远毅资本 MARATHON VENTURE PARTNERS

中国医药教育协会 CMEA

2022 Digital Health Innovation Report (updated)

数字医疗创新发展报告（更新）

Marathon Venture Partners

China Medicine Education Association

2022 Digital Health Innovation Report（updated)

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I. INTRODUCTION

Digital health is an emerging field empowered by the integration of digital technology and medical applications. Optimizing the entire prevention, diagnostics, treatment, and recovery process is achievable through digital health as it allows for the generation, collection, analysis, and application of medical and healthcare data. It also adds value to all parties involved in the medical and healthcare industry while bolstering the development of the healthcare system. From Healthcare IT in the late 1970s to Internet Healthcare in the early twentieth century, and then to Digital Health Innovation since 2016, the digital health industry is well and thriving.

The *China Digital Health Innovation Report* is the first comprehensive report on Digital Health in China jointly published by Marathon Venture Partners and the China Medicine Education Association with inputs from numerous industry experts.The report presents the perspective of the overall evolution of the digital health industry and explains the ground-breaking development history and important aspects of the emerging medical and healthcare industry empowered by digital technology. Starting from the stage of Healthcare IT to the stage of Internet Healthcare and then the stage of Digital Health Innovation, the report highlights the basic definition and characteristics of digital health.

Furthermore, the report describes the entire chain of healthcare data and provides a summary of the data from hospitals, internet, life science and technologies, pharmaceutical enterprises, device companies, insurance business, etc. The report also includes a summary of the innovation trends in the digital health industry in 2022 in four major segments——the entire diagnostics and treatment process innovation, hospital management innovation, medical payment innovation, and pharmaceutical and medical device enterprises innovation. The report also provides a retrospective analysis on the global and Chinese digital health investment and financing trends.

"Digital health is an emerging field resulting from the integration of digital technology and medical practice that can empower doctors' diagnostics and treatment, education, research, and management in a holistic manner. Despite a relatively late adoption of digital health in China's healthcare system, it is advancing rapidly. Since the outbreak of the pandemic, healthcare practitioners have experienced significant changes in their daily work life due to limitations brought by physical isolation. However, digital technologies represented by 5G, AI, and cloud computing have been invaluable in helping healthcare practitioners leverage existing resources. New business formats such as digital clinical experiments, auxiliary diagnostics, disease management, digital therapies, and medical robotics are emerging quickly, showing strong growth resilience and potential in the digital health field. Meanwhile, it is also important to recognize challenges including emerging of undefined concepts, uncertain profitability, unbalanced talent structure, and lack of connection in commercializing the scientific findings.

The 2022 Digital Health Innovation Report unravels the development history of the digital health industry, explains the value and innovation opportunities brought by the collection of digital technology-enabled healthcare industry for all stakeholders in the healthcare industry as well as the healthcare system, and systematically reviews the industry's development practices. Additionally, the report provides a cutting-edge interpretation and prediction of groundbreaking trends in the digital health industry through innovative thinking of the entire healthcare data chain and continuous observation of the global landscape of the digital health industry, combined with investment practices of Marathon Venture Partners. Hopefully, this can effectively promote the strategic development of the digital health industry.

In the future, digital health will significantly influence the development of the medical and healthcare service system, lead the innovative development of healthcare modernization in the process of building a healthy China and enhance the restructuring of the medical service system. Moreover, digital health will contribute more to safeguarding people's health and life safety. Let's look forward to a brighter future for digital health!"

-Huang Zhengming, President emeritus of the China Medicine Education Association, Academician of the United Nations International Academy of Ecology & Life Protection Sciences

II. OVERVIEW OF DIGITAL HEALTH INNOVATION

2.1 DEFINITION OF DIGITAL HEALTH

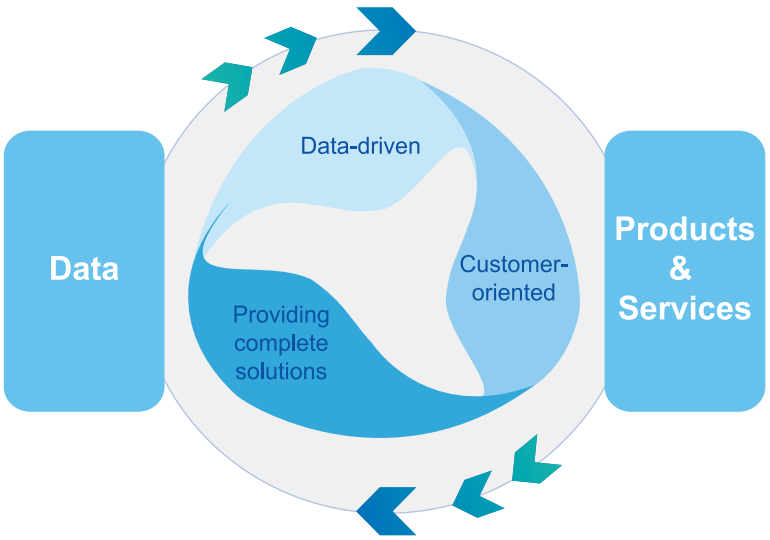
2.1.1 BASIC DEFINITION OF DIGITAL HEALTH

Digital health is the integration of digital technology with healthcare applications to empower the clinical pathway and healthcare value chain. Optimizing the entire healthcare pathway from prevention, diagnostics and treatment and recovery process is achievable through digital health leveraging generation, collection, analysis, and application of medical and healthcare data. It also adds value to the overall medical and healthcare industry value chain while bolstering the development of the healthcare ecosystem.

- Digital technologies:Artificial Intelligence, social networks, multi-omics, robotics, 3D printing, blockchain, Internet of Things， LLM, Generative AI, etc.
- Health pathway: Prevention, Screening, Diagnostics, Treatment, Rehabilitation and Health Management.
- Stakeholders: the public, patients, doctors, medical institutions, payers, regulators, and pharmaceutical and medical device enterprises.

2.1.2 FEATURE OVERVIEW OF DIGITAL HEALTH

Different from traditional healthcare, digital health is more focused on data and patient-centered solutions.



Basic Digital Health Features and Data Flywheel

◆ Data-driven

Data is the key element of production for digital health enterprises. These enterprises generate, gather, process, analyze healthcare-related data to apply to or create corresponding products and services. At the same time, they also create new data as they deliver digital products and services, creating a flywheel of “data-product/service”. This enables continuous product iteration to improve user experiences. In addition, the internal management and operations of digital health enterprises are highly digitalized. Efficient digital health enterprises rely on operational and management data for all organizational behaviors, enabling effective collection, processing, and analysis to inform objective decision-making. Organizations have become more agile and capable of adapting to a rapidly evolving external environment, and hence, the speed of innovation within the organizations has accelerated. Healthcare data is specifically characterized by a broad range of sources, diverse structures, uneven quality, protracted time cycles, data redundancy, and strict privacy. Digital health enterprises must have the necessary technical and operational capabilities to create a closed loop of products and businesses in response to these characteristics.

◆ Patient-centered Approach

Another important feature of digital health is being Consumer (Patient)-centric. Digital health solutions enable comprehensive collection of healthcare-related data to explore the underlying needs of their customers more accurately, and thus provide personalized solutions. Being customer-centric also fits well with the features of healthcare services. As a professional service, the demand and supply of medical services is highly personalized. In the non-digital era, healthcare providers used to provide relatively standard solutions for individual healthcare needs. However, in the digital era, they can provide more accurate and personalized solutions for different patients or different periods of time for the same patient, using digital and intelligent tools. Furthermore, digital health also shares common features of digital solutions such as interactivity and mobility, which further facilitate digital health enterprises to provide personalized solutions to customers and create superior experiences for patients.

◆ Total Solution, the convergence of products and services

Digital health enterprises provide total solutions to their customers. The line between products and services becomes blurred in digital health businesses. Product providers may provide related services that are compatible with products, and service providers may extract relatively standard value units from digital services to form digital products. Whether digital health enterprises feature products or services, they will gradually broaden the scope of their capabilities and eventually offer comprehensive solutions tailored to customer needs.

2.1.3 POLICY HIGHLIGHT IN DIGITAL HEALTH

In 2015, the State Council issued the *Guiding Opinions Concerning Actively Propagating the "Internet Plus" Plan*, which clearly explained the "Internet + Healthcare", that promoted a new online healthcare model, and provided specific navigation for mobile healthcare, Telehealth, internet health services, medical data sharing and medical big data platforms, etc. In October 2016, the *Healthy China 2030 Plan* was introduced, which included a high-level layout for the development of the digital health industry.

In April 2018, the *Opinions of the General Office of the State Council on Promoting the Development of "Internet plus Healthcare"* was issued, providing specific suggestions on the development of Internet + healthcare from three aspects: improving the "Internet + healthcare" service system, perfecting the "Internet + healthcare" support system, and strengthening industry supervision and security. In September 2018, the *Administrative Measures on National Health and Medical Care Big Data Standards, Security and Services* were introduced, which provided specific measures to strengthen the management of healthcare big data services and promote the development of "Internet + healthcare" from aspects that included management of standards, safety, service and management supervision.

In February 2020, for the purposes of leveraging the supporting role of information technology in helping pandemic research and diagnostics, innovating diagnostics and treatment mode, and improving service efficiency, the General Office of the National Health Commission issued the *Notice on Strengthening Information Technology to Support the Prevention and Control of COVID-19*. In June 2020, the *Program for Subgroups of China Healthcare Security Diagnostics Related Groups (CHS-DRG)* was introduced, proposing four requirements for localities to standardize DRG grouping, and further promoting the collection of digital health data and the development of payment platforms. In October 2021, the *Action to Promote High-Quality Development of Public Hospitals (2021-2025)* was introduced, which established specific requirements for leveraging digital power to consolidate the results of the "Action Plan to Further Improve Medical Services" and emphasizing the important role of public hospitals in safeguarding and improving people's livelihood.

In October 2022, the *Measures to Accelerate the Development of DTx (digital therapeutics) Industry in Hainan Province* was introduced, striving to build Hainan into a global innovative DTx (digital therapeutics) island, innovation resource cluster and industrial high ground with 2 to 3 years of efforts, and develop DTx (digital therapeutics) into a "new engine" for high-quality development of Hainan's healthcare industry. China's digital health sector is entering a rapid development phase, be it for clinical research and registration approval, application and promotion, or payment implementation.

Several policies have also been implemented nationwide to support the integration of digital economy with the healthcare sector and empower the transformation and upgrading of the traditional healthcare industry:

- Focusing on the development of digital health, **Beijing** has proposed several measures to promote trials to standardize data collection in digital health, improve digital technology supply capacity, build a digital technology innovation ecosystem, and expedite the development of the digital health industry.
- **Shanghai** is leveraging digitalization to promote basic livelihood security such as public hygiene and developing many digital demonstration scenarios such as smart hospitals and digital urban areas in a more balanced, accurate and adequate manner.
- **Suzhou** has launched a program for building innovative biomedical industry clusters to encourage the development of digital health services and the integration of BT (biotechnology) and IT (information technology).
- **Nanjing** hosted the International Forum on Innovations in the Smart and Digital Health Industry, where six global digital health companies were authorized and established. And Nanjing is expanding the smart and digital health industry cluster.
- **Hangzhou** has launched the “Digital Health Town” project to create a high-end digital economy and health industry cluster with strong competitiveness and international and regional enterprise-scientific research institution collaboration.
- **Tianjin** Binhai High-tech Zone has introduced Incentive Measures of Tianjin Binhai High-tech Zone to Promote High-Quality Development of Biomedical Industry and Incentive Measures of Tianjin Binhai High-tech Zone to Promote High-Quality Development of Cell and Gene Therapy Industry to further expedite the development of digital health enterprises.
- **Changsha** has established a healthcare related big data industry incubation base and built the Xiangjiang Digital Health Industrial Park.
- **Qingdao** has launched the Digital Health Technology Park, and the first eight digital health companies were centrally contracted and established.

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