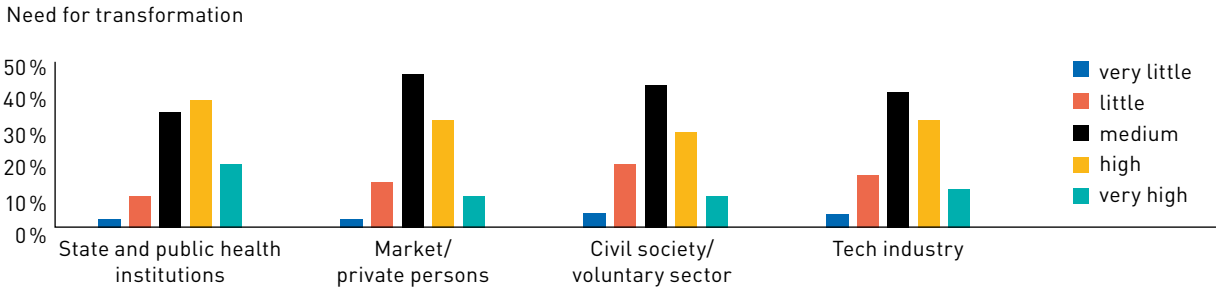
> The best customer experience wins. Whoever manages to use digital services to make the lives of patients/consumers drastically easier will win out over the established treatment pathways. Customer journeys in other sectors have shown this to be true.
> As in supermarkets, low inhibition thresholds promote change. Transparency is vital. Only as the patient/consumer gradually learns to weigh up and assess cost-effectiveness better will they become more confident and discerning in their approach to the services on offer.
> Change will happen in stages. There will be no sudden upheaval. We already have many tools at our disposal and we can leverage learning effects gained from other sectors and points of intersection with those sectors.
> We must solve the data issue to secure a successful healthcare system for the future. A wealth of data comes from sharing data. To this end, the exchange of data between all stakeholders needs to be intensified and simplified.
> Innovation requires cooperation: individual stakeholders in isolation cannot benefit from network effects and cannot learn fast enough.
> Cooperation is more important than hegemony. It needs to be easier and cheaper for service providers to use a shared digital network for their digital healthcare operations than to build their own.
> Sharing data will be an essential element of building trust. Who gets a share? Who should control the ecosystem? A global data corporation or an independent alliance of national stakeholders?
> Building a national health ecosystem is a chance for Switzerland to become a pioneer of smart, decentralised healthcare.

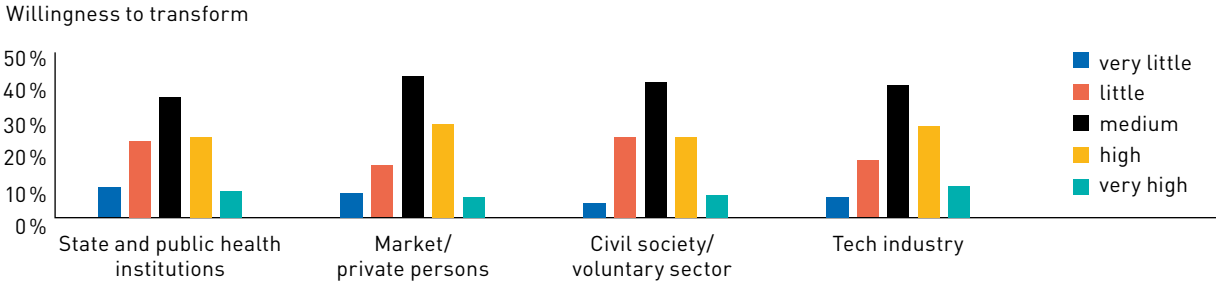


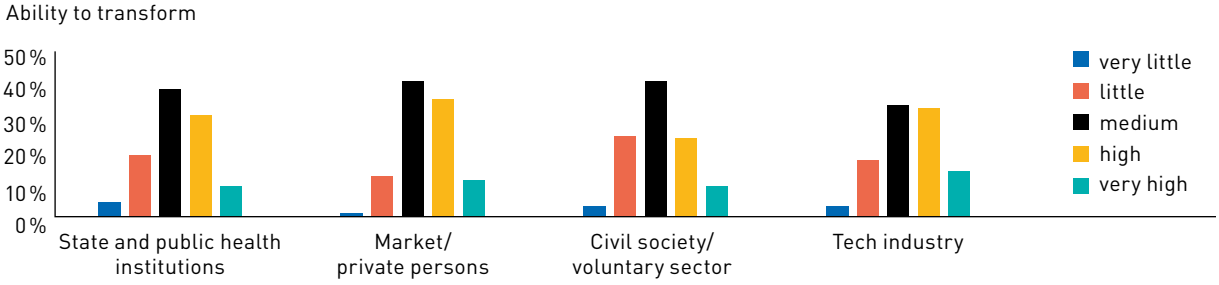
Appendix

In November 2019, the Gottlieb Duttweiler Institute, in cooperation with Innofact AG, asked around 400 Swiss healthcare sector experts from across the German and French-speaking regions of Switzerland about their views on future developments in their sector. The results served as a starting point for the study—as a way to obtain an initial assessment of future developments in the healthcare sector.

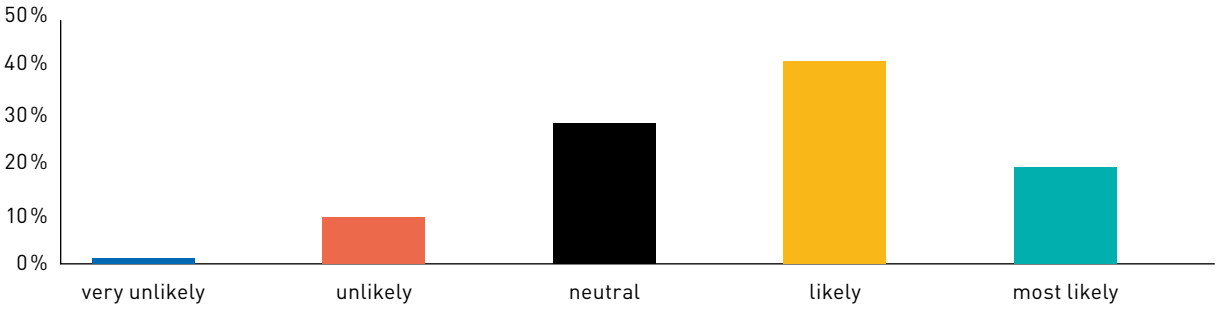
Question 1: How high would you say the need for transformation in the healthcare sector is, and what would you say is the level of willingness and ability to undergo such a transformation among the following key stakeholders?



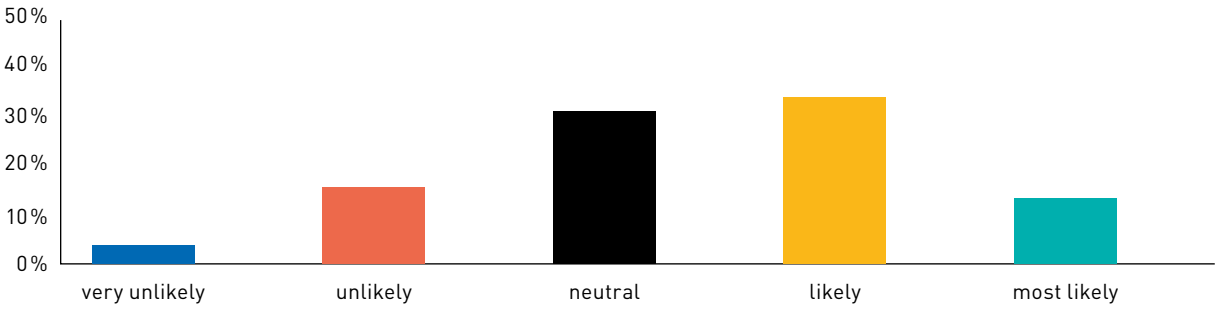




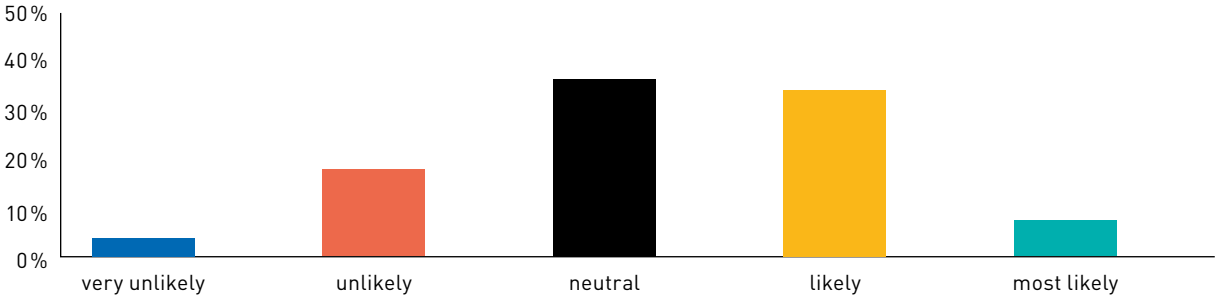
Theory 1: In 10 to 15 years, tech companies will shape the healthcare system as much as they do the media, music, travel and financial sectors today.



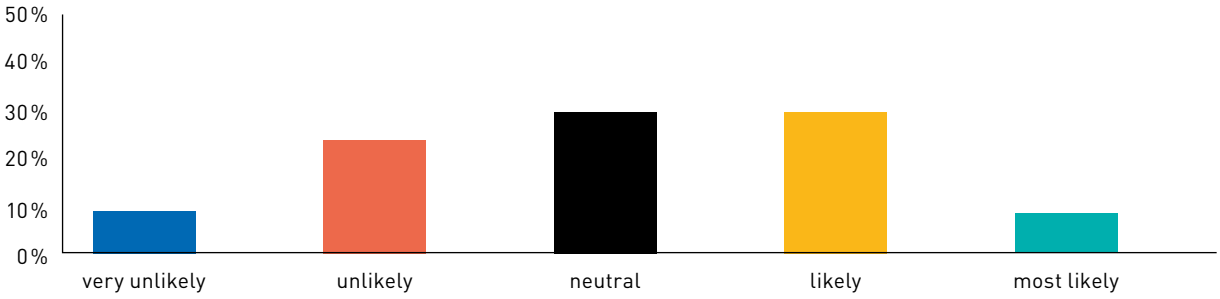
Theory 2: In future, all medication-based treatments will be provided together with supportive digital behavioural tools.



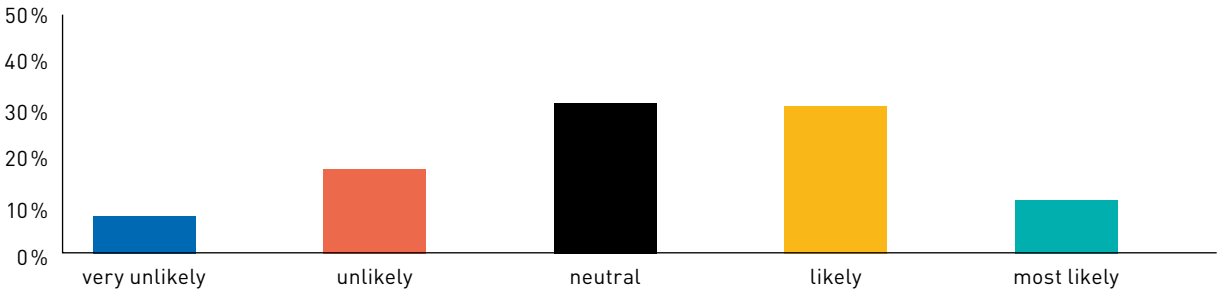
Theory 3: Thanks to improved prevention, the health of the Swiss population will improve by 50% on average in the next 20 years, similar to improvements already observed in dental health.



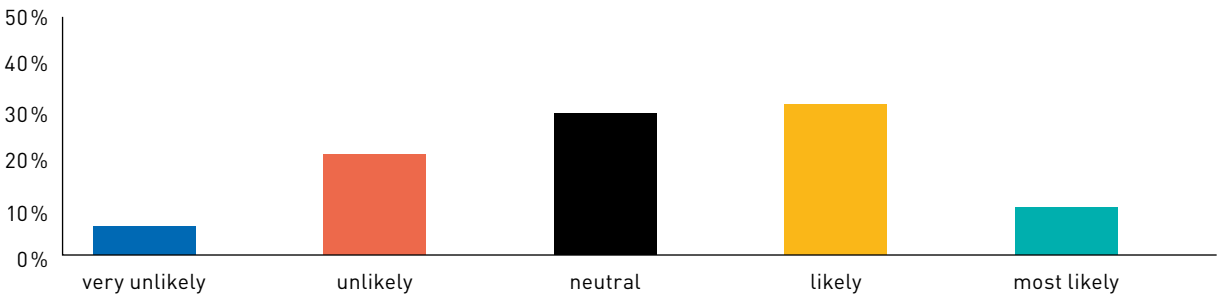
Theory 4: In the next 10 years, virtual doctor's appointments via smartphones or computers will become the norm and the number of inpatient treatments will reduce by at least 50%.



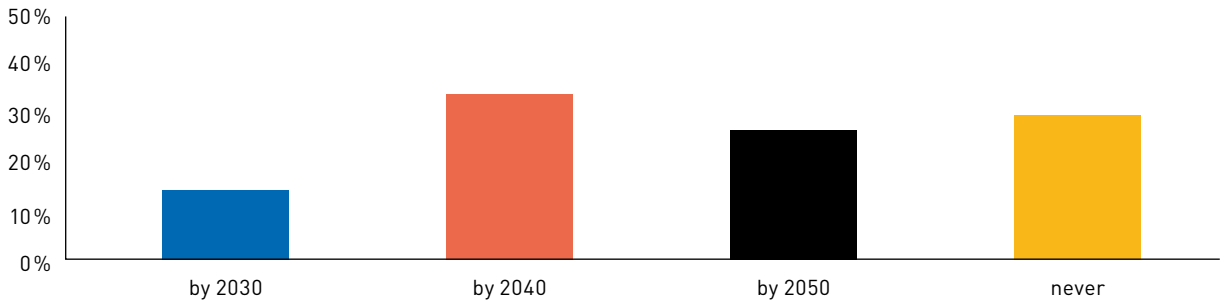
Theory 5: In the next 10 to 15 years, most medical practices and hospitals will offer a self-check-up using do-it-yourself tests.



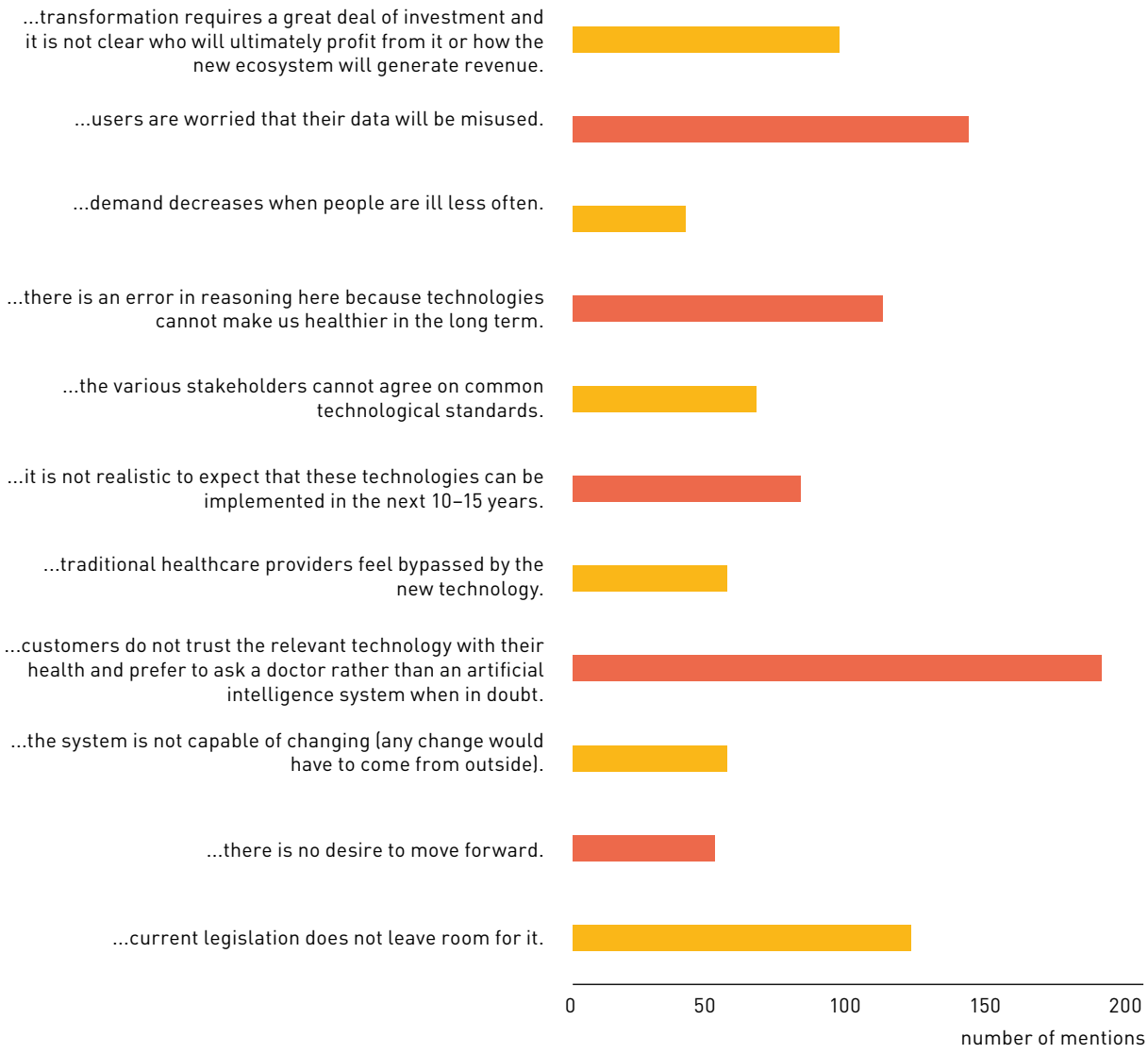
Theory 6: In the next 10 to 15 years, more than half of patients with chronic disease will be automatically monitored and cared for in real time wherever they are via smartphones and sensors placed in and on the body.



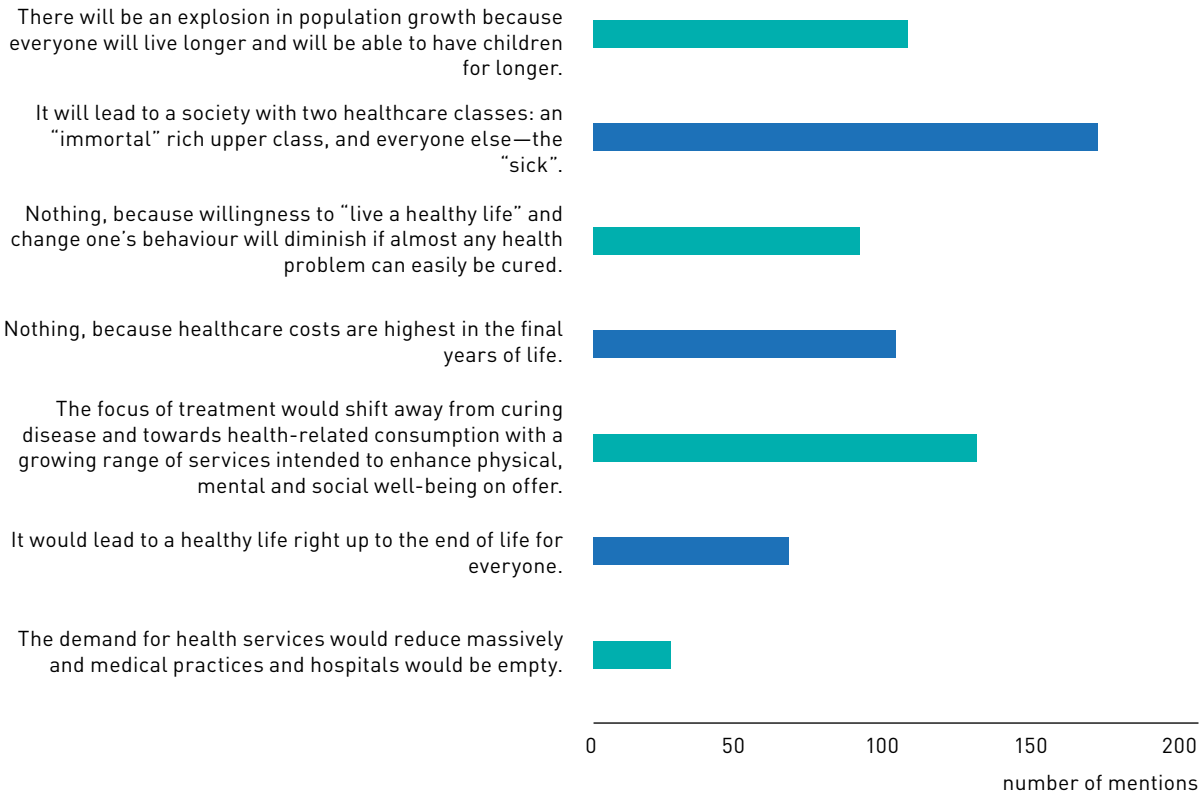
Question 2: When will AI doctors take over primary care of patients?



Question 3: What are the three most important factors impeding the creation of a new healthcare system in Switzerland (you can select multiple answers)? Innovation in the healthcare sector is mainly being slowed or hindered because...



Question 4: What would change most within the healthcare system with a breakthrough in anti-aging medicine (you can select multiple answers)?



Experts

Several workshops were held to discuss these theories on the future of the Swiss healthcare system. Many thanks to the steering board and all the experts involved for their valuable contributions.

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Selected literature

Atlas, S. W. (2016): Restoring Quality Health Care: A Six-point Plan for Comprehensive Reform at Lower Cost. Hoover Press.

Arbesman, S. (2017): Overcomplicated: Technology at the limits of comprehension. Penguin.

Baumol, W. J. (2012): The cost disease: Why computers get cheaper and health care doesn't. Yale university press.

Bosshart, D., Frick, K., Kwiatkowski, M. & Thalmann, L. (2018): Die neuen Techniken des Glücks. GDI Gottlieb Duttweiler Institute.

Boyle, M. (2020): Checkup for $30, Teeth Cleaning $25: WalMart goes into Health Care. Bloomberg Businessweek. Online: https://www.bloomberg.com/news/articles/2020-02-25/walmart-takes-on-cvs-amazon-with-low-price-health-care-clinics

Emanuel, E. (2020): Which Country Has the World's Best Health Care? PublicAffairs.

Emanuel, E. & Cowen, T. (2019): Emanuel Ezekiel on the Practice of Medicine, Policy, and Life. Conversations with Tyler Cowen.

Global Wellness Institute (2018): Global Wellness Economy Monitor. Global Wellness Institute.

Kraft, D. (2020): Daniel's Future of Medicine Newsletter. Online: https://danielkraftmd.net/newsletter

McKinsey & Company (2020): Digital Health @ Worldwebforum. Digital health ecosystems, hybrid care pathways and data ethics in healthcare. McKinsey & Company.

Tainter, J. (1988): The collapse of complex societies. Cambridge University Press, Cambridge.

Thompson, B. (2018): Amazon Health. Online: https://stratechery.com/2018/amazon-health/

Topol, E. (2019): Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again. Hachette UK.

Rees, T. (2020): From the Anthropocene to the Microbiocene. The novel coronavirus compels us to rethink the modern concept of the political. Online: https://www.noemamag.com/from-the-anthropocene-to-the-microbiocene/

Vaillant, G. E. (2002): Ageing Well: Surprising Guideposts to a Happier Life from the Landmark Harvard Study of Adult Development. Scribe Publications.

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