Data, analysis, perspectives | No. 2, 2022

Tech Giants in Healthcare

Building on opportunities to improve care – sustaining solidarity-driven healthcare

- **Innovation:** Having recognized the enormous potential of innovations in healthcare, global tech giants are rapidly developing a variety of digital products and services for use in the sector
- **Dominance:** Leveraging their market power, digital expertise and the availability of data, the tech giants are able to play a dominant role in the sector's digital transformation
- **Ambivalence:** While digital innovations delivered by the tech giants pose challenges to solidarity-driven healthcare, they also create opportunities to improve healthcare delivery
- **Balance:** We need healthcare policies that articulate clear rules and guidelines for promoting innovation without undermining the principle of solidarity

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From smartphones that serve as navigation systems in cars to ordering groceries via messaging apps to consulting Alexa or Siri for weather updates or sharing a story on Instagram, TikTok and the like – the digital devices and services provided by global tech companies have been shaping our daily lives for quite a while now. In recent years, these "tech giants" have also discovered the healthcare market as an arena for themselves. Taking on an increasingly powerful role in the sector, they promise to radically improve the future of healthcare and human health, deliver early disease detection, improve treatments, and to develop groundbreaking technologies and innovative products that benefit patients.

One of the key pillars of the tech giants' power to innovate is the vast amounts of data they have at their disposal. With the help of algorithms and artificial intelligence (AI), corporations are seeking to exploit the potential of this data, which is often generated by the use of billions of smartphones around the globe.

The relevance of digital applications in solving complex healthcare issues has been made abundantly clear by the coronavirus pandemic. Essential to research on vaccine and therapy effectiveness, big data is also required to ensure the feasibility of warning systems and contact tracing as well as the adoption of measures designed to contain the virus. However, the pandemic has also underscored just how far behind the German healthcare system is in terms of digital transformation. The use of fax machines to report infection data is just one prime illustration of this problem.

This state of affairs begs the question: How well prepared is Germany to deal with the tech giants' impact on healthcare?

To explore this question, a team led by ethicist Christiane Woopen (initially at the University of Cologne's ceres research center and later at the University of Bonn's Center for Life Ethics) compiled on behalf of the Bertelsmann Stiftung a survey of the tech giants' global activities in the healthcare sector and examined these activities from the perspective of ethics. The analysis focused on the following issues:

- Which healthcare products and services are already in use or under development by the tech giants?
- What do the tech giants seek to achieve in the healthcare sector?
- What are the ethically relevant challenges – and opportunities – emerging from the tech giants' innovations?

The findings summarized in this issue of Spotlight Healthcare show that tech giant activities and innovations are creating a number of opportunities to improve the quality of healthcare. The task of health policy is to identify and promote such opportunities, to harness them within the boundaries of a clear framework while, at the same time, ensuring that the German health care system as a whole remains grounded in solidarity.

Which tech giants are active in the healthcare sector?

The study uses the term "tech giants" to refer to those tech companies that stand out for their vast expertise in digital technologies and for the massive financial, human and technical resources they have at their disposal. Having achieved such success in areas other than healthcare, the tech giants' entry into the healthcare market is driven primarily by their commercial aims. At the same time, however, they claim to be using digital innovations in order to facilitate healthy behavior, improve healthcare and thus promote individual and public health. According to the study, a total of 16 companies meet these criteria and are active in various areas of digital health (see Figure 1). At the end of 2021, 13 of these companies ranked among the world's most valuable corporations by stock market value. Backed by their vast financial resources, these companies can also acquire promising startups and thereby expand their areas of expertise.

Overview of tech giant activities in relevant application areas

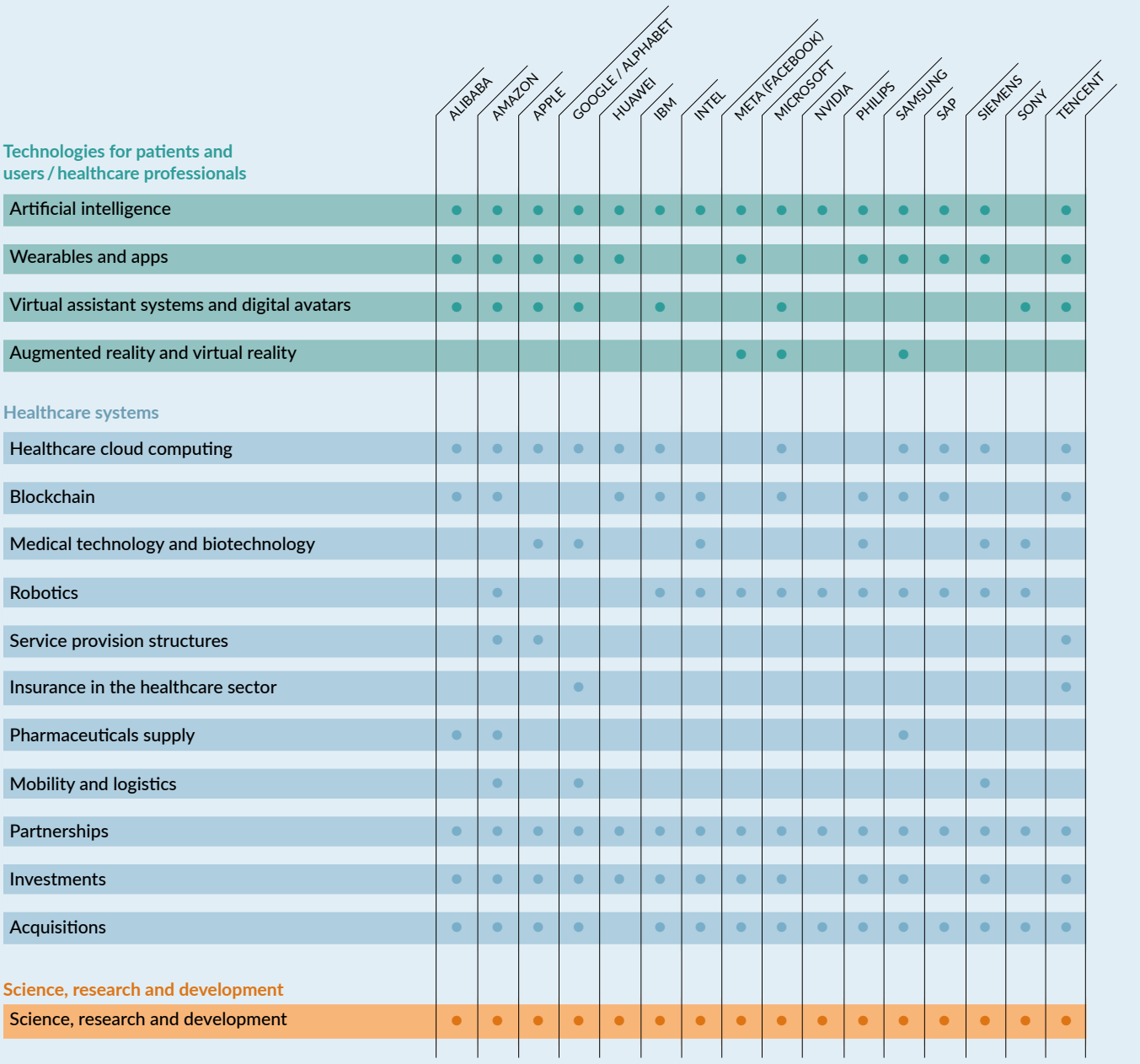

Figure 1 | Source: The authors

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The products and services provided by tech giants require above all enormous amounts of data. These companies have massive capacities when it comes to collecting and managing data – which often includes personal health data – as well as processing it with the help of AI systems. This data flows into the development of various things like storage and analysis platforms as well as disease-specific applications designed for use in precision medicine.

An enormous range of activities

The study clearly demonstrates just how broad and, in some cases, deep the activities of all 16 companies are in the healthcare sector (see Figure 1). In addition to the enormous range of tech giant offerings in the field, the study's overview provides the details of their specific products, services and cooperations and classifies each in terms of the targeted market position

and objectives. They are thus grouped according to the four following areas:

Technologies for individual use

Whether through smartphones, smartwatches or fitness trackers, firms such as Apple and Samsung can collect in real time vast quantities of health-related data with the help of wearables and health apps. Used mostly in the prevention, wellness and lifestyle areas, these applications record vital sign data, the number of steps a person takes, how many hours they sleep or the number of calories they consume. Equally popular tech innovations include AI-based voice assistance systems that provide access to health information or services and are also a source of user-generated data.

Tech giants often merge the collection of data with applications used in daily life. While in the case of some Asian companies, ethically dubious practices are tolerated when it comes to evaluating individual behaviors monitored by these applications, the great potential borne by these health technologies for personal use is undisputable. After all, they are elevating users' awareness of daily lifestyle choices and are promoting prevention in healthcare.

Technologies for healthcare professionals

Wearables are also being used to improve medical professionals' access to patient data and to optimize complex workflows. AI-powered software is used to assist with diagnostics and decision-making processes in individual treatment planning. Platform solutions are also making it easier for experts to network with each other in sharing their knowledge. Virtual assistance systems are reducing the burden of administrative tasks. These technologies all aim to improve the quality of care and reduce healthcare professionals' workload.

The healthcare provision system

Many tech giants are investing considerable resources in so-called healthcare cloud computing. The technology enables actors in healthcare to store, collate and manage large amounts of data and to network with actors in other sectors of the healthcare system.

Areas of application examined

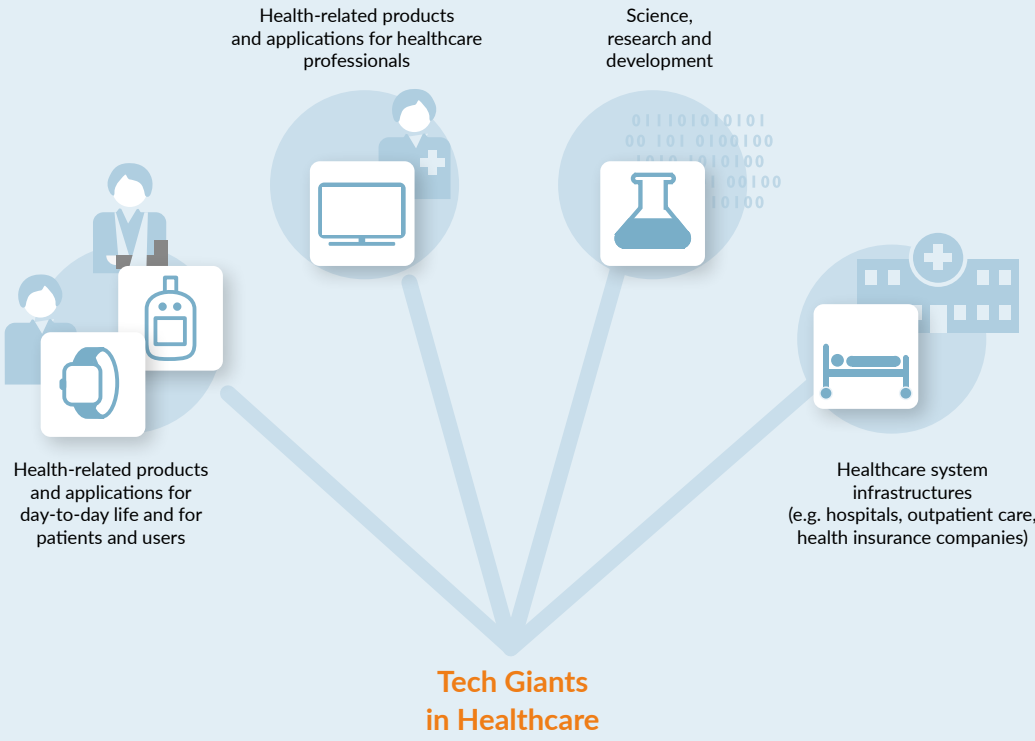

Figure 2 | Source: The authors

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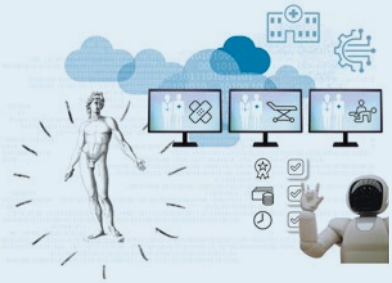
Transformation in healthcare and the healthcare system

Strengthening data-based prediction, prevention and precision medicine

- The collection of large amounts of health-related data from different areas of life and real-time data processing by AI systems is leading to a shift in focus in the medical field
- Sometimes referred to as P4 medicine (preventive, predictive, personalized and participatory); individualized, personalized, or stratified medicine; disease interception; or precision medicine

Multidimensional change in competencies of healthcare professionals

- A need to constantly update health profession skill sets in the provision and organization of healthcare services
- Change in health professions' required skills and self-conception
- Emergence of new health professions
- Redesign of education, training and continuing education programs



Monopolization and dissolution of sectoral boundaries due to digital healthcare

- Traditionally separate sectors become less distinct and begin to merge due to the digital availability of health data in a highly digitally networked system (integration of outpatient, inpatient and rehabilitative sectors; public and private sectors)
- Great financial, human and technological resource advantages give tech giants a lead in collecting and processing huge amounts of data, and in the (further) development of AI systems

Linking everyday care and research to a learning healthcare system

- Data from everyday healthcare is generated, combined and processed for research purposes
- Research findings are systematically introduced into everyday care
- Everyday care and research are linked in a regulated cycle of knowledge generation and knowledge application

Figure 3 | Source: Authors. Illustration: Ines Meyer, published in "Tech Giants in Healthcare"

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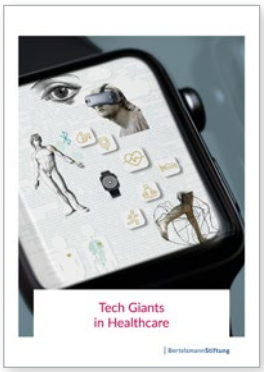

The "Tech Giants in Healthcare" study is available for download at www.bertelsmann-stiftung.de/digital-patient

Many of these companies are also active in the pharmaceutical supply sector and focus primarily on retail and logistics. Some of the tech giants even offer their own online pharmacy or manufacture pharmaceuticals themselves. In the United States and China in particular, some of the large tech companies are also focusing on establishing the infrastructures needed to provide medical services and help cover the costs incurred. This includes setting up telemedicine care facilities, insurance companies that offer health-related services, and healthcare service providers being offered as part of an employee benefit package.

Seeking to tap even deeper into the healthcare market, many tech giants are entering into international collaborations and partnerships with other facilities and businesses such as private hospitals, outpatient care providers and medical technology companies, which has resulted in a wildly diverse range of projects. Various investments in or acquisitions of healthcare startups are also helping to expand large tech companies' corporate structures and healthcare portfolios.

40.12

billion USD is the projected value of AI in healthcare by 2026 (Medgadget 2020).

3

billion USD is Apple's market value (as of early 2022; roughly equivalent to the Germany's annual economic output)

8.4

billion voice assistants projected to be in use by 2024 (which will exceed the global population. Source: Business Wire 2020; Moar and Escherich 2021)

Science, research and development

Collaborating with academic institutions or other healthcare companies is an attractive option for tech giants. Thanks to the availability of vast sets of data culled from the science and research communities, they can develop products and services that target specific needs. This can involve anything from improving diagnostics to developing innovative AI models and advancing research efforts. The world's tech giants are therefore rapidly establishing themselves as an integral and powerful actor in the world of science.

> "Tech giants can play an important role in efforts to build a learning health system. This potential should be leveraged. However, we need to ensure compliance with ethical standards as well."
>
> **Prof. Dr. med. Christiane Woopen**

Tech giants' power in digital transformation

Tech giants already play a major role in the digital transformation of healthcare (see Figure 2) and are thus increasingly relevant actors in the field. They have, in fact, penetrated certain areas of healthcare much more so than other actors. Other companies simply cannot compete with their vast tech expertise and access to massive pools of data.

Broadly speaking, European tech companies tend to focus on applications designed for use in clinical areas or with specific conditions. In contrast, U.S. companies have the power to shape the market through developing their business models and projects using pools of data from different areas or everyday life. Able to harness vast amounts of data with their products, Chinese companies are also now evaluating and monitoring user behavior.

Both opportunities and risks associated with tech giants

Exactly what impact are tech giant activities having on solidarity-driven healthcare systems such as the German system? The study's ethical analysis points to ambivalent trends.

On the one hand, the immense innovative power of these companies is creating great opportunities and considerable added value – for citizens, healthcare professionals and the science community. Their innovative products and services are opening up opportunities to establish cost-efficient, sustainable and patient-centered care, which is tremendously beneficial for everyone within the healthcare system (see Figure 3). In addition, the exchange of digital information allows patients to be more involved in various aspects of their care – from being admitted to the hospital to rehabilitation to follow-up treatments.

Opportunities and challenges, at a glance

Opportunities	Challenges
Shift to patient-centered care supported by the efficient collaboration of multidisciplinary healthcare teams across sectors improves health, safety and sustainability	Overregulation and a failure to implement integrated digital structures in Germany / Europe; interest group lobbying frustrates public policy; lack of interoperability of data
More efficient integration helps improve data access and data exchange	Poorly designed systems and cyberattacks create privacy and security risks; inefficient standards and structures for data access and exchange
Integrated, patient-centered care strengthens patient self-determination	Equal access and participatory justice are compromised by a lack of technical resources and insufficient digital skills
Great potential for added value (time and financial resources, quality of care)	Private or even exclusive healthcare offerings and unequal access to digital resources undermine justice and solidarity; an insufficient involvement of the tech giants in the further development of digital healthcare
Networking, collaboration and the introduction of value-based care approaches foster sustainable development, also recognising diversity	Tech giants can inhibit justice and solidarity by influencing the operation of state structures or by establishing parallel structures; freedom and diversity are compromised if tech giants gain substantial power to shape individual and social life through the gradual development of monopolies and dependencies (e. g., data-driven, technological and financial power)

Figure 4 | Source: The authors

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On the other hand, the monopolistic position of some tech giants in certain areas also poses challenges to the healthcare system, especially with regard to issues associated with equal access and participation as well as safety. Given their enormous data-driven, technological and financial power, these companies have the capacity to not only build parallel systems but shape entire areas and even infrastructures within the healthcare sector and thereby acquire the power to shape individual and social life.

There is a risk involved with actors in the German healthcare system failing to regulate the digital transformation of their sector and to cultivate the skills needed to deal with innovative technologies: The German healthcare system could miss the boat in terms of its digital transformation and fall even further behind on international comparison. The quality of care in the country could suffer as a result.

How can the technologies, applications and structures developed by the tech giants be incorporated into or complement the state-managed system of care? How can we meaningfully leverage the enormous potential provided by these products? More specifically, how can we deal with the tech giants' dominance of the data market? Can we effectively regulate battles over the distribution of data? Can we do so without making current regulation even more complex and thus slowing down efforts to digitalize? Promoting both public and professional debates on these issues and striking the right strategic balance in formulating solutions are the key tasks facing health policymakers today.

Recommended actions

Leveraging opportunities and minimizing risks

The tech giants will continue to penetrate the healthcare market. Their expertise with digitalization and their innovative strength can be taken as an opportunity to improve healthcare in Germany. At the same time, however, ethically relevant challenges must also be addressed. This includes preserving the principle of solidarity that underpins the German healthcare system. The following measures should therefore be taken into consideration.

Initiate political and public debates

- German and European health policy should first create a clear regulatory framework. This framework should define under which conditions and according to which rules cooperation with tech giants is possible. It should also specify how to integrate their innovations rapidly and beneficially.
- Health policy should initiate a public debate in which ethical principles for dealing with tech giants are discussed and developed, and which involves the public in determining the future of healthcare.

Promote innovation

- Public investment in the data economy and the development of AI should foster primarily innovations that conceive of data as a common good rather than a commodity.
- Funding programs should be created to provide opportunities for accessing data in ways that allow smaller players to leverage their innovations for the common good.
- Voluntary and participatory measures as well as creative efforts to acquire individuals consent to share their data should be introduced to promote data-sharing.

Establish clear data-handling regulations

- Access to health data should be regulated so as to prevent individual actors from acquiring a monopolistic position. This applies to both health system data and user-generated health-related data.
- Germany's proposed health data use legislation should include legal provisions that apply to all data holders, including the tech giants, on how to handle and share data. The same applies to the planned European Health Data Space initiative.
- Clear legal regulations at both the European and national levels must ensure that health-related data and the risk profiles they help generate cannot be misused.

Cultivate a learning healthcare system

- Healthcare policymakers should draft a strategy to develop and implement a learning healthcare system. Doing so will require allowing for the greatest possible transmissibility of data between care systems, research and development. Findings culled from analyses of data must be rapidly integrated into care systems to improve services and treatment.

Additional recommended actions are provided in the final chapter of the study.

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