

Healthcare

Digital Health: Total Convergence

Integrating technology to solve the world's healthcare challenges

A report by The Economist Intelligence Unit



Healthcare

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Foreword

“Nothing can stop an idea whose time has come”, a statement coined in the 1800s by the French writer Victor Hugo, still has relevance for our conversations on digital health today.

The time for leveraging technology to solve the most pressing healthcare challenges across the world has come. With the explosion of technological innovations ranging from artificial intelligence and big data technologies to ever more powerful sensors, the possibilities of using technology to improve healthcare are endless. The challenge now is less about technology than it is about finding viable models to implement those new technologies in order to make a real impact on the healthcare challenges that the world currently faces.

Clearstate, a business of The Economist Intelligence Unit has worked with and spoken to executives who have asked how their companies will be impacted by digital disruptions in healthcare, how quickly they need to respond and what their response should be. For some companies, meeting these challenges might be about business-model innovation; for others, it begins earlier, in figuring out the way that digital health is relevant to them, what areas of healthcare they can shape and influence, and where they need to adapt.

In this report, we examine how digital health is already changing the healthcare landscape in different parts of the world, in order to provide a deeper understanding of the topic of digital health, which has been dominating conversations in the healthcare industry. Based on this deepened understanding, we also examine the opportunities and challenges that lie ahead in terms of the practical realities of finding digital health solutions for the world.

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The preparation of this report engaged diverse healthcare stakeholders—patients, providers and industry leaders—in discussions and interviews to present a comprehensive and integrated picture of the digital health ecosystem.

We would like to thank all contributors and interviewees, including those who have chosen to remain anonymous, for their time and insights.

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We would like to express our special thanks to PatientsLikeMe for connecting us to patients in their network in order to enable us to develop a more nuanced understanding of patient needs.



Executive summary

The current challenge in digital healthcare is no longer purely about technology. Companies have to figure out how to initiate entire healthcare ecosystems to adopt new technology-enabled ways of meeting the innumerable challenges faced in healthcare.

Digital health hubs: Scaling up digital health solutions for the world

The interactions between technology and healthcare ecosystems in different parts of the world are creating digital health hubs with distinct areas of specialisation and focal points that have formed in response to local healthcare challenges. Clearstate examines how the geographical dispersion of innovations and testing of digital health solutions will be critical to the implementation of high-impact solutions on a global scale.

Digital divide: Locating technology's value proposition in different markets

Digital health instantiates itself uniquely in different countries and markets, each of which faces its own particular set of healthcare challenges. The value offered by digital healthcare lies in the way in which companies can apply recent breakthroughs in science and technology to different healthcare challenges to bring value to users. We examine how companies are extending their reach to new patient pools and markets by growing telehealth use in different settings and geographies. We also look at data-driven solutions that can be used to create smarter, more efficient and more precise healthcare delivery and better patient experiences.

Digital adoption will prompt a radical rethink of existing customer segments

Digital technology is creating new market spaces in healthcare. New customer segments, such as internet hospitals, have emerged. Digital technology has also reshuffled the delivery points of the various medical services, in a way that will create opportunities in decentralised and near-patient products and services. Patient pathways and journeys will need to be remapped in response to patient demand for technologically enhanced products and services.



What does digital health mean today?

Interest in the topic of digital health reached new highs in 2016,¹ and it is important that those participating in current and future conversations about the subject have an up-to-date conception of digital health.

In this report, Clearstate explores the true value of digital health—namely, the convergence of technologies to support healthy living around the world. This definition reflects the aim of this report: to provide a comprehensive and integrated view of how technology is used to solve the most pressing challenges that are faced in healthcare today.

The increasing infusion of technology into healthcare has already started to change healthcare ecosystems, activities and stakeholders in significant ways. More intelligent health enterprises—providers, and also pharmaceutical and medtech companies—have emerged to drive smart healthcare in ways that improve patient outcomes and bring down the cost of healthcare delivery. Empowered by technology, patients and consumers are becoming more active in healthcare. These new and more varied contributors and sources of influence that are being introduced to the healthcare ecosystem will forge new connections with one another, driving the emergence of a healthcare industry that will be vastly different from that in the past.

This report will be especially relevant for executives in pharmaceutical and medical technology companies who want to identify and capture opportunities to execute their digital health vision. The report will also be interesting to individuals and organisations—such as start-up firms, technology companies moving into the healthcare space, and universities—that want a deeper understanding of how technology is used to make a positive impact on healthcare.

¹ Worldwide searches on “digital health”, Google Trends, 2015-16



Digital health hubs: Scaling up digital health solutions for the world

Multinationals that ask the question: “What can we shape in digital health?” will find that the answer is “a lot”. In an environment in which both start-up firms and technology giants have a strong presence, healthcare multinationals are well positioned to drive innovation and the application of technology to major healthcare challenges. Market leaders in this field, such as Merck & Co. and Johnson & Johnson, are getting organised to lead change with other participants in the ecosystem—technology companies, digital start-ups, healthcare providers and patients—through digital health hubs.

Multinationals have a critical role in driving innovation and the application of technology to healthcare challenges on a large scale. Start-up ventures in digital health are sometimes portrayed as symbols of bold and agile innovation, in contrast to the digital health initiatives of pharmaceutical and medical technology multinationals. However, the tendency of start-ups to focus on niche health challenges, and their limited reach to providers and patients, makes it challenging for them to drive widespread adoption of promising technologies in a way that can have a substantial impact on the market. Where they may lack agility, pharmaceutical and medtech multinationals have the domain knowledge and influence that can enable them to lead innovation and application of technology at scale that will catalyse the transformation of entire healthcare ecosystems, thereby speeding up the adoption of digital health around the world.

Moreover, the corporate landscape is shifting. Pharmaceutical and medical-technology companies are moving their innovation processes away from inwardly focused, closed-door ventures by establishing collaborative centres that are open to external expertise. This reflects the realisation that applying industry-agnostic technology, such as computing and robotics, to the healthcare domain will require the expertise not just of pharmaceutical and medtech companies but also of non-healthcare entities like digital start-ups and technology firms. Consequently, companies have tended to create digital health centres in cities with high concentrations of technological innovation activity, such as San Francisco and Boston in the US. The presence of digital health hubs—clusters where multiple contributors interact around the application of technology in healthcare—is growing in several countries in a number of different parts of the world.

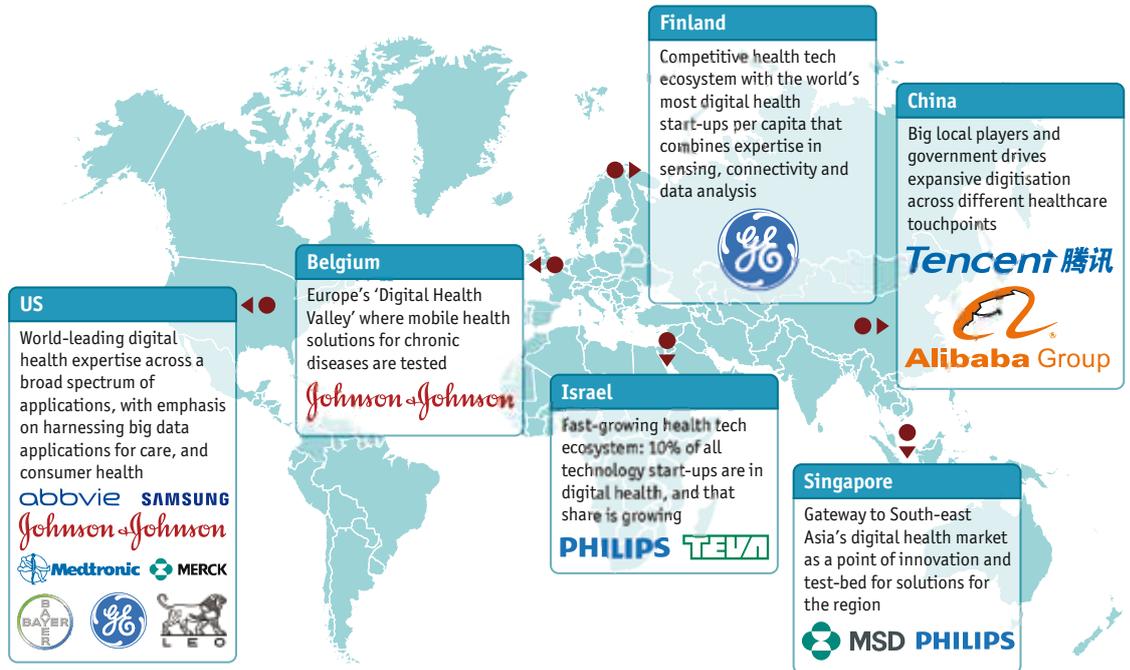
Specialisation and differentiation of the world's digital health hubs have also started to emerge. This is happening in response to demographics and healthcare challenges within proximity of the hub, and is an outcome of the unique characteristics and capabilities of local contributors. In the US, which enjoys strong consumer-affordability levels, a large part of the overall digital health effort has been directed at consumer health and at leveraging information to raise standards of care further. In markets in Asia, by contrast, digital health efforts are focused on achieving basic standards of care, such as supporting affordability and access to care for people living in rural areas and places with a shortage of doctors who can deliver more complex care.



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Figure 1: Key digital health hubs around the world



Source: Clearstate analysis

The dispersion of innovation and testing around the world is important in addressing the differing challenges pertaining to different geographies. To design digital solutions for different healthcare markets, companies are increasingly establishing new digital health innovation centres outside the prominent technology hubs in the US, in fast-growing centres of excellence for digital health in locations around the world such as Israel, Finland and Singapore. Pharmaceutical company Merck & Co. has formed a network of three global innovation hubs whereby each hub focuses on harnessing digital innovation to achieve better healthcare outcomes in a given region. The US hub focuses on the Americas, while another is located in the Czech Republic (serving the Europe and Middle East markets) and Singapore hosts the Asia-Pacific hub.

Companies are also innovating in conjunction with their customers, in various different markets that not only face differing healthcare challenges but which also have varying levels of readiness to use technology to address those challenges. Digital health centres are innovation and testing points that allow a company to interact with local hospitals and patients in order to develop digital health solutions. Medtronic's Applied Innovation Lab, based in the US, brings patients in-house to discuss with technology experts their user experience of digital health technologies. The centre also facilitates user-centric innovation for patients and hospitals in less accessible parts of the developing world. To address the rising number of hypertension cases in Ghana, Medtronic immersed its team in that country's healthcare environment—in places such as the waiting room of a local hypertension clinic—through the centre's 360-degree video screen. Innovating directly in collaboration with patients and providers can improve speed to market for new technologies and hasten their adoption.



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Key implications:

- For digital health to take off, there must be a fundamental shift in how stakeholders collaborate.
- Companies need a strategy not just for themselves, but for the entire digital health ecosystem.
- To scale up digital healthcare use, companies need to understand and respond to local challenges and varying levels of readiness for technology adoption in different markets.
- Multinationals can seed change in a number of different markets more effectively and quickly by setting up centres for digital health in strategic locations with high digital density, leading to the formation of digital hubs.
- Highly distinctive healthcare ecosystems have developed in different parts of the world, and these demand more focused solutions.
- When working with start-ups, focus on those with more localised and well-differentiated concepts or cost-saving technologies.



Digital divide: Locating technology's value proposition in different markets

We profile two key areas where pharmaceutical and medtech companies can use technology to drive volume and value growth. We examine how telehealth technologies are used in different settings and geographies to help extend care to new patient pools and markets. We also look at data-driven solutions used by companies, providers and patients alike to create better care experiences.

Technology is merely an enabler of the outcomes that we desire to achieve, whether these are to grow the business or create new value in products and services. In healthcare, business expansion and the creation of new value will result from the application of technologies in the context of the biggest healthcare challenges around the world.

Before embarking on a digital initiative, companies must first define which healthcare issue they are trying to address. Distinct sets of challenges beset different parts of the world. This shapes how the same technology is used in different markets, and means that the emphasis of digital health changes from one market to another. In this section, we look at the impact of the technology used by companies to deal with challenges in healthcare access and delivery in different geographies.

We pick two representative technologies with huge potential for large-scale implementation in healthcare. Telehealth technologies, which build on communications technologies, are used in different ways to support both developed and developing countries in improving access to healthcare for their populations. In this section, we explore how telehealth technologies can be used strategically in developing countries to improve and open up fresh routes of healthcare access for new patient populations. At the other end of the spectrum—the application of technology in more developed markets—we look at how big data analytics can be a multiplier of value that is locked inside diverse data generated from a wide array of emerging but fragmented technologies. We explore how connecting new and diverse data sources can help healthcare providers and businesses to begin to form a broader view in order to respond and adapt above and beyond the needs of its patients.



Reaching new patient populations with telehealth

The idea that digital technology has only limited application in developing markets is misguided. The growth story of telehealth demonstrates this point clearly. Expanding use of telehealth in remote and rural areas, particularly in China, India, South-east Asia and South America, is fuelling its growth. While technological innovations generally originate from digital hubs in developed markets, these technologies can be extended into developing markets in innovative ways. Philips Healthcare's pilot telehealth programme in Singapore has demonstrated that its programme can reduce the need for readmission to hospital for heart failure patients.² The pilot could help developing countries in the region such as Myanmar, which struggle with a severe lack of cardiologists, to meet the needs of their populations. In fact, adoption of technology is already happening rapidly in Myanmar. Maymay, a mobile app for maternity care that was launched in the country in 2014 (the same year in which telecommunications networks were launched there) already supports 1,500 telemedicine consultations each month.

A key reason for the growth of telehealth is that technological advances in communications tools and systems have increased the frequency and richness of interactions over a wider range of medical services, making telehealth an appealing option for patients who are receiving care. Telehealth is used to diagnose and treat a wide range of conditions, and also to offer other important services—allowing patients to seek a second opinion on their condition from a doctor on the other side of the world, for example, or to manage repeat visits to doctors.

One outcome of telehealth's growth is that geographical and physical location becomes less relevant in determining access to care; the same level of care can be provided regardless of the patient's whereabouts. Ask Apollo, a full virtual-healthcare service launched in 2015 by Apollo Hospitals, an Indian private hospital chain, allows patients located anywhere in the world to interact with doctors via video and voice communication and to pay for the consultation online. Sophisticated medical services such as virtual tumour boards bring together doctors from different medical specialties to jointly advise cancer patients on their condition and treatment options are carried out with patients remotely. This avails secondary and tertiary medical expertise in city hospitals to patients in remote locations, at a similar level of quality.

As new delivery routes—and hence new care settings—have formed around technology, pharmaceutical companies and healthcare providers are reaching new markets. There are opportunities to scale up telehealth to reach patients for whom the cost of healthcare access and delivery is particularly high. Creating new care settings will come from thinking “outlandishly”, reaching into some of the world's most inaccessible places (for instance, the Amazon rainforest and the Himalayas) and its most isolated environments (such as prisons). Apollo Hospitals has set up two telemedicine stations at an altitude of 14,000 ft in the Himalayas, where locals normally have to travel 20-50 km for primary care and 250 km (approximately the distance from Paris to Brussels) for secondary care. Under Apollo's real-time remote supervision and guidance via video conferencing, locals operate healthcare equipment at the telemedicine stations. A powerful point-of-care diagnostics at the station sees 22 different tests—including tests of cardiac enzymes and of liver and renal function—carried out on the patient within a few minutes using just a few drops of blood. VSee, the provider of low-bandwidth video

² ‘First tele-health programme for heart failure patients in Singapore enables patients to better manage their health and reduce hospitalisation’, Philips press release, 2014

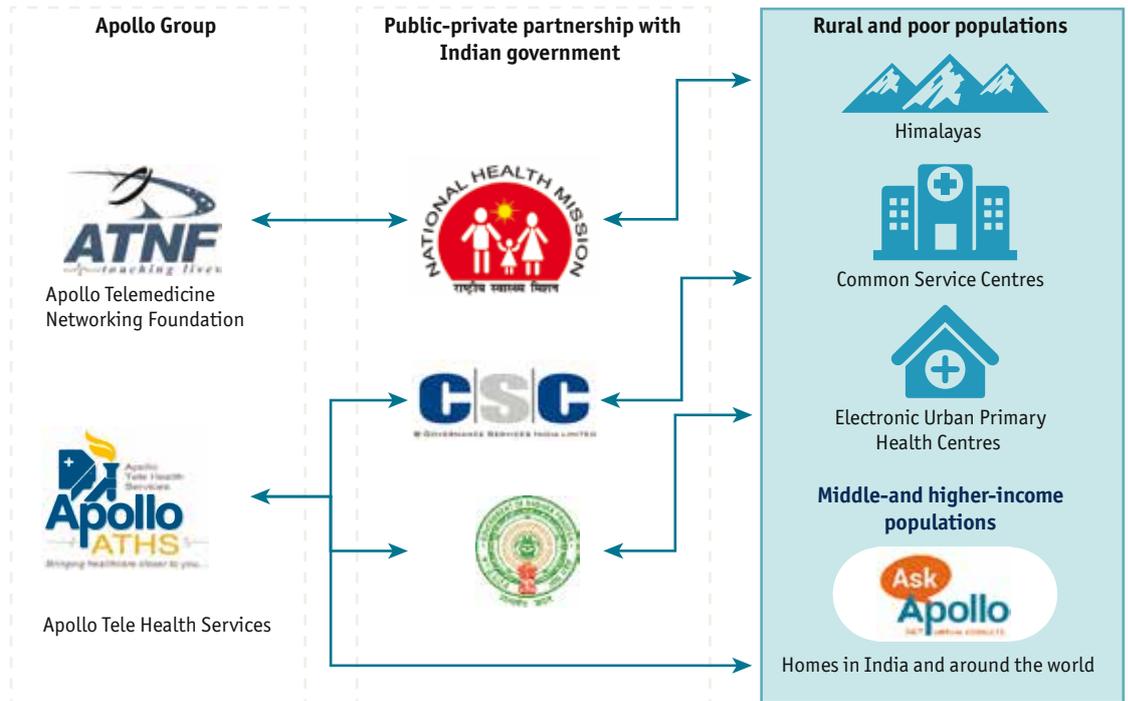


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for Apollo's Himalayan telehealth stations, also supports the delivery of care to more than 40,000 indigenous people living in the Amazon region in Brazil.

Figure 2: Apollo Hospitals: Delivering frugal healthcare through telehealth



Source: Clearstate analysis

The biggest challenge in sustaining telehealth is surfacing from these promising illustrations: that the people who can benefit most from telehealth solutions are those who can least afford to pay and need the most help in using the technology. Pharmaceutical and medtech companies can support the use of telehealth in developing markets in a number of ways. One, funding the set-up of telehealth programmes and work with local governments, non-profit organisations and providers to find an operation model that will sustain telehealth operations. For example, Medtronic has invested in local partnerships with government and providers in Brazil and Colombia to build infrastructure that will support the use of telehealth for emergency treatment and services for heart patients experiencing chest pain.³ Two, medtech companies can also offer affordable and localised devices that can be integrated with local infrastructure to support telehealth. For instance, Samsung has launched telemedicine centres in Africa where the equipment that it supplies runs on solar power, making it affordable and easy to use for the local population.⁴

Adoption of telehealth by physicians is another challenge that is present not just in developing markets but also in developed ones—and is even singled out as a greater challenge than patient adoption. Compelling telehealth solutions are needed in order to encourage use by physicians. To be successful, telehealth solutions must go beyond simply creating equipment and platforms that are technically compatible with existing infrastructure—they must also provide a better user experience for patients and physicians, based on efforts to study the user journey.

³ *A telemedicine partnership leads to better patient outcomes in Latin America*, Medtronic, 2016

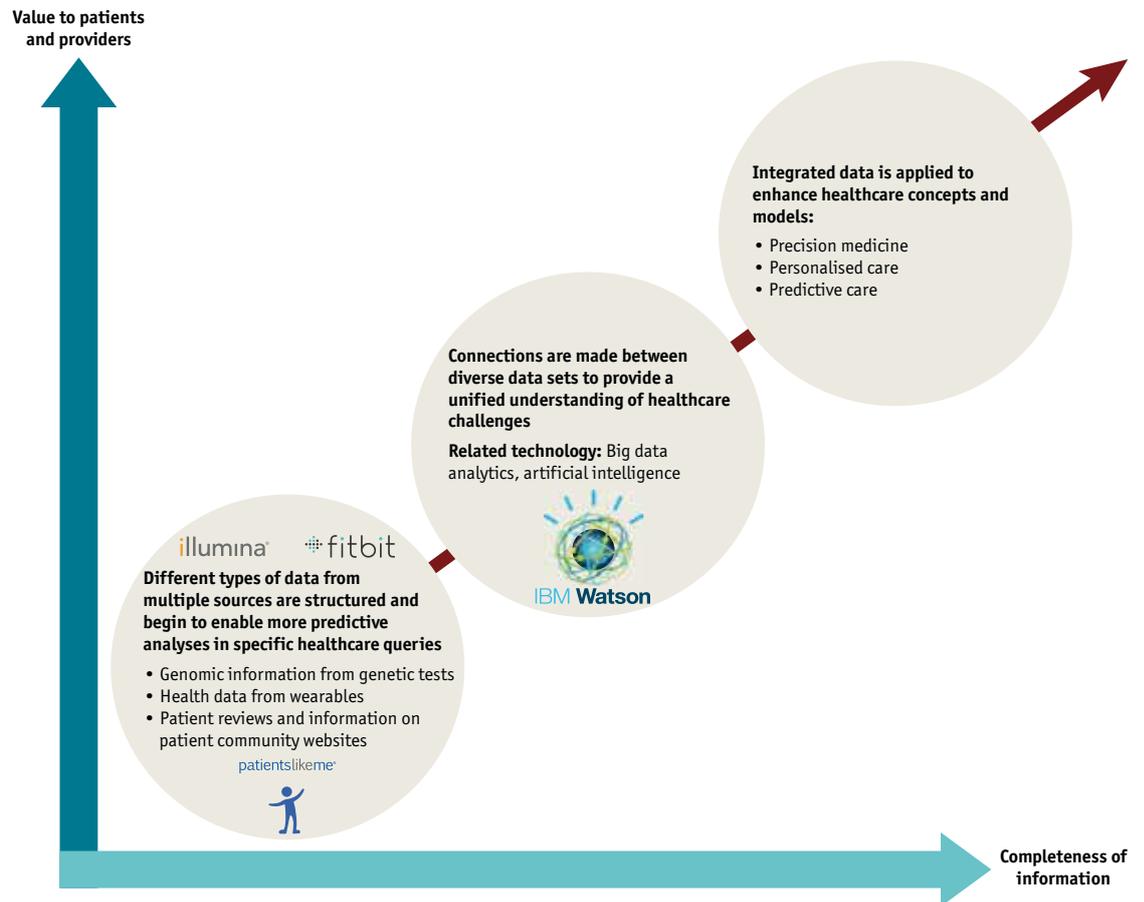
⁴ *'Through technology, Samsung makes healthcare more accessible'*, Samsung, 2013



The big data vantage point: Solving fragmentation in healthcare

A more complete view of healthcare issues that emerges from the analysis of big data (large and complex data sets) can help to improve patient experience while reducing costs. The crux lies in how value is extracted from the healthcare data that have grown exponentially in volume and variety as a result of advances in mobile technology, genomics and computing. By 2020, healthcare data is forecast to be equivalent to the contents of 500bn filing cabinets.⁵ Different types of data—ranging from genomic data to behavioural data, from multiple sources and devices such as smartphones equipped with sensors and connected mobile medical devices, and captured both in real time and in the real world—constitute information that can complete a powerful view understanding of patterns and trends.

Figure 3: The big-data value chain



Source: Clearstate analysis

Knowledge is power: Distilling value from data

Data are inert. The first challenge to be addressed in maximising returns from big data is the need to make sense of the data and extract meaning from them. Around 80% of health data are unstructured,⁶ and potentially insight-providing data contained in laboratory results, medical images and personal fitness devices are under-utilised. To utilise these data more fully and realise the analytical value of

⁵ *Bigger data for better healthcare*, Intel, 2013.

⁶ *Annual Report*, IBM, 2015



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big data, companies will have to define the meaningfulness of the data for themselves, whether it is lowering the cost of care or improving patient outcomes.

Knowing which data are needed to address a specific problem can help in finding data-driven solutions. The broad problem of fragmentation in healthcare manifests itself in many different ways in healthcare delivery systems around the world. Siloed operations within a healthcare facility or network can create the paradoxical problem of waste whereby hospital beds and treatment rooms lie empty while patients wait. Fragmented views of the patient prevents us from elevating the patient experience.

For providers, the problem is often how to make operations and care delivery more timely and efficient. Finland's Megaklinikka clinics are run without the traditional appointment workflows that cause pre-allocated medical resources to be used inefficiently. Instead, their innovative delivery model—which is often compared to air traffic control—is flexible and directs inbound patients to idle treatment rooms using data science, making the clinics more profitable by allowing them to serve more patients using the same resources.

For pharmaceutical and medtech companies, more integrated ways of understanding and profiling patients can help to improve the patient experience. Multiple ways of profiling patients have created a diversity of dimensions through which they can be looked at, such as the genetic dimension of the patient (through next-generation sequencing) and a rigorous behavioural dimension (through the continuous viewing of patient-generated data derived from wearables). PatientsLikeMe, a patient platform through which patients record their experiences in a structured way, provide real-world evidence that can help companies and patients alike to tailor their treatments and care better. Pharmaceutical companies such as AstraZeneca are working with PatientsLikeMe to use patient-reported data to help develop products and solutions that provide patients with what they truly need.

Patient experiences may not be novel information when one thinks of the conversations that patients may have had with their physicians and family members about their conditions. However, through a platform like PatientsLikeMe, patient experiences can be enriched in order to bring new value to their healthcare. What distinguishes PatientsLikeMe from other patient networks and sources of healthcare data is its ability to capture patient experiences in ways that are meaningful in order to improve healthcare outcomes. This provides another dimension through which to look at healthcare issues that tend to be dominated by clinically generated data which lack the context of patient narratives.

Data can also change patient behaviour for the better. Comprehensive information on prices of prescription drugs at over 75,000 pharmacies and the locations of these outlets available via the GoodRx tool can encourage drug adherence among patients in the US. High drug costs are a key reason for unfilled prescriptions and poor adherence to treatment regimens.

Big data needs open-data models

Because data are being generated from a bevy of digital applications and sources, with no single platform to bring them together, there is still some way to go in realising the scale needed to harness the full potential of big data in order to achieve precision and accuracy. What is needed is a unified and open health-data platform, and governments are best positioned to lead such an effort. Gatekeepers of patient data such as medtech companies, providers and users will have to work with pharmaceutical companies to make this possible.



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Patient openness to sharing data is at the crux of the success of big data in healthcare. Trust is still a major factor in sharing: almost four times as many people are willing to share their health records and genetic data with their doctor as with a pharmaceutical company.⁷ Technology companies fare worse than healthcare companies on the scale of consumer trust.⁸ People in the US—one of world's leading markets for the use of genetic sequencing technologies outside research laboratories and medical situations—still want to be in control of their own genetic information: an overwhelming 90% of them wish to control access to their genetic data.

When pressed to make a choice, people are more willing to share their data for altruistic outcomes, such as contributing to medical research, than for self-centred reasons, like getting a discount on their health insurance or receiving money for their data.⁹ This coheres with the attitudes expressed by the patients we spoke to, who expressed a strong willingness to share data for a greater good.

Healthcare needs new approaches to data exchange. Health information exchanges will also need to develop strong consent processes. Patients Know Best puts patients in control of their medical records through the world's first online patient portal with an inbuilt consent engine. The system gives patients the flexibility to invite their doctors and caregivers to view their medical records while adjusting privacy levels for different categories of data. For example, patients can choose to share general health information but to restrict access to data on their mental health to select groups of people.

Key implications:

- New insights will emerge that will challenge existing strategies and models in healthcare.
- Recognise and define which healthcare challenges can be addressed by technological solutions.
- Locate opportunities to use technology to enhance the core products and value propositions of pharmaceutical and medtech companies, for example by enabling the provision of more tailored treatments and services through big data insights.
- Determine how ready different markets and adopters are for the introduction of technologically enhanced product and service offerings, and tailor a go-to-market strategy accordingly.
- Figure out how incentives for adoption can be better aligned, for example by moving towards non-monetary incentives to encourage patients to share their health data.
- Pharmaceutical and medtech companies will have to think hard about how technology can be integrated into their overall growth strategies.

⁷ *The Genomics Inflection Point: Implications for Healthcare*, Rock Health, 2016

⁸ *Digital health consumer adoption: 2015*, Rock Health, 2015

⁹ *Ibid.*

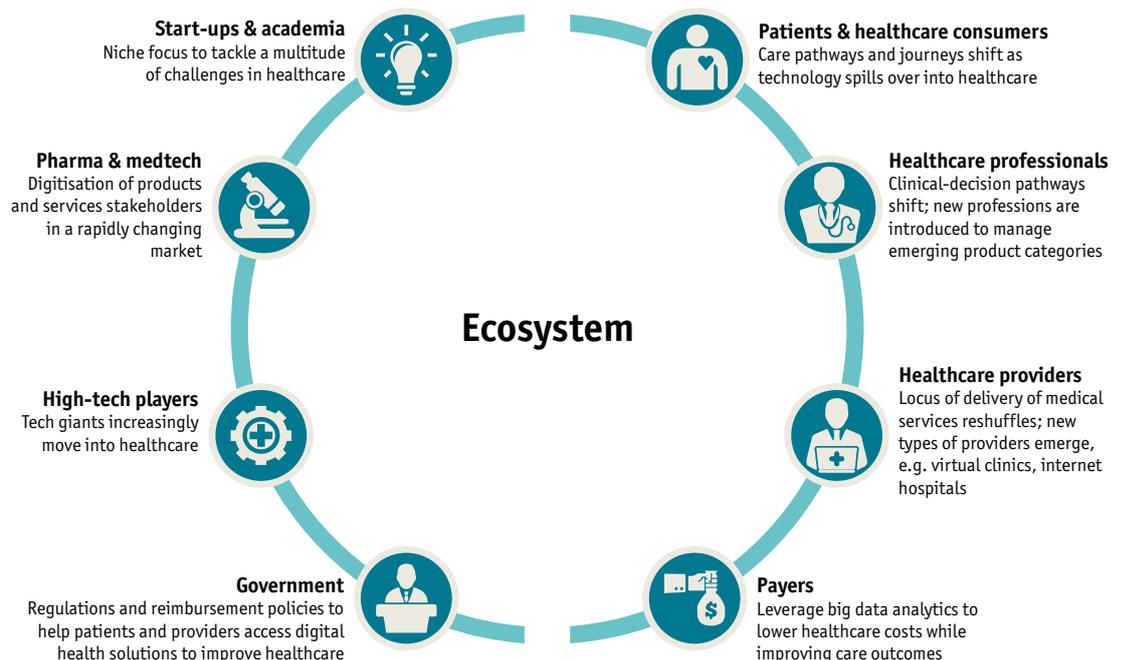


User value and relations: A new definition

Technology is not at the core of digital health—users are. Obtaining insights about how patients, providers and healthcare professionals use digital technologies, and how technology has reshaped customer segments, will help companies to engage their end users, offering them the innovations that they need.

Not only has digital technology brought new value to the users of healthcare products and services, it is also reshaping how individuals and organisations in the healthcare ecosystem interact with each other. From relatively small adjustments in patient behaviour related to seeking care, to large-scale transformations in providers that have launched digital business models for the delivery of healthcare services, the evolution of individuals and organisations in the ecosystem means that each of them must engage other players on new terms.

Figure 4: How the healthcare ecosystem gets reshaped



Source: Clearstate analysis

In this section, we focus on the end users in the healthcare system—the patients, the providers and the healthcare professionals—to gain an understanding of how they want to use technology.



Digital healthcare providers: A platform for care

Cloud computing, artificial intelligence and telehealth technologies are organising the healthcare provision network in new ways and reshuffling the locations from which medical services are delivered. The trend of digitisation on the part of healthcare providers goes deeper than the mere substitution of existing workflows—swapping paper for tablets and smartphones, or deploying robots to replace hospital workers. It involves transformative changes in how providers interact with their patients and suppliers across all touchpoints in a healthcare network.

Digitisation across healthcare provider networks will shift the primary locations for the delivery of different services. Less complex medical services will be relegated to clinics and homes, freeing up space in key delivery nodes in the network, such as emergency rooms.

The new-found highly differentiated purposes of homes and clinics in healthcare delivery will mean that medical devices must cover small-scale use for a diverse set of interventions. This shift will need the support of a range of devices to support home care. Medical tests will increasingly be completed outside of hospital laboratories, in clinics.

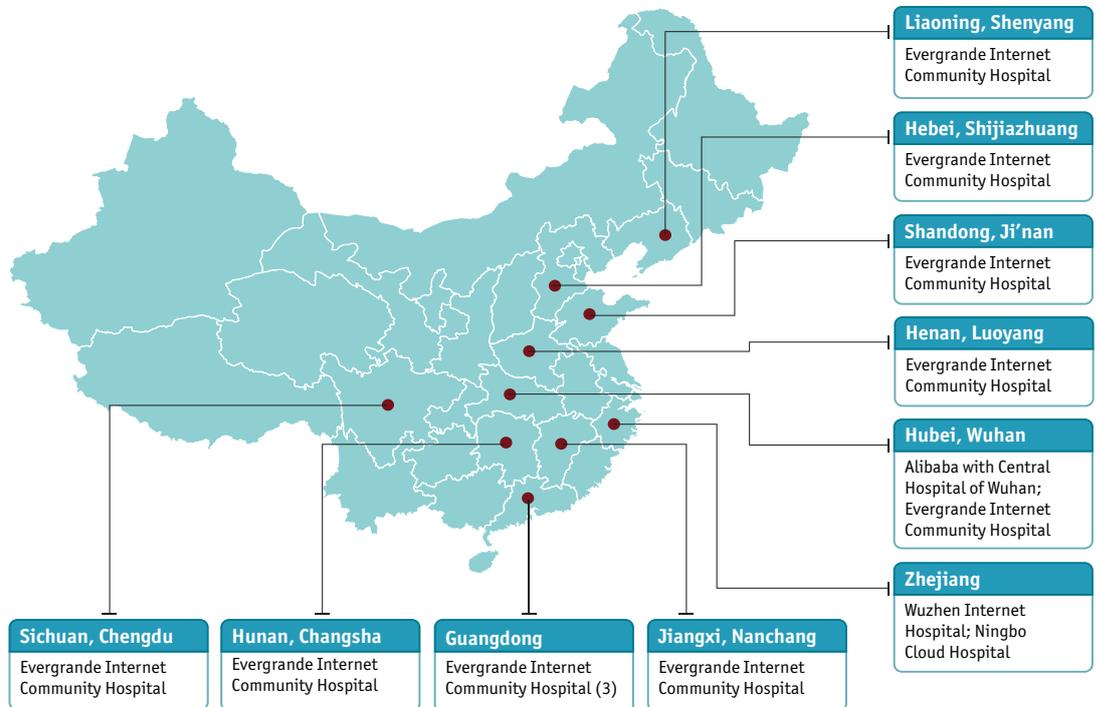
Entire hospital models have also been transformed as technologies have been integrated into the delivery of healthcare services. The accumulation of changes in the ways that services are delivered has heralded deeper shifts at the level of the healthcare institution, creating new types of hospital and clinic, such as internet hospitals. Going by alternative names, for instance “cloud hospitals”, these internet-based hospital platforms deliver medical services online. Conceptually, internet hospitals and traditional hospitals share the same core purpose of being a point where care is provided when patients need it: processes in care delivery can be completed on cloud and internet platforms or within bricks-and-mortar structures. Ningbo Cloud Hospital—China's first cloud hospital, which opened in 2015—is an open platform that connects major hospitals, primary healthcare facilities, doctors, pharmacies and insurance companies to deliver care.



China's internet hospitals

The internet hospital is an emerging and fast-growing hospital category in China. The proliferation of internet hospitals in China will help to satisfy the huge demand for good-quality care, currently not matched by the available supply of services, and will thus help to expand overall provision of medical services and clinical treatments in the country. Clinical treatments increased by 2.8% year on year in 2015—a year that saw explosive growth in internet hospitals in China.

Figure 5: Digital hospitals are expanding across key Chinese cities



Source: Clearstate

Just months after the 2015 Internet Plus strategy was unveiled by the Chinese government, China's Evergrande Group—one of the world's largest 500 corporations in 2016 as ranked by the Fortune Global 500—launched 12 Internet Community Hospitals in ten major cities across China, including Changsha and Chengdu. In alignment with the Internet Plus strategy to integrate technology into healthcare, advanced big-data health models and cloud technologies were used to build Evergrande's internet hospitals. The hospitals offer comprehensive, full-fledged services such as consultations with top doctors, treatments and health check-ups, all online.

Internet-based medical services have received a boost from the launch of internet hospitals by two Chinese internet giants, Tencent and Alibaba. Tencent-backed WeDoctor has created Wuzhen Internet Hospital, which brings together over 1,900 hospitals, 7,000 healthcare expert groups and 230,000 doctors within its network. Ali Health, the Alibaba Group's online medical and health service provider, has formed a partnership with the Central Hospital of Wuhan to create an Internet hospital.

Sources: China State Council; National Health and Family Planning Commission; *Beijing Review*; company websites



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Hospitals and clinics are becoming digital businesses with a different set of needs from traditional providers. Whether they operate on a fully digital model, as internet hospitals do, or with only partial digitisation of their services, changes in the delivery model will necessitate alterations in the business model. Internet hospitals tend to derive their primary source of revenue from services that support treatment of common, chronic diseases such as diabetes. This trend is particularly pronounced in the case of China's internet hospitals, where prescription drugs are dispensed by online pharmacies in the network rather than directly by the internet hospital. In China, prescription drugs are an important source of profit for hospitals, and internet hospitals that are missing out on prescription-drug sales have shifted their focus to offering medical services, rather than products, to patients. Medical services will increasingly be distinguished based on whether they can be fully carried out online or whether they will still require face-to-face diagnosis.

Technology will also inevitably lead to the emergence of new decision-makers and purchasing processes in hospitals. Pharmaceutical companies will have to understand and work effectively with new influencers in hospitals, such as molecular clinical pharmacists, to support the prescription of highly personalised products. In China, government efforts to drive big data applications across healthcare, as well as interconnectedness of application platforms for national medicine bidding and purchasing, are expected in 2017.¹⁰ As providers and healthcare professionals adapt to technologically enabled ways of working, the way that they define value in relation to other healthcare stakeholders, including patients and healthcare companies, will also change.

¹⁰ 'China to boost big data application in health and medical sectors', State Council, 2016



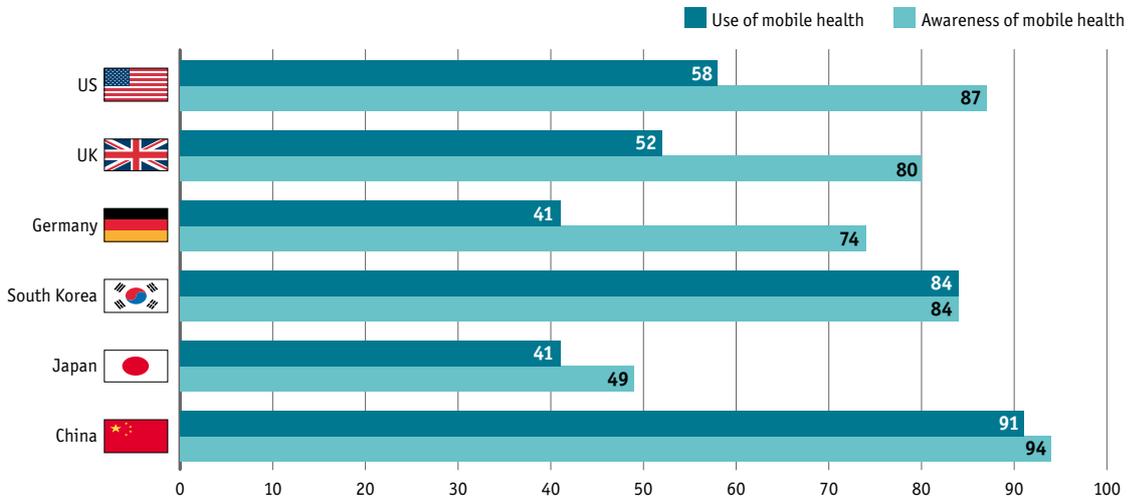
Healthcare users: Co-designers of healthcare products and services

The spillover of technology into everyday healthcare has raised important questions of what technology means not just to patients but to all of us. People – both those afflicted with medical conditions and healthy individuals alike are getting more involved in healthcare. What has also emerged is a blurring of the distinction between patients and consumers, with patients starting to behave more like consumers in that they are engaging in comparison shopping and are opening up about their experiences through online reviews. Patients who are becoming more consumer-like are commonly observed in areas such as cosmetic medicine that hinges between consumer healthcare and “real” healthcare. This will take the ongoing industry focus on a patient-centred approach to a higher level, whereby the key principle—namely, focusing not just on patients but also on consumers—will drive everything from product development to broader engagement of individuals in their health.

What people want from technology

Receptivity to new options in the management and receipt of care through technology is influenced by a variety of factors, such as where patients live, the conditions they experience and their exposure to technology. People are more likely to use mobile health technologies once they have become aware of them in Asian countries such as China, South Korea and Japan than they are in the US or the UK. While there is higher level of awareness of mobile health in the US than in South Korea (a country notable for its wired population), the proportion of people using mobile health in the US lags behind that in South Korea. China's enthusiastic use of mobile health technology in part reflects its citizens' desire for access to credible information. Trust in large organisations and institutions is weak among the Chinese, hence the rise in popularity of mobile platforms that offer open and reliable ways to share and access information from other patients and trusted doctors, in turn helping patients to find the best hospitals, doctors and treatments for their needs.

Figure 6: Mobile health around the world



Source: Japan External Trade Organization



Consumers are among the most important drivers of mobile health solutions, and people in many countries are already aware of mobile health solutions because of their familiarity with mobile solutions in other areas of their lives. To persuade consumers to use mobile healthcare, the challenge in most countries is not about raising awareness of the technology, but rather about creating compelling uses of technology that offer what consumers really want and need. GoodRx is the most popular medical app among users in the US¹¹ because it provides real value to patients and their caregivers by helping them to locate the best prices for the drugs that they need among the country's 75,000-plus pharmacies. Comparison shopping is already an entrenched concept outside healthcare, with popular sites that aggregate price information ranging from fashion retailers to air tickets. It is qualities that technology can bring, such as price transparency and convenience, rather than technology *per se*, that patients want. SoYoung, a popular healthcare app in China, is an e-commerce platform for cosmetic procedures where patients also post reviews. One out of every ten women who have non-invasive cosmetic procedures in Beijing and Shanghai uses SoYoung.¹²

Different medical conditions also shape different needs and wants in patients. For example, remote medical services are a more welcome option for patients with less serious, chronic conditions that require repeated and frequent care, whereas they can be less attractive to patients with acute or more complex diseases for which focused treatments are needed. In some disease areas, patients' experiences of their conditions may increase their affinity with using online patient community and information websites. When uncertainty is a key feature of a disease, the ambiguity tends to drive patients to seek information on their condition. Multiple sclerosis (MS) patients, for example, experience uncertainty related to diagnosis and treatment of their disease on many levels, including unpredictability of disease progression and the fact that the cause of the disease remains unknown. For MS patients, knowing the details of how the disease progresses in fellow patients and how they cope is invaluable. Patient-generated information provides unique, personal insights that complement educational content generated by pharmaceutical companies, enabling patients to make more informed choices about their treatment options. The lack of information plays out in a slightly different way in the case of rare diseases. Rare-disease patients can overcome the low probability of meeting offline another person with the same condition through online patient communities. The alternate reality without technology-intermediated connections will likely mean rare disease patients are likely to remain isolated from the rest of the disease population, which can be a matter of delayed diagnosis or finding a supportive community of people with similar experiences.

Expanding the ecosystem from patients to consumers

As patients start to behave more like consumers, companies will need to update their options for patients and create affordable, intuitive and enjoyable products and services in order to widen their appeal to patients and consumers. The cost of new technology is often prohibitive. For instance, advanced wearables such as exoskeletons have been approved by US regulators for use by people with walking difficulties—but at a price of around US\$70,000, such products are out of reach for many patients. But cost is not the only barrier: using exoskeletons also demands a high level of support in terms of training and wearing the product. For these reasons, the use of exoskeletons is still alienating

¹¹ Data from App Annie, 2016

¹² 'Tencent invests in Chinese nip-tuck app in \$50 million round', Bloomberg, 2016



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for most patients, even though they are aware of and understand the benefits of these available technologies.

Governments and companies need to make efforts to give patients access to new technologies. Progress in technology often brings cost down and keeps the technology within reach of patients. The recent huge fall in the cost of sequencing an entire genome is a salient illustration of this point. At around US\$1,000—a price point that can help genetic sequencing become a mainstream service in many developed markets—genome sequencing now costs just 2% of what it would have cost in 2010.¹³ As the downward trend of prices continue, we can expect greater demand for the service in markets around the world. Cancer care will be the fastest-growing use of next-generation sequencing (NGS) technologies in the Asia-Pacific region, with a forecast annual growth rate from 2016 to 2020 of over 37%. By 2020, the market for clinical NGS in oncology will be more than three times its size in 2016.¹⁴

Besides patients, technologies such as genetic sequencing has also attracted interest from consumers. 23andme offers direct-to-consumer genetic tests, at a price tag of around US\$200. But in the absence of an urgent medical need, the idea has remained largely a novelty for consumers. Consumer-friendly pricing models and user experiences are needed to unlock the consumer healthcare market. After finding success in the research and clinical markets, Illumina, the world leader in NGS technologies, is trying to get consumers on board with the technology by creating Helix, an app store for genetic information. Users can ask specific genetic questions through apps offered by various different partners that draw on the genetic information that is sequenced just once when a customer first signs up for Helix. The pay-as-you-go pricing model can help to ease consumers into embracing the value of genetic sequencing in smaller chunks.

Key implications:

- A radically changed healthcare delivery system has emerged as providers throughout the system begin reshuffling the delivery loci of different medical services.
- Companies must re-evaluate how they relate to providers as the latter changes, by optimising their solutions according to the needs and preferences of new categories of providers, such as internet hospitals.
- Consider needs and wants in different patient and consumer segments.
- Understand how patients and consumers access digital health technologies, in order to subvert common market misconceptions. For example, contrary to expectations, users in the US and Japan lag behind those in China in the use of mobile healthcare.
- Complete your map of patient personas via the new dimensions that have emerged through which an understanding of patients' needs can be gained.
- Remap patient pathways and journeys. Small preferences in the use of technology accumulate, resulting in broader changes in the patient pathway and journey.
- Integrating what patients and healthcare consumers want into care delivery and product design
- Anticipate patient needs: Engage patients to identify their priorities and wishlist related to their care to create better products that patients may not have even realise they need or imagined.

¹³ National Human Genome Research Institute, 2015

¹⁴ Clearstate analysis, 2016



Digital health and total convergence: A question not of “if”, but of “when and how”

We began this report with the aim of exploring digital health, defined as the convergence of technology to support healthy living, and illustrated how technology is permeating the healthcare value chain around the world and is plugging the gaps in healthcare. While in many cases these changes are incremental rather than transformative, it is only a matter of time before the full benefits of digital health flow throughout the system. More than ever, healthcare companies need to respond to that future now.

1. Can you see the digital health possibilities that are coming?

Innovation pathways for healthcare have become less structured, happening outside multinational corporations and other large institutions—and, more than ever, outside the healthcare industry. They are also more geographically dispersed. Technologically enabled products, services and models have found high-impact applications in unexpected places beyond technologically developed North America, and in places with large populations of users who are relatively new to using technology, such as Africa and India.

For executives, this means that being aware of global activity in multiple healthcare sectors and in industries other than healthcare is important in order to identify trends and opportunities for improving healthcare through technology.

- **Risk assessment:** What will be the impact of digital health technologies, and of new challengers and entrants from other industries, on your business? When and how will this impact be felt?
- **Trend scanning:** Identify global technology trends and assess their impact on regional and local healthcare systems and markets.

2. How can you realign your business across the healthcare value chain to maintain relevance?

Digital health creates new value and spaces in healthcare that will shift existing value propositions, delivery points and pathways of healthcare services and will alter the influence of various end-users.

For companies, this could mean the emergence of new markets and revenue streams that demand different business models and strategies:

- **Strategic planning:** Determine growth strategies and viable business models to integrate digital health technology and innovations in a variety of care environments.
- **Go-to-market initiatives in greenfield segments:** Determine a comprehensive strategy for moving into new markets and adjacent segments, covering all aspects from market access and pricing to customer engagement.



- **Market sizing:** Develop an understanding of how different market segments are impacted by new digital health technology. Determine market size of new markets and product categories that have emerged.

3. How can you engage your users in a rapidly changing market?

Preferences and behaviours of patients, consumers and providers of healthcare products and services are evolving in response to the new options offered by digital health. Digital health is also leading to increased interactions within and between various different groups of patients, consumers and providers.

Engagement strategies need to be recalibrated by rethinking:

- **Customer segmentation:** Map how different patients, consumers and providers respond to and take up new, technologically enhanced products and solutions.
- **Customer insights:** Develop an understanding of the customer ecosystem and unmet needs in different segments amid ongoing digitisation. Understand how patient pathways have changed as a result of the advent of digital health.

4. Who will make the best partners to execute your digital health vision?

Whether you are embarking on a smaller-scale digital health initiative or executing a comprehensive digital health strategy, finding collaborative partners and models that will enable you to achieve your goals is important.

- **Stakeholder mapping:** Identify and map out the influence of relevant stakeholders for your objectives. For example, credible partners, such as trusted communities of physicians and patients, are important to collaborating successfully with doctors and patients.



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