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GIHF^{AI}

German Israeli
Health Forum for
Artificial Intelligence

An inventory

Digitization and innovation in German and Israeli healthcare

The German healthcare system is among the best in the world. According to the Prosperity Index published by the London-based think tank Legatum Institute in 2019, Germany ranks 12th out of 167 countries. Leading are Singapore, Japan and Switzerland, followed by South Korea and Norway.¹

Israel is ranked 11th and thus directly ahead of Germany. Its efficient and modern healthcare system attracted international attention at the latest during the corona pandemic, which earned the young Middle Eastern state with a population of around 9 million the titles "vaccination world champion," "laboratory of the world" or "corona role model".

This was helped in particular by the country's highly digitized healthcare system and the effective use of artificial intelligence (AI) in the medical context. With a score of over 70 percent on the Bertelsmann Digital-Health-Index, which is considered a reliable measure of the degree of digitization in the healthcare sector, Israel ranks fourth internationally. By comparison, Germany ranks second to last out of 17 countries analyzed and thus has an urgent need to catch up in the area of digital health.²

A close exchange with Israel, where the digitization of the healthcare system began more than 25 years ago and whose healthcare industry is now one of the leading beneficiaries of artificial intelligence (AI)

and machine learning (ML), brings enormous potential. To understand what such cooperation might look like, it is essential to take a close look at the emergence and development of Germany's and Israel's healthcare ecosystems.

The German healthcare system

Around 1,900 hospitals, 150,000 physicians and approximately 28,000 psychotherapists working in outpatient care serve the German population. In 2019, healthcare spending amounted to 411 billion euros, which is 11.9 percent of the gross domestic product. This is supported by the solidarity-based health insurance system, which is based on the state social insurance system introduced by Imperial Chancellor Otto von Bismarck in 1883 – the first in the world. The social insurance contributions paid by employers and employees to the health insurance funds finance the medical services. The legal basis of social insurance is the Social Security Code.³

Today, there are about 100 statutory health insurance funds (Gesetzliche Krankenversicherungen; GKV), in which 88 percent of citizens are insured. All insured persons receive the same benefits and the general contribution rate is based on salary: those who earn more also pay in more. In contrast, the insurance contribution for private health insurance (Private Krankenversicherung; PKV) is generally

based on the risk of the insured. With around 7.9 million members, Techniker Krankenkasse is currently the largest statutory health insurance fund in Germany. The private health insurers have a total of less than 9 million insured.⁴ Since 2007, insurance has been compulsory for statutory health insurers, and since 2009 also for private health insurers.

By way of comparison, there are two other types of health care systems in the global context besides the social insurance system. These are, on the one hand, state health care systems, such as in Sweden, where medical care is financed entirely from the state budget. On the other hand, there are market-based systems, as in the USA. Here, private actors are responsible for financing and managing health care.⁵

“
The public health system in Israel, built on the foundations of social democracy, has saved more lives than anything else in the fight against Corona, and we will strengthen it.
 ”

Nitzan Horowitz, Minister of Health Israel, during the GIHF-AI kick-off event

nance Organizations). The largest and also Israel's first health insurance fund, Kupat Holim Clalit (Clalit for short), was founded in 1911 by a small group of agricultural workers. By the end of 1948, only 53 percent of Israel's Jewish population was insured. In the years that followed, Israel's health care system expanded, and within a decade, about 90 percent of Israelis had health insurance. In addition to Kupat Holim Clalit, there are three other health insurance companies in Israel today: Kupat Holim Maccabi, Kupat Holim Meuhedet and Kupat Holim Leumit.⁷

Unlike in Germany, where hospitals and clinics are funded by government or private agencies, HMOs maintain their own medical facilities. Insurance has been mandatory since the National Health Insurance Law was passed in 1995.

The Israeli health care system

Analogous to Germany, the medical care of the Israeli population is covered by the social insurance system, secured since 1954 by the State Insurance Institute under the auspices of the Ministry of Labor and Social Affairs.⁶

The foundation for this was laid by the Jewish community and the British military administration during the British Mandate time (1918 to 1948). At the time of the establishment of the state in 1948, the medical infrastructure of the Jewish state was relatively well-developed. The British Mandate Health Office was replaced by the Ministry of Health (Misrad HaBriut) in 1948, and regional health offices and an epidemiological service were established.

Medical services were already then provided by health insurance companies, known as Kupat Holim (Kupot Holim in plural) or HMOs (Health Mainte-

Today, 99 percent of the Israeli population is insured. They have access to a medical network consisting of around 350 hospitals and nearly 30,000 physicians.⁸ The majority of medical care facilities belong to health insurance companies, while a small proportion are privately owned. The four HMOs are required by law to provide all their members with a minimum package of health care services and treatments known as the "health basket" (Sal HaBriut). This "basket" is financed by social security contributions from employers and employees.

The Ministry of Health supervises the HMOs, and certain services are under the direct administration of the state. Measured against the high quality of Israel's health care system, health care spending at 8 percent of GDP in 2020 was low compared with that of other OECD countries, which averaged 9.9 percent. Before the corona pandemic (2000-2019), it was only between 6.9 and 7.4 percent.⁹ On the one hand, this speaks for the effectiveness of the

healthcare system and, on the other hand, explains the development urge for innovative and, above all, efficient healthcare applications.¹⁰

Digitization and AI in healthcare

Data is the gold of the digital age and the essence of AI

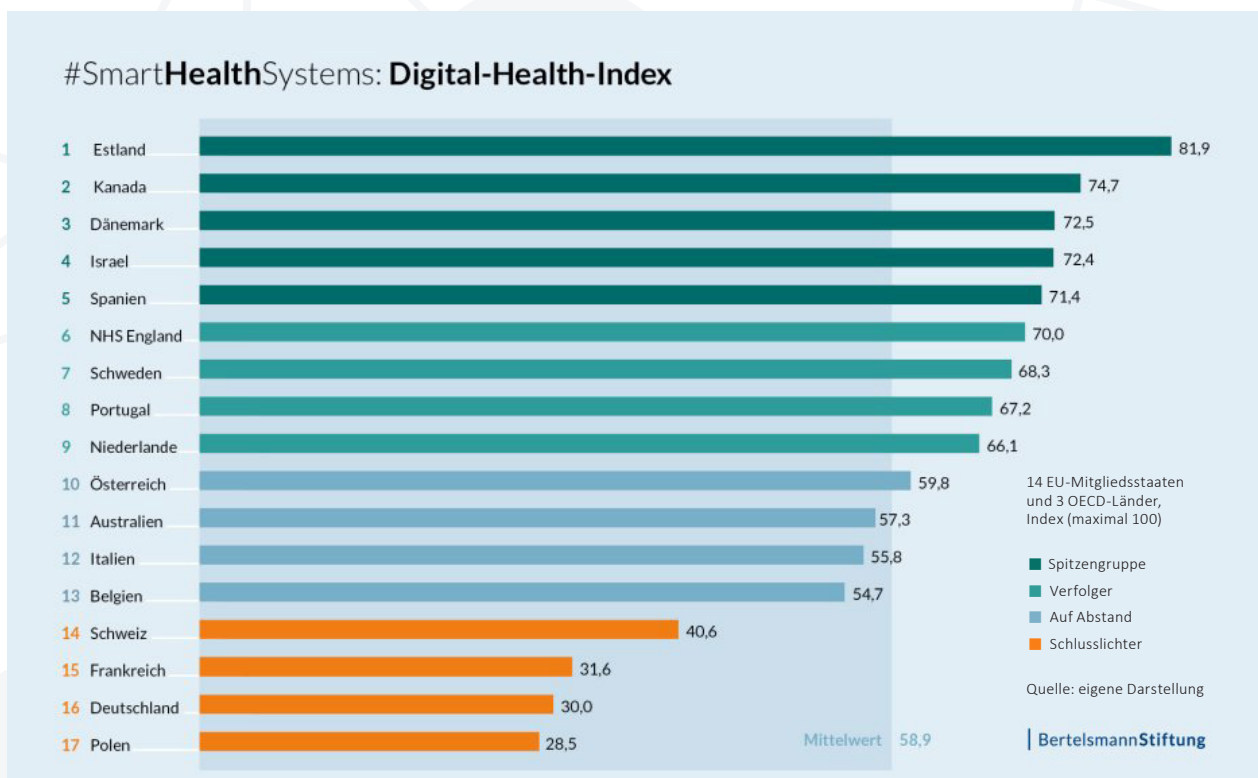
Whether in diagnostics, drug development, personalization of treatments and genome editing, AI applications are being used in a wide variety of ways in medicine. By strikingly improving diagnostic and treatment options on the one hand and increasing productivity on the other, they have the potential to revolutionize our healthcare system.

This is not about replacing doctors or nurses with AI but supporting their work and giving them more time for their patients. AI can take over certain activities, such as analyzing X-ray images or measuring vital signs. In addition, it can help with the development of drugs for rare diseases or personalized cancer therapies.¹¹ If we talk about the use of artificial intelligence in

healthcare, it quickly becomes clear that digitized patient data is the basic prerequisite for the effective use of AI in medicine. Artificial intelligence thrives on data, and the more data it has available for its learning process, the more precisely it can work. The keyword is Big Data, i.e. the availability of complex, multifaceted data sets.

In addition to quantity, the quality of the data and interoperability, i.e. the ability of different data systems to work together, are also important. The use of AI applications can therefore not take place without a digitized healthcare system with big data volumes.

A look at Germany's digitization status in the healthcare sector shows that we are still at the very beginning in this country, especially by international standards. In the above-mentioned Digital Health Index of the Bertelsmann Foundation, which compares 14 EU member states and 3 OECD countries in its study, Germany found itself in second-to-last place with 30 percent in 2018. By comparison, Israel landed in fourth place with 72.4 percent.¹²



Since the Bertelsmann Stiftung published its data, many important steps have been taken in this country toward a digitized healthcare system. Numerous new laws have been passed, such as the "Act for Better Care through Digitization and Innovation" (Digitale-Versorgung-Gesetz; DVG), which came into force in December 2019. It enables health applications to be obtained on prescription, the use of online consultations, and the access of the secure healthcare data network for treatments anywhere.

In terms of the reimbursability of digital health applications (Digitale Gesundheitsanwendungen; DiGA), Germany is even taking a pioneering role in a European comparison. In the meantime, the Federal Institute for Drugs and Medical Devices (Bundesinstitut für Arzneimittel und Medizinprodukte; BfArM) has added 30 DiGAs to its list, often within a few months thanks to the DiGA fast-track procedure.¹³

The same applies to the "Patient Data Protection Act," (Patientendaten-Schutz-Gesetz; PDSG) which was passed by the cabinet in 2020 to make, for example, the electronic patient record (elektronische Patientenakte; ePA) and the e-prescription usable. Additionally, medical findings, doctor's reports or X-rays, the vaccination card, the maternity passport, the examination booklet for children and the dental bonus booklet can also be stored in the electronic patient file as of this year. Use of the electronic patient file is voluntary for insured persons. They can decide for themselves who has access to which data.¹⁴

The Hospital Future Act (Krankenhauszukunftsgesetz; KHZG), which was passed in 2021, was also a special milestone for the digitization of hospitals. Within this framework, the federal and state governments will provide 4.3 billion euros for hospital digitization. The current results of the "DigitalRadar Krankenhaus," an evaluation of the maturity of German hospitals with regard to their digitization, make it clear that Germany has made significant progress in an international comparison.

However, there is still a great need for development, especially in the areas of clinical processes, information exchange, telemedicine and patient participation. There is also room for improvement in the sharing of structured data in the hospital sector and in interoperability between the prevailing software solutions. The average score of the so-called DigitalRadar-Score of German hospitals is 33.25 points out of a maximum of 100.¹⁵

Last but not least, the Research Data Center Health (Forschungsdatenzentrum Gesundheit; FDZ) at the BfArM needs to be mentioned. It is currently in the development stage and aims to give researchers access to the data of all people with statutory health insurance in Germany, with the goal of making the data usable for research purposes. From 2023, insured persons will also have the option of voluntarily making the data stored in the ePA available to research as part of a data donation.¹⁶

INFO

Artificial intelligence (AI):
 "Artificial intelligence is the umbrella term for applications in which machines perform human-like intelligence tasks. This includes machine learning, natural language processing (NLP) and deep learning.

The basic idea is to use machines to approximate important functions of the human brain- learning, judgment and problem solving."¹⁷
 (Source: SAP)

- AI is being trained using large amounts of data. The more data the AI is being made available for its learning process, the more precisely it can work. Furthermore, the quality and interoperability of the data are crucial.
- In the medical field, AI is being used in diagnostics, drug development, personalization of treatments and genome editing.

**Artificial
 Intelligence
 (AI)**

The current developments in Germany are certainly a step in the right direction. In addition, the corona pandemic clearly demonstrated the advantages of digital health and made them tangible. Due to quarantine and fear of infection, many patients had to rely on online therapy services for the first time, apply for their sick leave digitally, or receive a diagnosis via telemedicine.

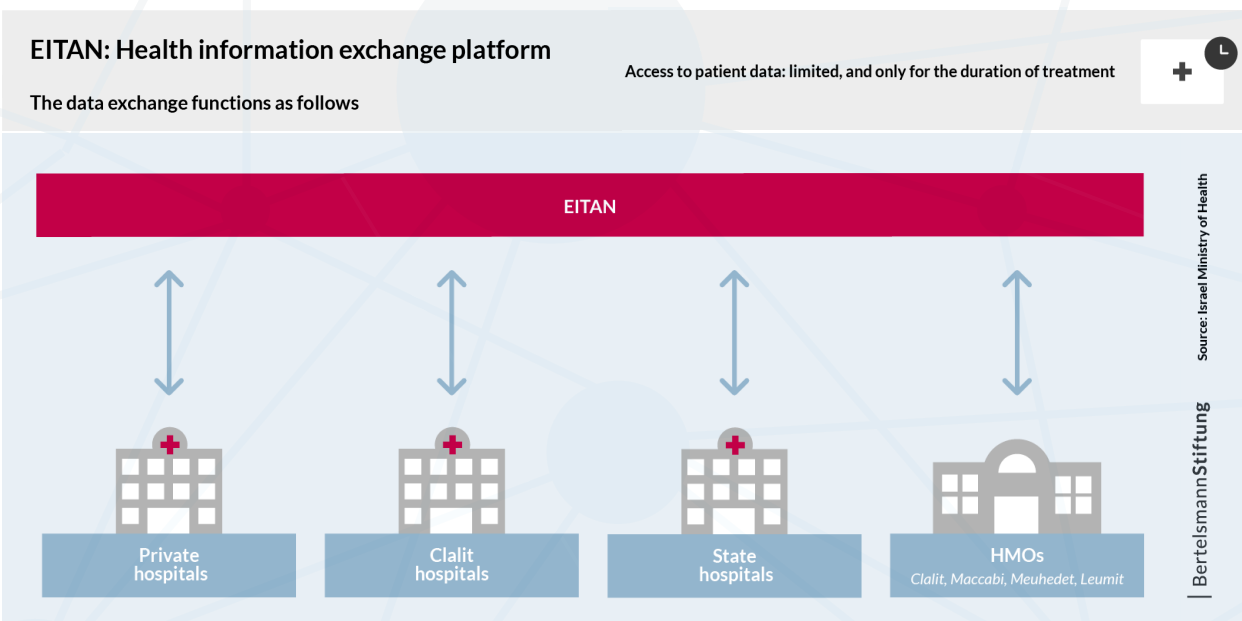
Still, progress is slow. Healthcare institutions complain about not having enough financial resources for digitization. In addition, there are problems to be solved with IT security, technical implementation and data protection. And although German research in the field of AI and health is growing significantly, it has so far had to rely on data that is already available or conduct research in international collaborations: with Israeli researchers for example, who have patient data of 99 percent of the 9 million inhabitants available almost entirely in digital form.¹⁸

Israel began digitizing patient data as early as 1995 as part of the aforementioned National Hospital Insurance Law. The 1996 Law for the Protection of Patients' Rights¹⁹ established binding standards

of conduct and codes for the protection of patient data. However, the data resided exclusively with the patients' respective HMOs. There was a lack of government regulation and coordination and cross-insurance data sharing. While this led to HMOs outdoing each other in developing and investing in digital health applications due to high competition among them, the data was not universally available for research and privacy issues also arose.

A turning point was reached in 2018 with the adoption of a national digital health development plan. As part of the approximately \$270 million government initiative, innovative projects were funded and the population's health data was further digitized.

Among other things, a Big Data platform called "EITAN" was built under the supervision of the Ministry of Health to use the data of all patients simultaneously and make it available to researchers, entrepreneurs and medical institutions. The data does not reside in a central database; rather, EITAN acts as a data exchange platform.²⁰



This same digital backbone of the healthcare system was instrumental in combating the COVID-19 pandemic, in Israel and beyond. The anonymized patient data available in the system related to vaccination was made available to a pharmaceutical company for COVID-19 vaccine research. It is important to understand that real-world data sets are scarce, and at the same time very important for drug and vaccine development.

The results of the vaccination studies supported by Israel's data pool could subsequently be used in various countries to develop vaccination and pandemic management strategies. Thus, not only Israel benefited, but the international community as well.²¹

AI in medicine - Germany

According to a 2017 study by PricewaterhouseCoopers (PwC) on AI in the healthcare industry, AI solutions were already being used in Germany before the corona pandemic: around 30 percent of German healthcare companies were using them in diagnostics, prophylaxis and the treatment of diseases or the prevention of severe disease progression.²²

Furthermore, numerous companies in the healthcare industry are conducting research on artificial intelligence and initiating innovative projects. And the government has also invested heavily in innovative AI-based healthcare applications in recent years: In 2018, the German government adopted the "Artificial Intelligence Strategy". With the strategy, it wants to render Germany and Europe into a leading location for AI, secure competitiveness as well as promote the diverse application possibilities of artificial intelligence in all areas of society.

Within this framework, the German Federal Ministry of Education and Research (BMBF) is providing around 230 million euros from 2018 to 2025, for example.²³ However, the technology has so far only made a very limited impact on patient therapy. According to a PwC study, 64 percent of stakeholders

in the healthcare sector are convinced that AI will fundamentally change our healthcare system in the next ten years.²⁴

In order to be able to benefit from the technological progress that AI brings with it, in addition to Big Data, it is above all necessary to adapt regulatory procedures, both at national and EU level (for example in the form of the Artificial Intelligence Act - AIA). Regulation is of utmost importance, especially when it comes to ethically sensitive issues regarding the use of AI, yet it must be prevented that patients are deprived of their right to innovative AI medical solutions through overregulation.

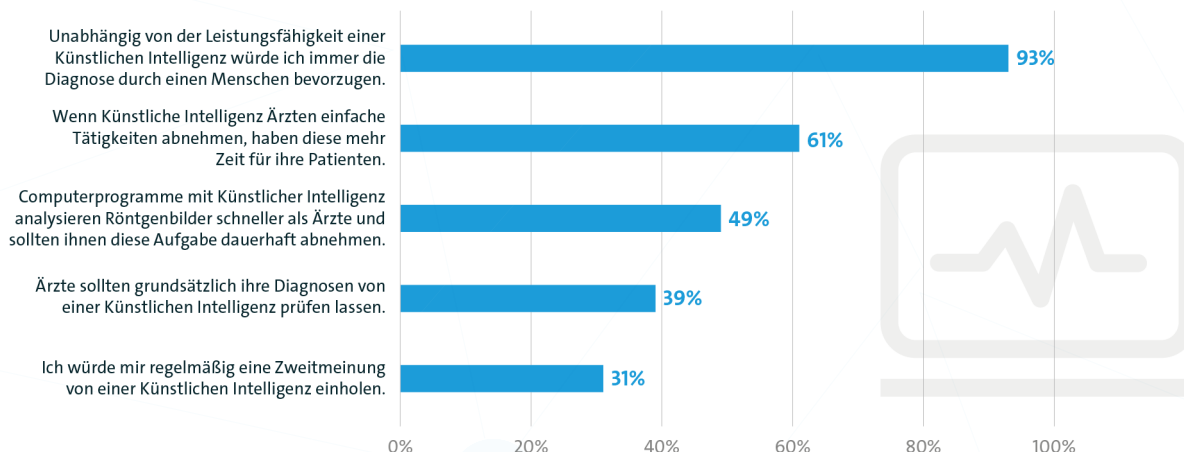
Fittingly, the German Bundestag's Enquete Commission "Artificial Intelligence- Social Responsibility and Economic, Social and Ecological Potentials" published its final report at the end of 2020 and called, among other things, for "politicians to decide to push for the framework conditions needed [for the introduction of AI in healthcare]."²⁵

In addition, AI must be made more understandable and the benefits of AI applications must be clearly demonstrated through trust-inspiring best practices. Because even though more and more people are recognizing the opportunities that artificial intelligence brings, and a majority expect AI to noticeably change society as early as the next five years (Bitkom 2019), skepticism prevails.

93 percent of respondents would prefer to be diagnosed by a human, and only 31 percent of respondents would regularly seek a second opinion from an AI in the future. In turn, 61 percent of respondents said that doctors would have more time for their patients if AI relieved them of simple tasks. So, on the one hand, there is still a lack of confidence in AI applications in medicine, and on the other hand, one of their greatest benefits is recognized: The workload reduction it provides to healthcare professionals, enabling them to treat their patients even better.²⁶

Jeder Dritte würde Zweitmeinung von einer KI einholen

bitkom



Translation graphic above:

One in three would seek a second opinion from an AI

1. Unrelated to the performance of an artificial intelligence, I would always prefer the diagnosis of a human- 93%.
2. When an artificial intelligence takes over easy tasks from doctors, they gain more time for their patients- 61%.
3. AI-based computer programs analyse X-ray images faster than doctors and should take over this task permanently- 49%.
4. Doctors should generally let their diagnoses be verified by an artificial intelligence- 39%.
5. I would get a second opinion from an artificial intelligence on a regular basis 31%.

AI in medicine - Israel

While regulatory barriers to the use of AI-enabled healthcare applications are debated in Germany and many people are rather skeptical of them, they have already made their way into the daily lives of many Israelis. This trend was further fueled by the Corona crisis. This is because, in addition to digitized patient data, there were three groups of digital technologies that served Israel in its pandemic response: First, systems related to surveillance, contact tracking, and reporting. For example, the Israeli Ministry of Health partnered with a startup to develop one of the world's first voluntary digital applications for contact tracking in the wake of the COVID-19 pandemic.

Furthermore, patient monitoring and diagnostics technologies have been deployed, with local startups rapidly developing numerous new tools. For example, an AI-powered remote triage system of COVID-19 symptoms in real time, or an app for early detection of symptom deterioration based on

vital signs measurement. Telemedicine also played a major role, allowing patients to continue to have access to medical examinations during a lockdown or when concerned about infection. In a very short time, considerable progress was made here in the development of eHealth products. Exemplary is an all-in-one solution for remote medical examinations that allows physicians to connect with patients at home to check their health status. In this context, these technological innovations, which were almost indispensable in Israel in the wake of the corona pandemic, have one thing in particular in common: they are based on artificial intelligence.

In addition, there are numerous other AI-based digital health applications that are being developed and used in Israel, as well as being used around the world. For example, a portable device (a so-called wearable) that enables blind, visually impaired, reading or otherwise disabled people to read. Or an analytics and diagnostics platform that helps diagnose and plan treatment for cancer, as well as a tool that interprets medical data to indicate life-threat-

ening conditions early. An app, on the other hand, only needs a quick glance at the smartphone to determine how high the blood pressure is and whether the oxygen saturation is sufficient. This is not science fiction, but reality. The range of possibilities that IT-supported systems are taking on in healthcare is almost endless. Since patients themselves decide whether and how they use the tools and which data may be passed on to treatment providers as well as healthcare institutions, they are 100 percent privacy-compliant.²⁷

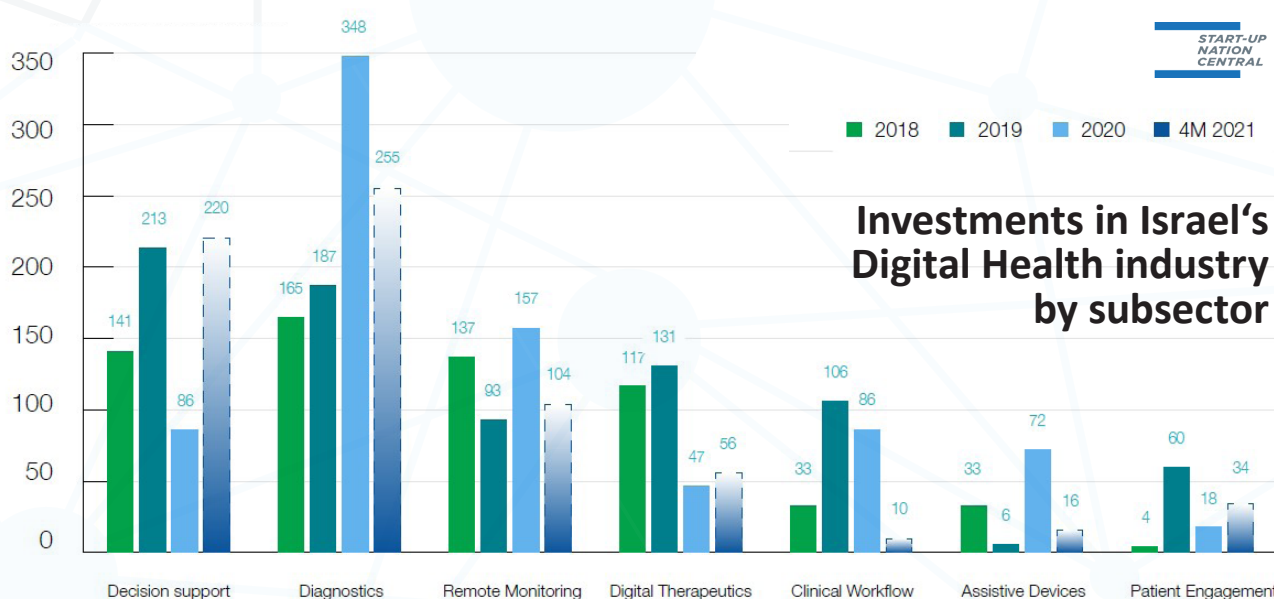
Artificial intelligence is now the fastest growing technology in the digital health sector in Israel, with 85% of total investments going to companies using AI solutions. As of today, there are more than 700 Digital Health startups – 85% of which are applying AI solutions. In 2018, the digital health ecosystem in Israel consisted of 537 startups, 4 HMOs, 32 multinationals, 4 incubators, and around 100 active investors. In 2019, \$662 million were allocated, in 2020 it were already \$813 million, and in 2021, \$700 million in the first quarter alone. Growth is difficult to forecast. However, it is certain that things are looking up. The question is only how fast that will happen.²⁸

Israel certainly has a major competitive advantage when it comes to developing AI-based health ap-

plications. The wealth of healthcare data, coupled with great expertise in the IT field and a strong culture of innovation, are the perfect breeding ground. Germany benefits from a medical ecosystem that has grown over generations, an established network of excellent scientists, and a large market for AI-based health applications. In addition to health insurers, pharmaceutical companies, medical technology manufacturers and software companies, this market is made up not least of the more than 80 million end users.

In the medical, scientific, economic and also political fields, both countries have a lot in common on the one hand. Both healthcare systems are based on social insurance, have a strong focus on digital health, and have been close trading partners for years. On the other hand, they complement each other. Israel's hands-on mentality and innovative spirit as well as IT know-how meet Germany's traditional healthcare and high density of medical research institutions and pharmaceutical companies.

An exchange of knowledge and cross-border cooperation between Germany and Israel on the application of AI in medicine therefore seems indispensable, not only against the background of close German-Israeli relations.



German Israeli Health Forum for Artificial Intelligence (GIHF-AI)

To exploit the recognised potential of German-Israeli cooperation in the field of digital health, the European Leaders Network (ELNET) founded a new initiative in 2021, the German Israeli Health Forum for Artificial Intelligence (GIHF-AI).

The GIHF-AI is funded by the German Federal Ministry of Health (BMG). It supports the exchange of knowledge and experience between Germany and Israel in the field of Digital Health with a focus on Artificial Intelligence (AI) and Machine Learning (ML).

The forum brings together experts from science, medicine, industry, research and politics and takes a multi-sectoral approach: it addresses the three core areas of technology and security, regulation, and communication and trust. The aim is to develop recommendations for action for policymakers through regular publications, dialog formats, workshops and annual conferences.

In addition, the forum also serves as a platform to build new bridges between the two countries. After all, the corona pandemic has once again made it clear to us: health knows no borders.

What added value can the responsible use of AI have in medicine?



Patients benefit from comprehensive applications that support their diagnoses and treatments.



The workload for healthcare staff is reduced and therefore it can better concentrate on patient care.



The increased productivity leads to cost savings, which favors investments in other areas.

About ELNET

ELNET aims to promote European-Israeli relations on the basis of common democratic interests and values in a non-partisan way. Our focus is on foreign and security policy, fighting anti-Semitism and promoting innovation. We are independent, non-partisan and nonprofit.

Our offices in Berlin, Brussels, London, Paris, Tel Aviv and Warsaw, as well as activities in Italy and Spain, strengthen the dialogue between European and Israeli decision-makers in politics, business and society. To this end, we have been supporting existing networks since 2007 with specialist publications, strategic dialogue events and delegation trips.

ELNET-Germany is supported by a large number of private individuals, foundations, institutional partners and companies. We receive project-related funding from various federal ministries.

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