FROST & SULLIVAN

Market Engineering

Asia-Pacific Digital Health Outlook

Drivers and Needs for Digital Transformation of Healthcare in APAC

EQUINIX

Preface

The APAC healthcare industry is forecast to generate $517 billion in revenue in 2018. Business growth and industry transformation will not come from traditional healthcare segments. Instead, demand for innovation in healthcare services, greater focus on patient-centricity, and an industry shift toward personalization, prevention and wellness are forcing market participants to develop new business models, especially in care delivery.

Digital technologies are a cornerstone of the business model transformation impacting the healthcare industry. Governments, insurance companies, pharmaceuticals, and medical technology vendors unanimously agree that digital transformation is the single-most important competitive advantage that they must harness. However, the following challenges exist:

- Insufficient IT infrastructure maturity that enables seamless, scalable services.
- Trepidations around data security, privacy, ownership, and applications in healthcare.
- Historically under-delivered returns on IT investments, which make healthcare decision makers apprehensive of further investment.

In this study, Frost & Sullivan highlights current and emerging opportunities for Digital Health in Asia-Pacific, with insights on specific stakeholder challenges that can be addressed through innovative connectivity solutions.

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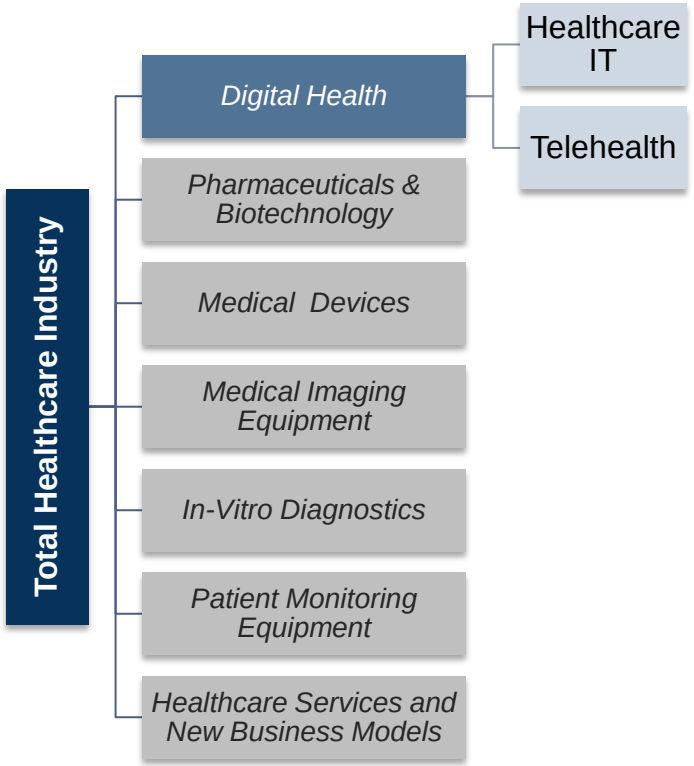
Partner, Frost & Sullivan

Project Scope and Segmentation



Geographic Coverage	Asia-Pacific (APAC)
Focus Countries in order of Digital Health market maturity	1. Australia 4. Japan 2. Singapore 5. China 3. Hong Kong 6. Indonesia
Monetary Unit	US Dollars

Total Healthcare Industry: All businesses that develop and provide products and/or services across the healthcare spectrum, that is, for diagnosis, treatment, and prevention.

Digital Health: The Digital Health market consists of all information and communication technologies (ICT) in healthcare delivery, including software suites, IT services, mobile and telecommunications, sensors, analytics, remote monitoring platforms, telemedicine and big data. It is broadly segmented into Healthcare IT and Telehealth. Note: Study only provides Telehealth market revenue for APAC. Global revenue includes only Healthcare IT, not Telehealth.

Pharmaceuticals & Biotechnology: Therapeutic products including pharmaceuticals, biotechnology products, and regenerative medicine.

Medical Imaging Equipment: Equipment used in medical imaging for diagnostics and interventions.

In-vitro Diagnostics: Devices, kits, and platforms used in the detection of diseases, conditions, and/or infections.

Healthcare Services & New Business Models: Include primary, secondary, and tertiary care, specialty clinics, and diagnostic lab services. Key trends in healthcare services are included in the study scope; however, the market revenue is not included as it is not mutually exclusive of the segments listed above.

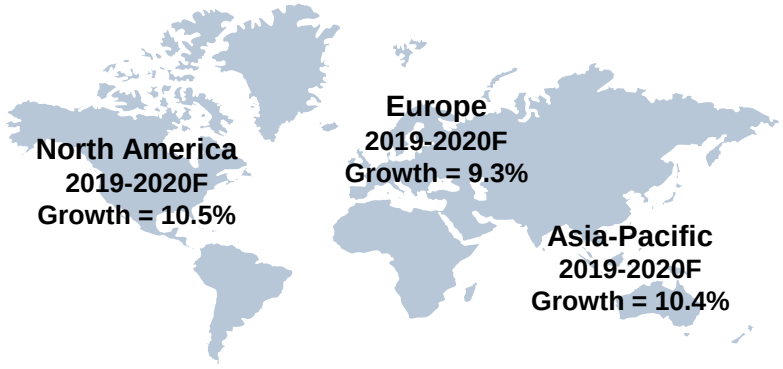
Medical Devices & Patient Monitoring Equipment: All forms of medical products, equipment, and consumables used in care delivery and monitoring within clinical settings.

Fundamental changes in healthcare business models globally are driving industry-wide technology adoption

Industry Drivers for Technology Adoption in Healthcare

INDUSTRY SHIFT	NEED FOR TECHNOLOGY
Moving from treatment to prevention and wellness	Granular patient understanding and proactive intervention based on data and insights using horizontally integrated platforms.
Increasing focus on efficiency and compliance	Seamless data capture and exchange at all points of care while maintaining stringent data security, privacy, and compliance within IT systems.
Moving from volume to value across all types of healthcare businesses	A radical business model change that targets patients/consumers with outcomes-based services is driving an overhaul of the sites and processes by which health information is collected and used.

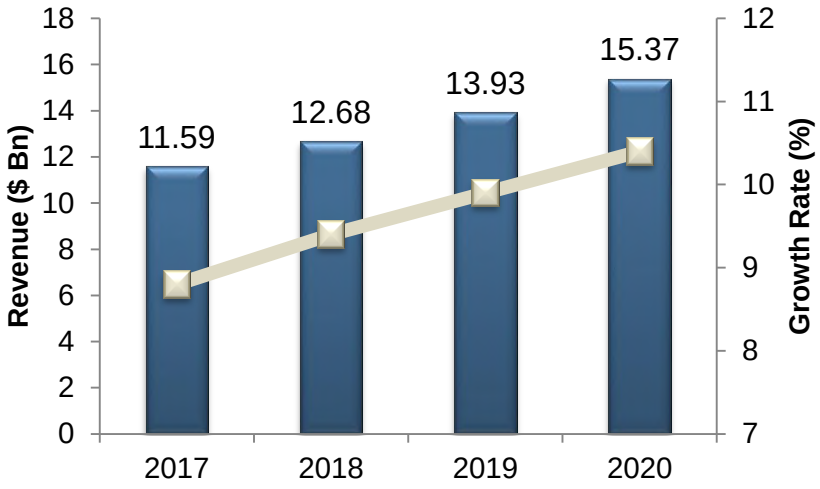
Digital Health is the enablement of healthcare services through technology.



Digital Health emerged as a sustainable market segment in APAC less than 10 years ago. Since then, adoption and market revenues have grown steadily with year-on-year growth forecast to exceed the 10% mark by 2020.

Digital Health spending growth is driven by IT transformation and tech-enabled care delivery innovation by healthcare providers

Digital Health Revenue Forecast, APAC, 2017-2020

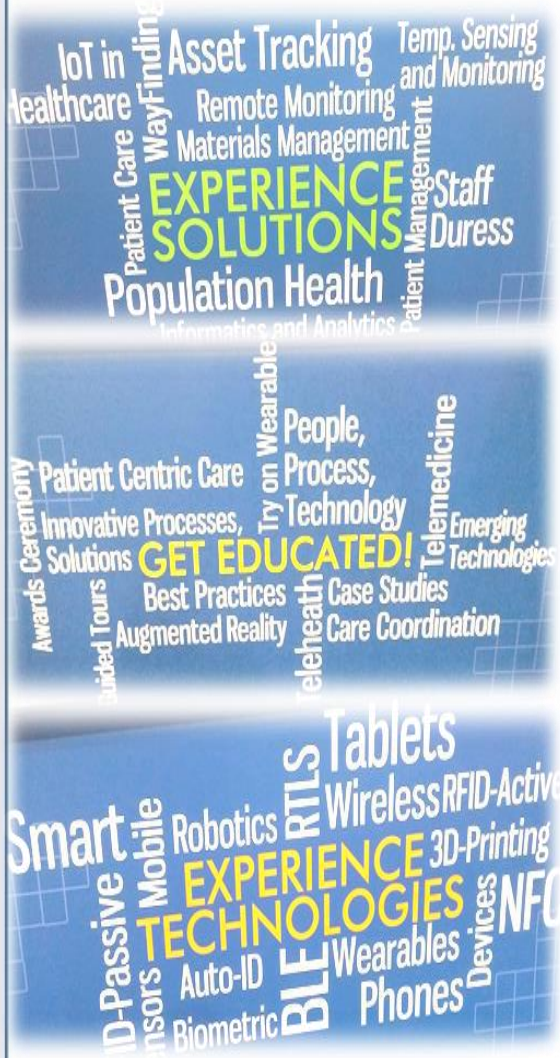


Beyond Digital Health, digital transformation across other market segments including Pharmaceuticals & Biotechnology, In-vitro Diagnostics, Medical Devices, Patient Monitoring and Medical Imaging requires companies to spend between 2% and 4% of their total expenditure on IT, depending on the country.

Drivers for Digital Health Spending

- Rapid expansion of hospital infrastructure and services creating demand for IT platforms.
- Industry shift toward decentralization of care driving the need for connectivity platforms.
- National-level health data repositories and exchange platform initiatives in Australia, Singapore, Malaysia, China, India, and Japan.
- Increasing consumerism driving patient-centric business models among pharmaceutical and medical device start-ups.
- Growing need for operational and financial efficiency as well as advances in clinical applications through the use of big data and analytics.
- Increasing penetration of IoT devices in healthcare stimulating demand for sophisticated analytics and AI.

Healthcare companies are investing in new business models that depend on a well-designed technology architecture, which includes:



1 Meaningfully Leveraging the Cloud

Healthcare companies need to create vertically integrated clouds that enable comprehensive data capture and analytics at the point of need.

2 Enabling IoMT*

Full potential of patient-centric services can be delivered through IoMT which requires creation of a partner ecosystem.

3 Impact on Organizational Productivity & ROI

Return on IT investment continues to be a challenge as application speed, reliability, and end-user experience are far from maturity.

4 Network Connectivity & Bandwidth

With increasing volume and complexity of healthcare data and analytics, solutions to optimize network connectivity, latency, and bandwidth are a necessity.

5 Data Safety & Security

New technologies, sources, and use of health information are prompting healthcare organizations to take a closer look at their data security, privacy, and compliance architecture.

*IoMT: Internet of Medical Things

APAC Trends Driving Digital Transformation in Healthcare

Frost & Sullivan considers governments, payers, providers, suppliers (e.g., pharmaceutical, medical technology, and digital health companies), and consumers as key stakeholders in the healthcare industry ecosystem. These stakeholders share a common dilemma, which is, to improve quality and access to healthcare while reducing cost. Technology has been unanimously identified as an important enabler to achieve this goal. Evolving trends like healthcare decentralization, consumerization, and personalization further drive the need for Digital Health.

A number of healthcare industry challenges can be resolved using smart technologies, making digital transformation a strategic imperative

Rising Demand for Volume and Quality in Healthcare Services

By 2025, about 25% of APAC population will be aged 65 years and above needing high volume of complex care.

>60% of Asians aged over 65 have at least 2 chronic diseases making care more complex and expensive.

India, Thailand, Malaysia, Singapore, and South Korea are targeting development of medical tourism that relies on remote care and patient engagement.

Health systems continue to face issues such as redundant processes, repeat diagnostic procedures, and medical errors.

Increasing affordability and awareness of high-quality care.

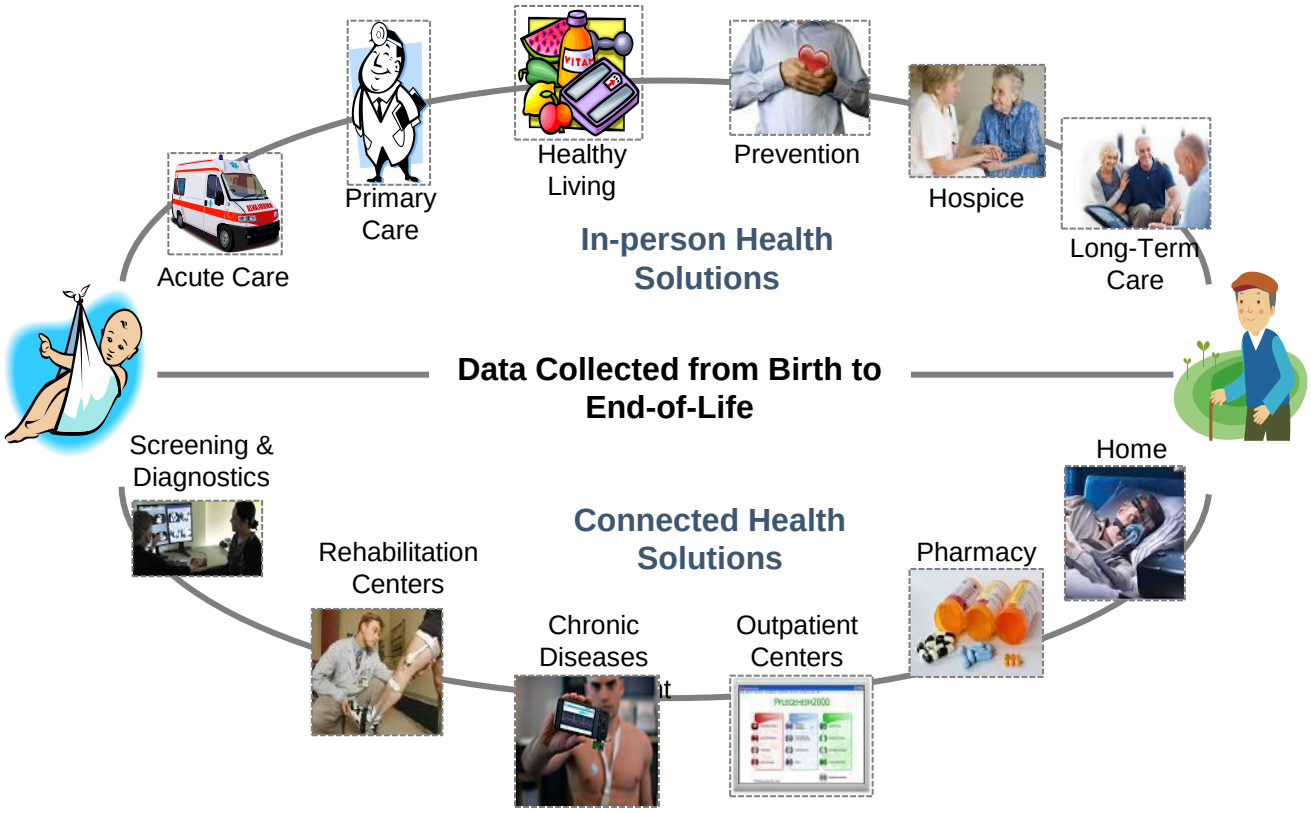
With increasing data volumes, the management, ownership, privacy, and security of patient information are becoming concerns.

Most countries have below OECD* average numbers of doctors, nurses, and hospitals. Medical resources are also concentrated in urban areas while rural regions are underpenetrated.

Urgent Need to Improve Efficiency and Distribution of Healthcare Services

*OECD – Organisation for Economic Co-operation and Development

Trend 1: Decentralization of care in Australia, Hong Kong, Singapore, and Japan aims to bring healthcare services closer to patients



Healthcare services need to be:

- **Ubiquitous** – follow the patient, not the doctor
- **Real-time** – continuous and not episodic
- **Error free** – safe and reliable
- **Personalized**
- **Cost effective**

Decentralization of healthcare services is closely linked to decentralization of data in healthcare. A significant chunk of healthcare data is now collected outside the hospital, much closer to the patient.

- Integrating patient-generated data into a longitudinal, holistic view of the patient is a critical market need.
- Developing connected platforms that empower the front-line healthcare workforce with patient information, analytics, and connected healthcare devices is an emerging area of investment.

Trend 2: Patients are bringing consumerism to healthcare, demanding greater control over their health data and decisions

1
- Real-time information at the point of use
- Information comes to consumer
- High levels of interaction and Q&A online through engaging interfaces

UMCH

OMRON care4today Mobile Health Manager

2
- Ability to control and customize healthcare experience
- Flexibility and convenience for the patient
- Anytime, anywhere options, including at-home services

3
- 24/7 support via phone, chat, and other channels
- Direct outreach to consumers based on consumer preferences
- One-stop resolution or call back

DOCTOR2U TELEME D2D Healthcare doc DOCTORONCALL.COM.MY BookDoc Connect & Unite

- Patient-controlled data generated from mobile apps, wearables, social media platforms and patient portals is valuable for providers, pharmaceutical companies, and medical device manufacturers that are investing in platforms equipped with connected devices and applications to integrate this data better.

Trend 3: Personalization combined with consumer empowerment will be the key ingredient for prevention and wellness

Prudential launched myDNA in Singapore, an integrated service that includes initial genetic screening and mobile app for activity tracking and ongoing advice on nutrition, diet, and lifestyle.

Chinese unicorn company, iCarbonX, has created the Digital Life Alliance between HealthTell, PatientLikeMe, AOBiome, SomaLogic, GALT, Imagu and Robustnique to deliver personalized health analysis.

Preventive health management platform, Healthi, advises employees on suitable diagnostics and health packages and leverages the data collected to issue further health advisories.

Thorne Research provides biomarker-based home diagnostic tests and uses the information to offer personalized supplement intervention.

Hong Kong-based Advanced Genomic Solutions (AGS) provides DNA-based nutrition and lifestyle advice at HK$4,800 to employees and clients of Willis Tower Watson, Modern Terminals, and Pure Fitness.

Asia Genomics spun off Imagene Labs to enter the direct-to-consumer wellness business. Imagene provides personalized nutritional supplements, skincare products, and fitness advice on a subscription model.

Success of these new business models depends on 2 strategic technology decisions:

- Enabling access to data from partner organizations that may be geographically dispersed and structurally different.
- Enabling analytics and insights closer to the point of use of data to improve efficiency and data protection.

Investment Priorities for Healthcare Digital Transformation

In response to emerging decentralization, consumerization and personalization trends, industry stakeholders are bringing tech-enabled innovative solutions to the market, such as home monitoring and home care services, Internet of Medical Things (IoMT), precision medicine, and drug discovery IT. Countries display a spectrum of market maturity across each of these areas. In the near future, population health management, augmented and virtual reality technologies, artificial intelligence (AI), and value-based care (VBC) are expected to evolve from pilot projects to real growth markets.

Priority 1: Home monitoring platforms and home care services represent an opportunity worth $507 million in 2018, growing at about 8% annually

- India is leveraging frugal innovation in home monitoring devices, combined with integrated home care and patient convenience services that encourage out-of-pocket spending among the growing middle- and high-income groups. Philips announced expansion of its Healthcare@home services beyond respiratory and critical care to include other chronic and short-term conditions in major metropolitan areas.

- In 2017, Singapore's MOH allowed MediShield and Medisave coverage for autologous bone marrow transplant for cancer patients as data collected by the National University Cancer Institute showed that home care was more cost effective than in-patient treatment.

- Australian government is funding a A$21 million trial that offers 200 GPs bundled payments (instead of fee-for-service) to manage chronic conditions for 65,000 people.

Internet of Things (IoT)
Diabeto, Philips+AWS IoT Services,

Robotics
Softbank, NTT Data, Loomo (Segway Robot),

Mobile Apps
iRelief, Doctor2u, Doctor Anywhere, MyDoc, RingMD, Pill Pocket, Health Buddy (SingHealth), MediHome (MobileHealth2U+HSC Medical Center), Silverline, Ping An Good Doctor

Connectivity solutions will see escalating demand in the overall connected home and home healthcare segments, especially in emerging countries where network connectivity is poor, but demand and the ability to pay for home healthcare out-of-pocket is higher.

Image Source: www.angieslist.com; www.gigaom.com; www.fugenx.com

Priority 2: IoT sensors in the home and around the patient are being used to collect data for effective chronic disease management

Key Components for Success

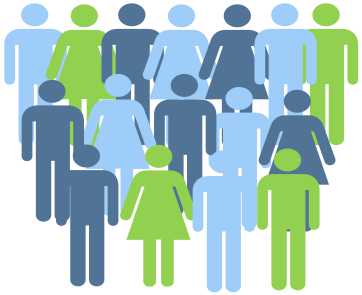
- Patient Experience
- Provider Optimization
- Big Data Analytics
- Artificial Intelligence
- Platform Environment

Source: Frost & Sullivan

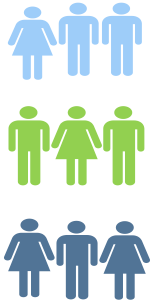
Ubiquitous sensors that capture and transmit medical information form the Internet of Medical Things (IoMT). Data exchanges for healthcare IoT remain relatively primitive in APAC as healthcare companies have yet to realize the full potential of services that can be delivered if the right ecosystem partners for an IoT platform is in place.

Priority 3: Precision medicine is an emerging area of interest in Japan, Singapore, and Hong Kong, among hospitals and pharmaceuticals

Generic Care → *Phase 1* → **Stratified Care** → *Phase 2* → **Precision Medicine**



Patients are grouped by:
- Disease sub-types
- Risk profiles
- Demographics
- Socio-economic traits
- Clinical features
- Biomarkers
- Molecular sub-populations



Each patient receives individualized care based on:
- Genomics and Omics
- Behavioural preferences
- Health history
- Medical records
- Medication compliance
- Exogenous factors

Uniform Clinical Workflows → **Precision medicine ensures timely intervention with evidence-based patient services, which is more likely to drive positive outcomes for all stakeholders.** → **Unique Clinical Workflows**

Significant investment is required, especially by pharmaceuticals, in revamping their legacy IT architecture to enable precision medicine workflows. Precision care delivery, which refers to targeted treatment and long-term care, is also a goal for the governments of Singapore and Hong Kong, but requires extensive IT architecture development.

Priority 4: Pharma drug discovery IT to generate $5.34 billion by 2020 globally, with APAC contributing at least 20% of the revenue

Emphasis on Improving Operational Efficiency

- Rising cost pressures and depleting new drug pipelines are pushing pharma companies to seek efficiency in their research operations.

Influence of Digital Media Applications in Patient and Physician Engagement

- Mobile and social media applications are increasingly becoming a popular medium for pharma companies to engage with patients and physicians for clinical trials, product marketing, and sales.

Digital technologies that can play a key role in APAC

Biomarkers
Accelerate patient recruitment by way of biomarker-based diagnostic tests/kit development.

Artificial Intelligence
AI for patient identification and matching, identification of new molecules, identification of new applications for existing molecules, and regime adherence.

Big Data and Clinical Informatics
For personalized treatment, personal, medical and population genomics data are used for patient recruitment (specifically in oncology trials)

mHealth + Internet of Things
Remote and home monitoring solutions for trial participants, improvements in patient experience, engagement, and subsequent retention.

Cloud technology
Provides better electronic connectivity and accessibility, real-time monitoring, collaboration, and information exchange

Wearables
Remote monitoring solutions reduce on-site physician visits and costs , and improve patient engagement

Digital technologies provide time- and cost-efficient approaches for precision therapeutics and enhance patient centricity, which is expected to help overcome traditional challenges – particularly in regard to patient access difficulty, data consistency, and patient monitoring – in the region.

Future health technology development will be closely linked to advances in data mobility and organizational collaboration

Population Health Management

PHM involves reducing the physiological and financial burden of disease in a sizeable population. Most APAC countries are debating over centralized versus distributed architectures to capture and analyze population-level health data that is most suited for enabling PHM.

Value-based Care

Companies like Medtronic envision moving from volume-to-value in care delivery by integrating patient information from all points of care (e.g., hospital, clinic, diagnostic lab) and providing value-added services to the patient and care manager. This demands sophisticated analytics at the point of use and constant communication and collaboration among all stakeholders.

Augmented & Virtual Reality

AR and VR technologies to assist in surgery, diagnostics, patient education, pharmaceutical and medical device R&D, and medical education depends on highly robust network connectivity and cloud platforms.

Artificial Intelligence

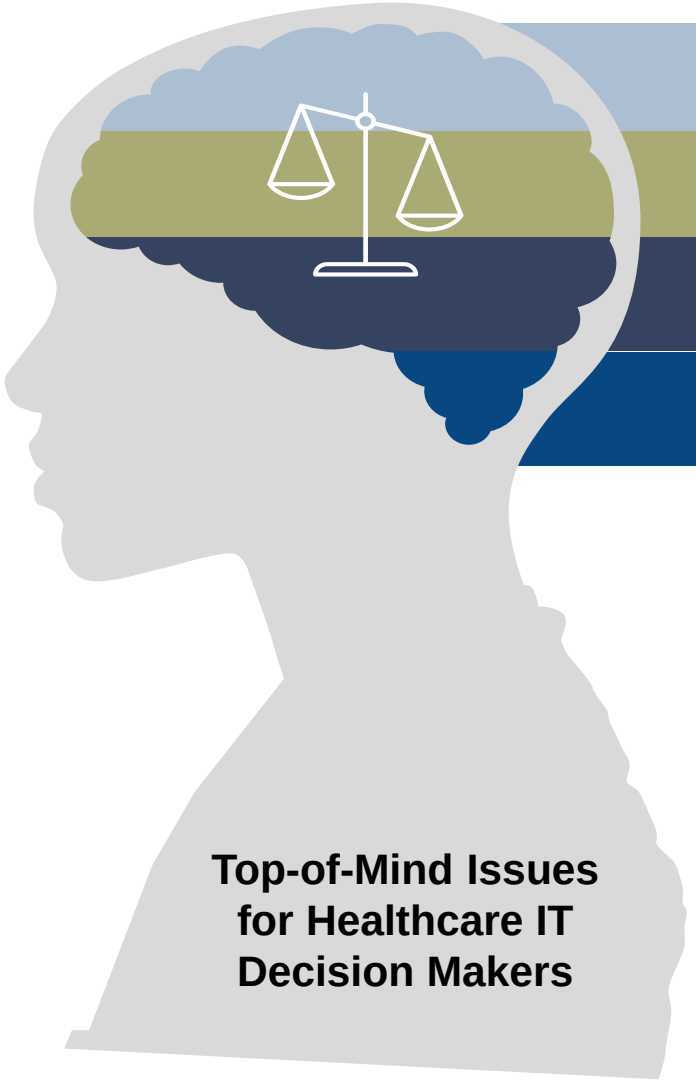
AI will be the next big game-changer in healthcare. Its penetration in oncology, clinical decision making, imaging, diagnostics, R&D, manufacturing, and direct-to-patient services is already on the rise in APAC. Cloud vendors are supporting DevOps organizations (internal or external to a healthcare enterprise) to serve emerging AI needs of the industry.

PHM, AR, VR, VBC, and AI are white spaces for technology and healthcare organizations to expand into by not only creating new solutions, but also introducing new models of care delivery. Such technology solutions are already in pilot phases and expected to enter the APAC market by 2025.

Strategic Imperatives for Healthcare Organizations Seeking Digital Transformation

Enabling current and future growth through technology investment in the cloud is an urgent strategic imperative for all healthcare industry stakeholders in APAC. In the near future, growth and sustainability for healthcare companies will depend on efficient data continuity platforms, big data, analytics and AI, precision medicine, and IoMT. However, the road to development is fraught with challenges such as providing a seamless end-user experience, delivering ROI on technology, and addressing cybersecurity issues.

Tactical hurdles exist in driving on-the-ground adoption of digital technologies in healthcare



Top-of-Mind Issues for Healthcare IT Decision Makers

Network Connectivity & Bandwidth

To ensure speed, access, and high-quality experience, network connectivity, latency, and bandwidth are key considerations.

Impact on Productivity & ROI

IT downtime, poor application performance, unintuitive workflows, under-defined performance indicators, and nebulous service level agreements could impact investment returns.

Data Security

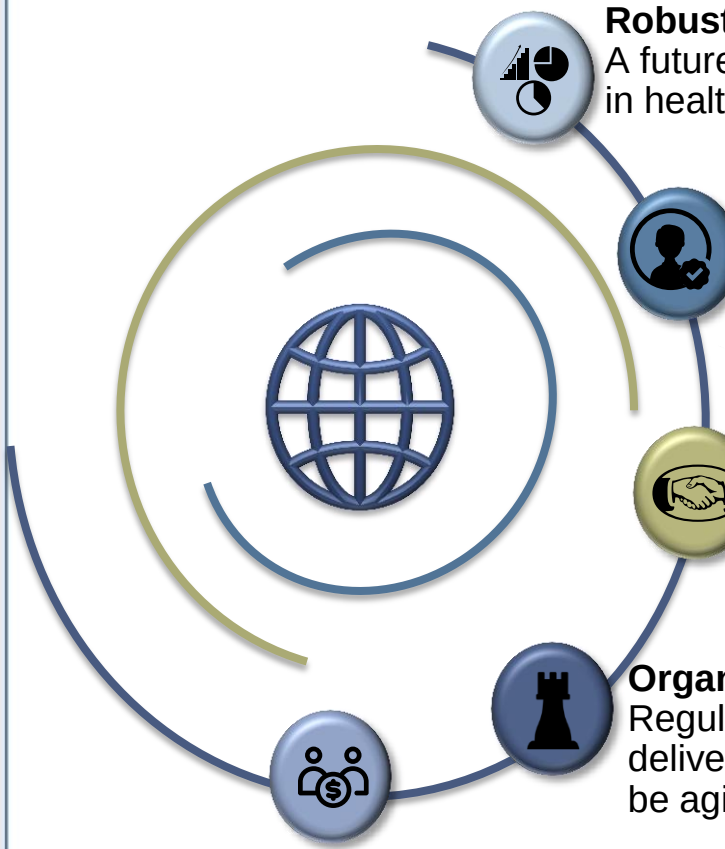
Security, privacy, and compliance are emerging as key issues with growing data volume, sources, and cloud adoption.

Cloud Adoption

Home monitoring, IoMT, precision medicine, and drug discovery IT depend heavily on cloud adoption in healthcare.

Digital Health is changing the way healthcare personnel operate on a daily basis. To ensure acceptance and adoption, technology must deliver a more superior experience than traditional workflows.

To overcome these hurdles, healthcare stakeholders must invest in forward-looking IT strategies built around these success factors:



Robust, Long-Term Data Strategy
A future-proof data strategy that envisions the future role of information in healthcare as the single-most important competitive advantage.

Patient-Centricity
A seemingly simple focus shift from clinician to consumer could bring along complex restructuring of the entire healthcare organization.

Business Model Innovation
Tech implementation and establishment of new business models will require healthcare organizations to invest in ecosystem development that comprise peers and non-healthcare entities.

Organizational Dynamism in Response to Evolving Regulations
Regulatory uncertainties relating to data security, compliance, care delivery models, and R&D processes require healthcare companies to be agile and nimble.

Prepare for Competition
The healthcare industry is increasingly attracting non-traditional market participants from various sectors including consumer technology, automotive, sensors, cosmetics and lifestyle, and food. Participants need to be creative in establishing a competitive advantage in this dynamic environment.

Australia Digital Health Market Snapshot

Consumer and end-user demand for technologies that improve the quality and efficiency of elderly care and chronic disease management is high in Australia. Simultaneously, regenerative medicine has been identified as an investment priority by pharmaceuticals that also want to reduce the cost of R&D. To support these market needs, the Australian government is working toward creating a policy framework that enables growth and sustainability of technology solutions.

Spotlight on Australia

Socio-Political

*"Dramatic health system reform can save **AUD200 billion** in the next 20 years."*
– Australia Productivity Commission (PC), Oct 2017

Economic

Healthcare expenditure in 2015-2016 was 10.3% of GDP at AUD170.4 billion or >AUD7,000 per person.

Health

Further development of the national electronic health record system, My Health Record, to add more industry stakeholders, even though consumer adoption remains low at about 21%.

Technology

Investments in Digital Hospitals continue to grow, with the Royal Adelaide Hospital as the latest addition to the list. Increasing investment in technology to enable PHM in Northern Territory and New South Wales.

Regulatory

Private insurance premiums have been rising at 5.6% per annum since 2010. The Australian government plans to encourage private sector contribution and participation by those aged 30 years and below.

Australia – Healthcare Challenges

Industry Challenges

Over Dependence on In-Patient Care
- Hospital re-admission rate in Australia increased at twice the rate of population growth from 2013-2014.
- In-patient expenditure contributes almost 50% of total industry spending.

Better Resource Utilization
- Nurses spend 30-45 minutes per shift just looking for devices and consumables.
- Time and energy is lost in exchanging paper and messages between departments.

Effective Chronic Disease Management
- According to the Australian Institute of Health and Welfare (AIHW), chronic diseases affect 1 in 5 Australians.

Better Home Care Support
- GPs and nurses could spend up to an hour driving for a home visit.
- Some nurses spend half a day on phone medication reminders.

Technology Implications

Providing services at alternative points of care through video telemedicine, home monitoring, wearables, and ambient sensors is an emerging area of investment among aged care facilities, GP clinics, and private insurers.

Technologies that can make healthcare workflows more efficient have a high demand in Australia. It is also easy to demonstrate the ROI on areas such as radiology IT, RFID tags, and enterprise communication platforms due to the process improvement.

This creates opportunities for new market entrants in predictive solutions for diagnostics, telehealth, and cloud platforms that improve home care, chronic diseases management, and patient engagement.

There is a need in the market for interoperable systems to provide clinical support to patients at their homes without compromising the quality and safety of healthcare services and patient data.

Australia – Evolution of the Regulatory Landscape

DATA PROTECTION	REVISING DEFINITIONS	REIMBURSEMENT STRUCTURE	DRIVING INNOVATION
Australia is prohibitive in terms of geographic location of stored personal data, but it is not a challenge for cloud vendors as most have a base in the country. Specific regulations on the ownership and management of health data are required in the country.	In 2017, the Therapeutic Goods Administration (TGA) clarified definitions on which wearables are to be regulated as medical devices, allowing their safe use and reimbursement for clinical care and research purposes. They are also looking into definitions of medical software.	The government is pushing for greater contribution from private sources of funding, leading to high private insurance premiums and decreasing adoption. In response, payers are trying to maintain margins by reducing payout through the use of predictive health monitoring.	TGA revisions include processes that allow faster access to market for new pharmaceutical products and innovative medical devices based on real-world evidence. The goal is to allow new, patient-centric technologies to enter the healthcare space faster.

The Australian government is instituting a policy framework that supports the development of markets for home monitoring technologies, wearables, mHealth apps, and remote care services. So far, market development has been restricted due to the absence of reimbursement models for many healthcare technologies but this is set to change. 5G enablement in the country is also expected to drive adoption of Digital Health.

Australia – Emerging Digital Health Opportunities

Key Areas of Technology Investment in Healthcare

Integration with Primary Care

- Improving communication, collaboration, and data sharing outside the hospital are key priorities. Integration of primary care and diagnostics services through cloud platforms is gaining traction.
- Data exchange and continuous collaboration through innovative interfaces and across multiple devices are being demanded by front-line medical workforce.

Patient Engagement & Experience

- A number of healthcare service providers and pharmaceuticals are building patient portals and patient engagement/experience tools. These include mobile-based telemedicine platforms, cloud-based portals, and outsourced patient services.
- Pharmaceuticals are collaborating with technology companies in this space.

Integrated Payer-Provider IT

- Healthcare service providers and government and private insurers are trying to build integrated platforms for better revenue cycle management.
- The payer market is also willing to experiment with wellness solutions for individuals and corporate organizations that enable real-time data capture, analytics, and advisory for patients.

Population Health Management (PHM)

- Investing in PHM solutions is a near-term goal for governments and providers. One of the earliest successes in this area is the deployment of Allscripts' dbMotion Solution on Microsoft Azure cloud at South Western Sydney Primary Health Network.
- PHM is an emerging topic of discussion with significant room for health IT solutions to develop customized analytics for payers and providers.

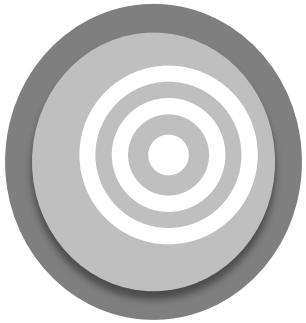
Australia – Key Success Factors for Digital Health

Focus on Integration

Organizational IT strategy should focus on integration and interoperability of best practices rather than best-in-class software.

Future View of Regulations & Compliance

The government is pushing for industry regulations that enable tech-based care delivery models. Business transition in this direction needs early planning.



Business Model Readiness to Adopt PHM

PHM business models require access to new data sources and meaningful analytics as well as organizational change management. Businesses need to be prepared for this.

Singapore Digital Health Market Snapshot

Singapore is a good test-bed for new technologies as the government provides significant financial and regulatory support to drive innovation in areas such as senior care, team-based care, prevention and wellness, and precision medicine. A number of technology vendors are conducting pilot studies that will help generate the data required to drive regulatory and reimbursement reforms.

Spotlight on Singapore

Socio-political

Singapore's public health system is targeted for consolidation into 3 major regional clusters. A new regional cluster combining Tan Tock Seng Hospital and Khoo Teck Puat Hospital was established in October 2017, serving **2 million people**.

Singapore spends about **4.9% of GDP on healthcare.** The government contributes about 40%, hence the average Singapore worker spends **10.5% of wages on health benefits** through Medisave.

Economic

Health

Singapore is expanding its healthcare infrastructure; **10,000 beds** will be added in acute hospitals (2,000), community hospitals (1,450), and nursing homes/long-term care (6,300) by 2020.

The next phase of the **National Electronic Health Record (NEHR)** will aggregate patient data from multiple sources including telehealth and integrated data analytics.

Technology

Regulatory

The Singapore Medical Council (SMC) Ethical Code and Ethical Guidelines (ECEG) have been revised. The new law **bans Third Party Administrators (TPAs) from charging** a percentage of the doctor's fees for their services.

Singapore – Healthcare Challenges

Industry Challenge

Aging Population
- Population aged over 65 are estimated to exceed 15% by 2025, by which Singapore would be rapidly aging, with elderly care spending that could bankrupt the country.

Over-crowding at Public Hospitals
- Public hospitals in Singapore run at over 80% capacity. Patients face long waiting times in both in-patient and outpatient settings. Admission wait times can be almost 2 hours.

Effective Chronic Disease Management
- Singapore is fighting chronic diseases like cardiovascular conditions, diabetes, and obesity. Diabetes alone will cost the health system $2.5 billion by 2050.

Pace of Innovation
- 4 in 10 Singaporeans use a health app or gadget to monitor themselves as per Cigna. However, regulations prevent successful business model development.

Technology Implications

In Singapore and Johor, Malaysia, a number of providers and real-estate groups are building aged care facilities equipped with the latest home monitoring technologies and home care services.

Digital platforms, especially cloud-based solutions, to enable resource optimization, patient management, patient scheduling, and healthcare enablement in the home or community clinics are key investment areas for the government.

Telehealth programs to manage stroke patients have shown strong potential. The government is pushing for team-based care, which will require communication and collaboration among diverse care providers to manage a single patient.

New technologies are being developed by a number of start-ups and established companies specializing in telehealth, genomics, clinical trials, and diagnostics, but their ascent to the market is hampered by tight regulations concerning usage and reimbursement.

Singapore – Evolution of the Regulatory Landscape

DATA PROTECTION	DIGITAL ADOPTION	REIMBURSEMENT STRUCTURE	DRIVING INNOVATION
Singapore's Personal Data Protection Act (PDPA) protects health information while providers like SingHealth establish additional guidelines on how they are protecting data collected at their facilities. The proposed Healthcare Services Bill will make NEHR data accessible to all doctors, but limit the access of employers and insurers. This would put a constraint on employer and payer applications that leverage patient data.	Strong government push for the National Electronic Health Record (NEHR) has enabled its near-perfect adoption in public hospitals, and is now driving primary care adoption. Phase II will look into issues such as data governance, interoperability, and usage.	National financing schemes for those aged above 65 are increasing, including reimbursements for chronic disease management platforms based on pilot data supplied by vendors. This eliminates the hurdle of business model development for these vendors.	In 2017, the Health Sciences Authority (HSA) announced regulations for fast-tracking innovations in strategic areas like regenerative medicine or those that can address key healthcare issues in a cost-effective manner.

Data privacy concerns among the people have led the government to create more restrictive legislations compared to countries like Australia, which could prevent the development of patient-focused services by healthcare companies, employers, and insurers.

Singapore – Emerging Digital Health Opportunities

Key Areas of Technology Investment in Healthcare

Smart Hospital Transformation

- Private hospitals like Farrer Park and Fullerton Health have already created a Smart Hospital environment where people, processes, and technology work together to deliver high-quality care.
- Public health systems like NUHS are in the process of digital transformation.

Chronic Disease Management

- The NEHR is a rich data asset that can be used for improving care quality, utilization of healthcare services, R&D, and economic and regulatory decision making.
- The next phase of NEHR is focused on how data can be used to its full potential with PHM being an important next step.

Precision Medicine

- Research agencies, pharmaceutical companies, providers and start-ups like mHealth, and wearables vendors are leveraging shared platforms to conduct analytics on disparate data sets, such as genomic and life style information, to identify root causes of pathophysiology.

Population Health Management (PHM)

- Providing high-quality care at the patient's convenience is a top priority for the government, public and private providers, and GP clinics to support the aging population. Therefore, CDM platforms such as the Philips Hospital-to-Home services have a high growth potential in Singapore.

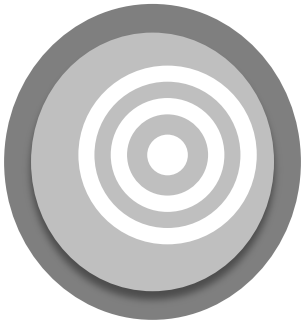
Singapore – Key Success Factors for Digital Health

Regulatory Imperative to Drive Nationwide Adoption

NEHR is expected to be made a regulatory mandate for all types of care delivery organizations. Both public and private sector entities need to be prepared for this.

Prepare for Data Security & Protection

Government regulations on ownership, management, and usage of health and wellness data are raising concerns among business owners as well as consumers. Compliance will be an emerging area of investment in the near future.



Decision Making Flexibility within Organizations

Singapore is strongly emphasizing on innovation in healthcare, but organizational leadership continues to be rigid and risk-averse. There is a need to break hierarchical barriers, especially in investment outlay, to drive innovation.

Hong Kong Digital Health Market Snapshot

Hong Kong's early investment in a population-level electronic health record has placed the city on strong footing to develop population health management and precision medicine solutions. The cloud is currently a hot investment area in Hong Kong, with the government instituting supportive cybersecurity laws.

Spotlight on Hong Kong

Socio-Political

Hong Kong health chief, Sophia Chan, announced a voluntary scheme for medical insurance with average premium of **HK$4,800** and tax cut of HK$800 per person for joiners to encourage more people to take up medical insurance.

Public healthcare spending will be allocated **$71.1 billion** in 2018-2019, an increase of 13.3% over the previous year.

Economic

Health

Hospital Authority (HA), Hong Kong, the public hospitals management body of the city, reports over **2 million Accident & Emergency** attendances, about **1.7 million in-patient** attendances, and **over 7 million specialist outpatient** visits.

The government's **Smart City Blueprint** includes the establishment of a big data platform by the Hospital Authority in 2019 that will enable advances in aged care and population health management.

Technology

Regulatory

The use of technology to enable care was mandated as early as 1990 in Hong Kong. As a result, the government now holds **280 terabytes of healthcare data**, spanning patient records, clinical notes, drug history, laboratory records, and imaging data.

Hong Kong – Healthcare Challenges

Disproportionate Strain on Public Hospitals
- Women diagnosed with breast cancer have been reported to wait as long as 256 days for a mammogram.
- Average Emergency Room wait time in public hospitals for non-urgent patients is 130 minutes.

Workforce Constraints
- Public hospitals in Hong Kong serve 90% of in-patient volume, but employ only 40% of full-time employed doctors in the region. Over 300 doctors work part-time at public hospitals.

Aging Population
- Those aged above 65 account for almost 16% of the population. The aging population is expected to drive health spending to almost 10% of GDP by 2030.

Ensure Long-term Sustainability
- Hong Kong has identified healthcare as a key growth sector for its economy and has been building capabilities in biotechnology, genetics, and regenerative medicine.

Technology Implications

The government is committed to improving efficiency of the public sector by investing in infrastructure development and technology adoption, and increasing the tech-savvy medical workforce.

IT solutions in the provider segment such as HIS and EMR have strong penetration in Hong Kong and the government is driving further adoption. There is also a push for robotics and virtual assistants in healthcare to ease the burden on doctors.

Technologies supporting senior care as well as technologies for early diagnostics and prevention and wellness are taking the lead in Hong Kong. The goal of the Electronic Health Record Sharing System (eHR) is to act as a single, longitudinal, comprehensive view of a patient's health journey across all points of care.

While the public health databases are an important source of population-wide data for reliable clinical research among Asians, emerging start-ups are offering gene sequencing and clinical trials management services using digital platforms.

Hong Kong – Evolution of the Regulatory Landscape

TELEMEDICINE	DATA OWNERSHIP	mHealth	CLOUD IN HEALTHCARE
China released guidelines for conducting safe, standards-based telemedicine in the Telemedicine Opinions as early as 2014. However, adoption of online consultation platforms in Hong Kong remains low. Many doctors use store-and-forward models of telemedicine but are hesitant to deliver online consultations due to lack of awareness of the regulatory framework.	Personal data in Hong Kong is protected by the Personal Data (Privacy) Ordinance (PDPO). On top of this, the Electronic Health Record (eHR) Sharing System Ordinance confers the management and ownership of EHR data to the government and the hospital. Patients are contesting this right to ownership of health data.	Regulations pertaining to the development, approval, and usage of mobile apps in healthcare are absent in Hong Kong, creating barriers to adoption of mHealth for clinical workflows and chronic disease management. There is no indication on when supporting regulations will be introduced.	Cloud storage and computing regulations in Hong Kong allow healthcare organizations to leverage cloud platforms as long as they adhere to PDPO and the eHR Sharing System Ordinance, and reveal data location. There are some limitations on transferring data outside Hong Kong, but overall, the city shows high adoption among hospitals, mHealth and telemedicine companies, and pharmaceutical and medical technology manufacturers.

Population-focused technologies are expected to develop well as the regulatory landscape evolves. Hong Kong is the most mature market in APAC to leverage big data tools and the cloud platform for public health programs and policy-making. However, direct-to-patient care delivery platforms have limited room for growth until further regulatory reform is instituted.

Hong Kong – Emerging Digital Health Opportunities

Key Areas of Technology Investment in Healthcare

Technologies for Aging Independently

- About 27% of the elderly in Hong Kong continue to work, thus having significant spending power. About 40% have received secondary education and a large number of them live alone or with an elderly partner.
- Technologies like home monitoring, mobility solutions, and robotics allowing independent aging are in high demand.

Electronic Health Record

- Hong Kong will be implementing Stage 2 of the National Electronic Health Record in 2019.
- Stage 2 includes augmenting the current eHR infrastructure for increasing penetration, adherence to international standards, and enablement of patient-centric technologies like mobile apps and patient portals. It will also lead to PHM.

Precision Medicine

- Precision medicine has been designated a strategic market for economic growth by the government for several years now.
- As a result, genetic testing service companies like Prenetics and iGene have sprung up in the city. Genomics platforms for clinical research and diagnostics are also key investment targets.

Cybersecurity

- With increasing development of big data infrastructure containing comprehensive patient health information city-wide, the government is paying special attention to cybersecurity. Solutions that ensure data safety and quality in the hospital are being explored by the Hospital Authority.

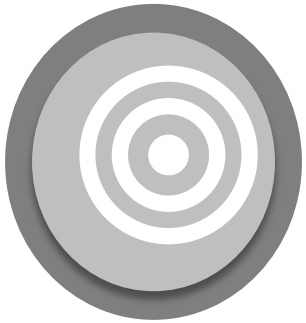
Hong Kong – Key Success Factors for Digital Health

Regulatory Imperative to Drive Nationwide Adoption

Like Singapore, the Hong Kong government is also focused on driving widespread adoption of the national EHR and will need to work with multiple stakeholders to achieve this.

Prepare for Data Security & Protection in the Cloud

A cloud-first strategy is the priority for providers in Hong Kong, as directed by the government. Ensuring compliance and security is critical for all providers and their partner organizations.



Data Strategy Centered on Precision Medicine

Future goals for Digital Health organizations in Hong Kong are heavily targeted toward precision medicine. Data capture, workflows, and analytics are to be designed with these future goals in mind.

Japan Digital Health Market Snapshot

Regulatory reform has significantly lagged behind technology development in Japan, creating a major adoption gap. While the government is pushing for regional health information exchanges and connected platforms to manage home care end-user knowledge, adoption remains slow. Several pharmaceutical companies are interested in leveraging AI and real-world data for clinical trials, but lack awareness of how to implement these solutions.

Spotlight on Japan

Socio-Political

Japan is collaborating with multiple countries, including India, China, and the Netherlands, to reinforce its position as a key **exporter of health technology innovations** and education.

In order to curb healthcare expenditure, the Finance Ministry has proposed multiple policy revisions, ranging from fee reductions for drugs and medical services to **increased out-of-pocket spending by those aged above 75 years**, and a temporary halt on child allowances for wealthy households.

Economic

Health

Antibiotic overuse and over-prescription by doctors in Japan add to healthcare costs and AMR risk. The country targets a **reduction of the total antibiotic usage by 33%** by 2020, and wants active prevention and wellness initiatives that involve consumers.

Japanese private insurance companies are driving population-based cost reduction mechanisms by promoting healthy behaviors. **Neo First Life Insurance** introduced premium discounts for people with a lower "health age" that is calculated based on data provided by the Japan Medical Data Center.

Technology

Regulatory

An increase to **consumption tax** was proposed previously, but no action has been taken. The current government is pushing for the tax to be **increased to 10%.**

Japan – Healthcare Challenges

Industry Challenge

High dependence on in-patient care
- Approximately 2.6 million patients or 2% of the population receive hospital care every day.
- Average length of hospital stay is 16.5 days, as compared to 4 in the United States.

High volume of expensive treatment options
- 112 MRI scans performed per 1,000 population per year, as compared to the OECD average of 52.
- High usage of branded drugs.

Aging population
- 30% of the population will be aged 65 years and above by 2020, the fastest aging society in the world, placing a strain on the existing medical workforce.

Patient and clinician readiness
- Only 42% of patients and 21% of clinicians believe people can manage their own health, as compared to 81% and 41% in the US, according to a Philips survey.

Technology Implications

The government is striving to reduce the burden on in-patient care by emphasizing home-based and community care models. This requires IT infrastructure investment that allows data to be shared outside hospitals.

Besides regularly updating reimbursement schedules, the government needs to institute value-based health technology assessments. These depend on the availability of high-quality population-level data sets and sophisticated analytics tools.

Robotics and virtual assistants to support nursing staff and home care workers are in huge demand in Japan. Japanese robots for home care are not only taking care of the elderly in the country, but they are also a huge export business.

Patients and consumers in Japan are not as evolved as digital health consumers in other APAC countries. This is negatively impacting technology adoption for providers, pharmaceuticals, and medical technology companies as well.

Japan – Evolution of the Regulatory Landscape

MEDICAL R&D	HEALTHCARE DIGITALIZATION	TELEMEDICINE	DATA PROTECTION
One of the goals of the Health Ministry is to create an international market worth 5 trillion yen for high-tech Japanese medical equipment by 2030. To support this, the government is launching a slew of initiatives and directives to promote the development of AI and robotics in medical care, medical devices, and pharmaceutical R&D.	The "Declaration to be the World's Most Advanced IT Nation" by the IT Strategic Headquarters includes directives to build digital infrastructure to support medical care and nursing services. This is an important driver for healthcare IT investment in the provider segment.	In August 2015, the government relaxed regulations to allow the introduction of telemedicine in the country. Other aspects of the Japan Revitalization Strategy are spurring investments in IT infrastructure for regional health information exchanges and home monitoring.	Japan's new Act on the Protection of Personal Information (APPI), enacted in May 2017, centralized personal data protection responsibility with higher restrictions on data transfer across borders. Personal data for Japanese citizens is collected using the unique government identifier, My Number. While sensitive patient data is strictly protected, guidelines for using anonymized data for medical research have been established.

While regulations to allow health data sharing is a first step, developing the IT architecture to enable health information sharing is a critical component of regulatory reform in Japan. Key priorities are ensuring access, speed, and quality when sharing healthcare data among clinicians.

Japan – Emerging Digital Health Opportunities

Key Areas of Technology Investment in Healthcare

Regionally Integrated Health Records

- EMR penetration in Japan is as high as 90% in large hospitals, and 50% in medium-sized hospitals. However, patient records are restricted to the hospital, and not shared with other points of care. While data protection issues are being addressed, the government is also building health information exchanges to enable better data sharing.

Big Data, Analytics, and AI

- The Japanese government has a huge data asset in the form of medical claims submitted to the National Health Insurance (NHI). In 2017, it passed a bill allowing medical records stored in hospitals to be pooled for research purposes. These large datasets are highly valuable to providers, policymakers, and pharmaceutical companies for disease and drug research.

Drug Discovery IT

- Pharmaceutical companies in Japan are keen on leveraging IT in drug discovery, including automated workflows for R&D, and clinical trials, AI to identify new molecules, and the use of wearables to collect real-world data. Their current challenge is gaining access to patients and patient data, and lack awareness on how vertically integrated technology platforms can help.

Home Monitoring and Home Care

- To support the aging population, the government wants to drive adoption of patient portals, home monitoring devices, and enablers of home care, such as robotic nurse assistants, which are already being trialled at some aged care homes.

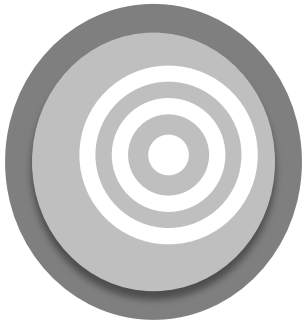
Japan – Key Success Factors for Digital Health

Data and IT Strategy Focused on Integration

The government is expected to aggressively tackle the major challenge of integrating health information across various points of care in the near future. Healthcare organizations need to prepare for this.

Future View of Industry Regulations

Several regulatory reforms that impact digitalization in healthcare are in the pipeline, but there is uncertainty around their prospect and timeline for implementation. Healthcare organizations are future-proofing their IT architecture in anticipation.



Data-Centric Business Model Innovation

As health information becomes more fluid, Japanese companies will be in a better position to create new business models based on innovation in data analytics and services.

China Digital Health Market Snapshot

China is emerging as a powerhouse of technology companies ready to penetrate healthcare markets abroad. However, within its own borders government regulations and their enforcement lags behind the demand for care delivery innovation among clinicians and consumers. A number of start-ups offering preventative health and wellness services directly to consumers have emerged, but they seem to be performing better in international markets than in their home country.

Spotlight on China

Socio-Political

The **Made in China 2025** campaign has led to an increase in smart manufacturing, industrial IoT, and cloud platforms across the program's focus industries, including medical technology. AI and VR are major segments of innovation.

Economic

The Chinese Ministry of Health ordered **medical device manufacturers** in the country to disclose sensitive business information, such as manufacturing costs, so that it could renegotiate prices.

Health

Cancer is the leading cause of death and concern in China (approximately **3 million deaths** per year) with half of the cancer-related deaths happening due to lifestyle factors. Breast cancer incidence can be as high as 60 out of 100,000 women in populated cities.

Technology

Alibaba is working on a **blockchain-based health information exchange** platform while Infervision is testing its AI software for lung cancer diagnostics across 20 grade A hospitals.

Regulatory

More medical institutions will receive approval and support from the ministry to conduct **phase 1 clinical trials.** Special regulations will be announced in 2018 to reduce the time-to-market for innovative medical devices for consumers.

China – Healthcare Challenges

Industry Challenges

Efficient Utilization of Public vs. Private Hospitals
- Lack of gatekeeping allows everyone to go to a hospital, even for minor ailments.
- Doctors prefer to work at public hospitals as they get better exposure.

Healthcare IT Infrastructure
- Only about 30% of hospitals have a basic EMR while about 2% have a sophisticated solution. Healthcare IT investment has stagnated for decades.

Market Competitiveness
- Healthcare has been identified as a high growth sector for the country to export high-value solutions and services.

Access to Healthcare
- China has universal coverage, but the depth of coverage is poor. Many people do not have access to care due to geographic or financial constraints.

Technology Implications

Regulations to encourage private hospital groups to build infrastructure have been instituted. As a result, foreign hospital chains are bringing state-of-the-art facilities to China to attract medical talent and local, high-paying patients.

The government is funding regional health information exchange platforms and medical record databases. Simultaneously, local healthcare IT vendors like Alibaba, Tencent, and Neusoft are working through public-private partnerships to develop health IT infrastructure.

The government is encouraging established companies and start-ups to build innovative solutions for healthcare AI and precision medicine. It is also supporting international expansion for companies like Alibaba, Tencent, and Baidu.

A number of start-ups in areas like telemedicine, mobile apps for patient information, appointment booking, online diagnostics, wellness advisory, referrals networks, and insurance-backed health management platforms have been introduced.

China – Evolution of the Regulatory Landscape

INSURTECH	DATA PROTECTION	REGENERATIVE MEDICINE	DATA LOCALIZATION
The government's impetus to revise the insurance industry through technology has influenced healthcare insurers as well. Private health insurance companies are providing mobile app-based chronic disease management solutions. Ping An Good Doctor is one of the leading digital health services platform offered by an insurer in the country.	China is expected to revise the National Standard for Personal Information Protection by the end of 2018 with more stringent limitations on consumer consent, storage, handling, and application, including secondary use, of data. This could limit the development of AI in healthcare.	To develop a new high-value export as well as support its aging population, the government has released over 30 new policies that promote R&D in regenerative medicine since 2010. Technologies like AI, virtual reality, and 3D printing are driving advances in stem cell research, tissue engineering, and complex, age-related diseases.	In 2017, China revised its cybersecurity law to ensure that all data on Chinese consumers are stored within the country. As a result, companies like Apple are building data centers in China while other major multinational vendors are expected to follow suit. This has implications for healthcare companies such as medical device manufacturers that collect patient information as part of usage.

Revisions to the personal data protection and cybersecurity regulations in China are expected to prompt various healthcare organizations (e.g., private hospital chains, pharmaceuticals, medical device companies, and technology vendors) to establish data center presence in the market through direct or partnership investments.

China – Emerging Digital Health Opportunities

Key Areas of Technology Investment in Healthcare

Health Information Continuity

- Integrating health data is a key goal of health reforms. Leading cities including Beijing, Jiangsu, and Fujian are investing in regional health information exchanges while hospital groups are investing in EMRs.
- Supporting the data storage needs in full compliance with cybersecurity laws will be key in China.

Patient Engagement and Experience

- A number of hospitals in China, especially in the private sector, are now interacting with their patient base through patient portals and mobile apps.
- These platforms collect patient data outside the hospital and provide analytics services almost on a real-time basis, making them ideal targets for cloud solutions.

Regenerative Medicine

- China is emerging as a market leader in regenerative medicine in APAC. While regulations to promote R&D and market development for new products are in place, local and multinational pharmaceuticals struggle to have access to technologies like sophisticated AI and ML solutions, virtual reality, and 3D printing.

Personalization and Wellness

- Start-ups in China are targeting the consumer-facing gene sequencing market to create personalized services for consumers, such as daily health recommendations, disease prediction and management, and personalized over-the-counter therapeutics.

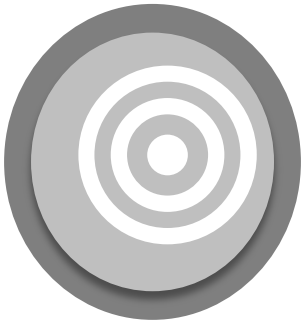
China – Key Success Factors for Digital Health

Local Partners to Navigate Industry Regulations

Industry regulations in China are inexact and their implementation is even weaker. Local partners can help companies work through the red tape.

Stringent Cloud and Data Security Compliance

Regulations around storage and protection of data relating to Chinese people are driving multinationals to invest in local assets. This will continue as more healthcare organizations start creating and capturing patient data.



Locally Developed, but Globally Competitive Solutions

In line with the government's strategy of exporting high-value solutions and services to international markets, healthcare businesses will have to create solutions that can be expanded to other geographies.

Indonesia Digital Health Market Snapshot

The sheer population size, growing demand for healthcare services, and expected mega investment in healthcare infrastructure make Indonesia an attractive market for Digital Health. However, market sophistication is low and even before the country can explore advanced solutions, it needs to improve basic IT infrastructure in hospitals and on its dispersed islands. While EMR penetration is low, imaging informatics is more developed and a number of vendors are pushing cloud-based archives for medical images.

Spotlight on Indonesia

Socio-political

Ahead of the 2019 elections, Indonesian President Joko Widodo has put **$20 billion worth of infrastructure projects** on hold to refocus resources on education and healthcare.

Indonesia's Universal Healthcare Coverage scheme, **Jaminan Kesehatan Nasional (JKN)**, has led to an increasing demand for pharmaceuticals, medical devices, clinical labs, and healthcare services in the country.

Economic

Health

Urbanization and the rising middle class are resulting in an increase in lifestyle-related diseases. Tuberculosis is the leading infectious disease killer in the country while cardiovascular diseases are responsible for **37% of deaths**.

The trend of **outsourcing tests from hospitals to centralized labs** is driving the adoption of automated high-throughput workflow solutions to minimize cost and improve operational efficiency.

Technology

Regulatory

The government's **Negative Investment List** launched in 2016 has allowed 100% foreign ownership in 29 key sectors as a strategic measure to attain 7% year-on-year domestic growth by 2019.

Indonesia – Healthcare Challenges

Industry Challenge

Quality of Healthcare Services
- Despite the existence of a universal coverage system, about 600,000 Indonesians travel abroad for better-quality care and health services.

Access to Care
- In an archipelago spanning 5,000km from east to west, 56% of the population live in Java. Many rural pockets do not have access to health facilities.

Information Asymmetry
- The level of health awareness and data consciousness among Indonesians is low, leaving treatment options to the discretion of clinicians.

High Cost and Inefficient Use of Pharmaceutical Drugs
- Pharmaceutical spending is projected to rise above $10 billion by 2021, of which only 11% will be contributed by generics. Indonesia is the largest market for counterfeit drugs in Southeast Asia.

Technology Implications

Private hospitals are striving to reverse the outbound flow of medical tourists by investing in internationally accredited facilities and foreign medical talent, which require extensive IT investment.

The government is investing in public-private partnerships to enable telemedicine in remote areas while equipping local clinics with connectivity infrastructure for consulting hospitals in developed cities.

Government-funded and private start-ups like Alodokter are doing well in providing information such as names and contact details of specialists, procedure price comparisons, and insurance coverage to patients.

E-commerce platforms like ApotikAntar and Prosehat aim to bring convenience and efficiency to pharmaceutical distribution while companies like IBM are introducing blockchain to make supply and distribution of pharmaceuticals more transparent.

Indonesia – Evolution of the Regulatory Landscape

E-HEALTH POLICIES	JAMINAN KESEHATAN NASIONAL	E-CATALOGUE	DATA PROTECTION
Telemedicine and teleradiology have been identified as potential digital solutions to improve access and quality of care in Indonesia. The government has been investing in pilots independently or in partnerships with private vendors like GE Healthcare since 2012. However, no data on outcomes of the pilots or definitive policies to drive adoption have been released.	Jaminan Kesehatan Nasional (JKN), Indonesia's universal health coverage scheme launched in 2014, has led to overcrowding at public hospitals and budget over-runs for the government. As a result, the government is encouraging private hospitals to play a greater role in supporting the program.	The Ministry of Health launched the e-Catalogue system a few years ago. It is an online procurement platform for over 200 medical devices serving both private and public hospitals. It has enabled digitalization and transparency, and reduced prices and corruption in the medical device market in the country.	Indonesia instituted a Personal Data Protection law in 2016. However, the law has less stringent guidelines on data collection, ownership, storage, and transfers than neighboring APAC countries. It also does not specify guidelines for handling patient data. As a result, there have been episodes of discrimination among insurers and employers based on health records.

Regulatory architecture in Indonesia is rather weak and cannot sustain a vibrant Digital Health industry. It can only drive pockets of IT investment among providers and consumer-facing start-ups.

Indonesia – Emerging Digital Health Opportunities

Key Areas of Technology Investment in Healthcare

Electronic Medical Records

- Despite a number of hospitals using an electronic billing system (mandated by the government) less than 30% have a high functioning EMR in place.
- Indonesia is a hot target for EMR vendors with few of them testing cloud-based solutions in the country.

Radiology Informatics

- A number of medical imaging companies are targeting the Indonesia market for new and replacement imaging IT solutions.
- Next-generation imaging informatics in Indonesia will demand cloud storage, vendor-neutral archives, and mobile access for clinicians, which will drive IT investment in radiology, especially among private hospitals.

mHealth

- Smartphone penetration in Indonesia is almost 45%.
- In order to bridge the access gap and improve the quality of services, private insurers, hospitals, and start-ups are investing in mHealth solutions for health advisory, provider information, and patient convenience services targeted at consumers.

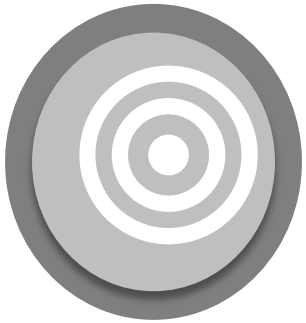
Indonesia – Key Success Factors for Digital Health

IT Strategy Enabling Consumer Centricity

IT architecture and workflows need to allow far more information to be captured and made available to patients and consumers.

Ecosystem Partnerships Enabling Geographic Expansion

Siloed digital health solutions will have limited growth. Industry partnerships with peers and non-healthcare partners will allow companies to grow beyond country borders with strong prospects across Southeast Asia.



Consumer and Patient-centric Business Model Innovation

Growing demand for healthcare services makes Indonesia a hot-bed for business model innovation among pharmaceutical and medical technology companies targeting services-based business models.

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