



Software as a Product and Service in the Healthcare Industry in Developing Markets

Opportunities for Malta-Based Service Providers

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List of Acronyms

WHO	World Health Organisation
ICT	Information and Communication Technology
AI	Artificial Intelligence
VUI	Voice User Interface
IoT	Internet of Things
IoMT	Internet of Medical Things
HIS	Hospital Information System
RPA	Robotic Process Automation
EHR	Electronic Health Record
PHR	Personal Health Record
EBITDA	Earnings Before Interest, Taxes, Depreciation and Amortisation
RPM	Remote Patient Monitoring
CAGR	Compound Annual Growth Rate
GDP	Gross Domestic Product
GNI	Gross National Income
IMF	International Monetary Fund

1.0 | Scope

This report assesses the latest trends in the digital revolution that is sweeping the health industry: a service sector that is fundamental to every country's social and economic development and to the well-being of its citizens.

The focus is on software as an integral feature of this revolution, assessing how the latest health technology trends may be affecting its traditional position within the health care value chain. The report therefore outlines the latest trends and developments in established markets, together with some insight into the emerging growth areas that will dominate the sector over the next few years. The focus will then shift to how digital health is evolving in developing and emerging markets, identifying key similarities and differences between the path this seems to be taking in such countries compared to that we have seen in advanced economies. While digital health is clearly making inroads in these markets, it is being shaped by the particular needs and priorities of developing health systems. The applications and technologies that are leading the digital revolution in line with these priorities are therefore identified, indicating niche growth areas for growth in these markets.

In essence, this report will provide a snapshot of the health technology landscape, clarifying where the sector stands today and where it seems to be heading, in the health value chains of both the developed economies that lead the charge as well as in the developing markets that are adapting this technology to their own reality. It will conclude with a focus on developing countries in Asia Pacific, which the report considers to be significant growth markets for health technology over the coming years.

2.0 | Executive Summary

As more and more governments in developing regions acknowledge that health is a key driver for economic growth, many emerging markets are experiencing the highest-ever levels of public and private investment in this sector, with digitisation featuring strongly in the change strategies being implemented.

Of the three developing regions considered for the purposes of this report, Asia presents significant opportunities. Challenged by a growing and ageing population, and now reaping the benefits of significant economic growth in recent years, the health sectors across the developing countries in the region are investing heavily in health reform as they work to scale up the currently inadequate health infrastructure to address these issues.

Digitisation is an integral part of this process, in many cases harnessing the mobile and internet connectivity that is so prevalent in the region. There is no sign that the momentum we have seen to date will run its course any time soon, and the latest projections show that Asia is set to become the fastest-growing digital health market within the next five years, overtaking the advanced economies that have traditionally led the way.

On this basis, Asia clearly emerges as a frontrunner for any Malta-based technology enterprises currently assessing export opportunities.



3.0 | Introduction

This report focuses on software as a product or service in the value chain of the healthcare industry with a focus on emerging markets.

3.1 | Definition of a 'Value Chain'

The 'value chain' concept was developed by Professor Michael Porter in 1985. Although this was largely based on the manufacturing model prevalent at the time, it can be applied to virtually any industry and is considered to be an excellent means of analysing the interaction of the various activities required to create and deliver a product or service of value to end users or customers.

Porter's Value Chain

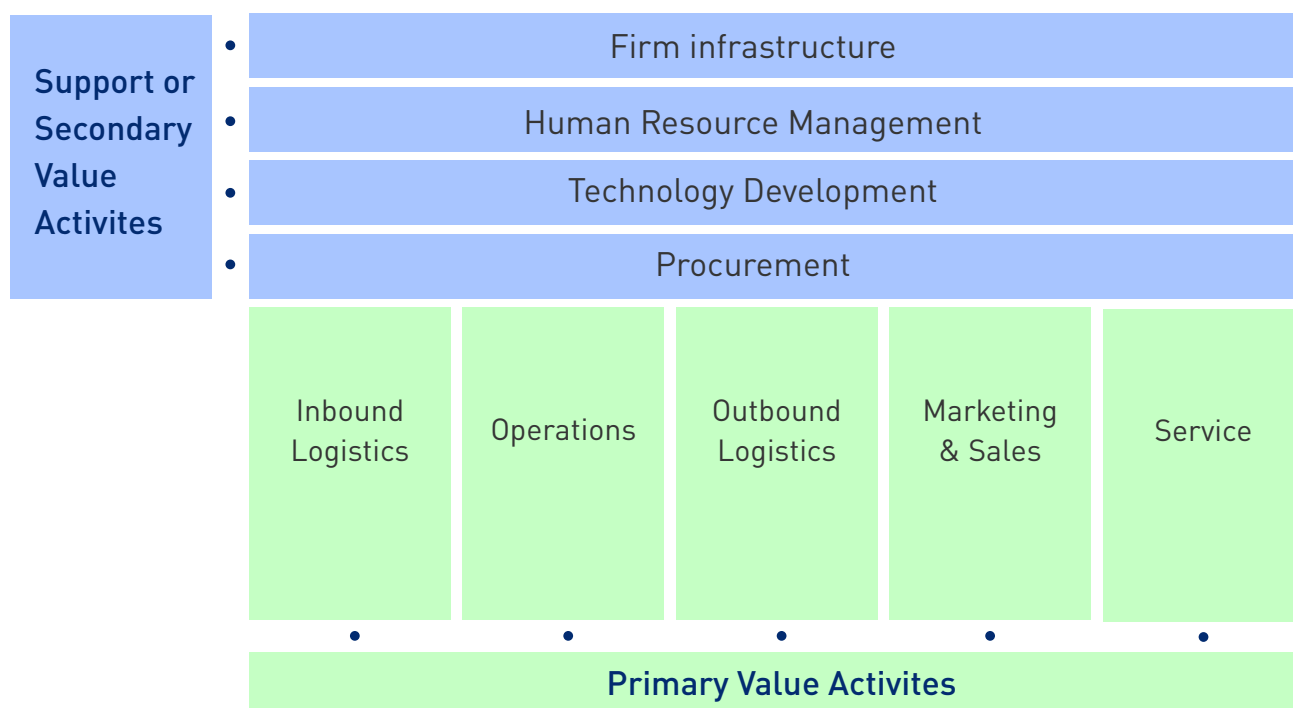


Figure 1: Porter's Generic Value Chain'

As can be seen above, this value chain splits an industry's activities into two categories: 'primary' and 'support' value activities.

Primary activities

These consist of five components, and all are essential for adding value and creating a competitive advantage:

- 1 Inbound logistics:** The receiving, storage and inventory control of input materials.
- 2 Operations:** Value-adding activities that transform these inputs into the final product or service.
- 3 Outbound logistics:** Activities required to deliver the final product or service to the end-user.
- 4 Marketing and sales:** Strategies to attract potential customers to purchase the product or service.
- 5 Customer Service:** Activities to maintain and enhance the product or service's perceived value in the marketplace.

Support Activities

The role of support activities is to help make the primary activities more efficient. When you increase the efficiency of any of the four support activities, it benefits at least one of the five primary activities. These support activities are generally considered to be overhead costs. These activities are:

- 1 Procurement:** The purchasing activity which acquires the inputs necessary to support the value-adding activities.
- 2 Technological development:** Technological activities used to support the value chain.
- 3 Human Resources (HR) management:** Recruitment, development, retention and compensation of employees.
- 4 Infrastructure:** Finance, legal, corporate management and governance.

As can be seen above, technology is perceived as a core support activity and an integral link in an industry's overall value chain. As we will see in this report, its relative importance in this context has been growing steadily with the onset of the digital revolution and it is now indispensable in creating and maintaining a competitive advantage.

In the following section we will take a high-level snapshot of how technology is impacting the healthcare value chain, assessing whether this is shaping into a major growth area that could provide opportunities for specialised companies based in Malta who may wish to enter this particular industry. Our assessment will first look at the situation in developed markets, given that these generally shape the trends emerging in developing regions, before focusing on particular markets that may provide opportunities for Malta-based suppliers.

4.0 | 'Wired Health': How Health and Technology are Converging

Technology has been considered a key support activity for the health industry for decades, with landmark inventions such as x-ray imaging and electronic records management bringing radical improvements to the way medicine is accessed and administered. Since the 1990s however this support role has evolved into a far wider one, taking in all aspects of health service provision. This has given rise to some confusion in the terms used to describe this shift, with labels such as 'electronic health', 'digital health', 'connected health' and 'health tech' often used interchangeably. Malta-based ICT service providers exploring opportunities in this field should start with clarity on what these different terms refer to.

The latest guidelines issued by the World Health Organisation (WHO) point to 'digital health' as a collective term that covers both electronic health and mobile health. They go on to define these as follows:

DIGITAL HEALTH	
Electronic health (e-health)	The cost-effective and secure use of information and communication technologies for health and health-related fields
Mobile health (m-health):	A component of e-health, involving the provision of health services and information via mobile technologies, such as mobile phones, tablet computers and personal digital assistants

Table 1: WHO definition of 'Digital Health'
Source: World Health Organisation. Retrieved 18th April 2019, from <https://www.who.int/tb/areas-of-work/digital-health/faq/en/>

What is clear is that, beyond any formal definitions, digital health is moving towards a holistic approach that embraces both technology enablers (networks, platforms, software, equipment) and health solutions (products, services, content and applications).

This is shifting technology's position in the health value chain from its traditional support role to one at the very forefront of change within the sector and we now seem to have reached the point where observers describe technological disruption as being "Healthcare's New Normal"¹ or refer to "Big Bang Disruption in Healthcare."²

Some of the digital innovations that are driving disruption in healthcare are:

- **Analytics**
- **Cloud**
- **Internet of Things**
- **Genomics**
- **Imaging**
- **Blockchain**
- **Virtual Health**
- **Artificial Intelligence**
- **Robotics**



One of the main reasons for the perception that convergence between health and technology has reached this pivotal point is that, historically, and relative to other sectors, the health industry has been less affected by the transformative impacts of technology. This was due mainly to heavy regulation as well as a lingering negative attitude to digitisation as being impersonal and, as such, a threat to the traditional doctor-patient dynamic.

However, just as innovation disrupted other industries, healthcare is proving to be no exception. As a leading article in the 'Journal of mHealth' recently put it "We've digitised calling a cab, getting our groceries and communicating with friends, so it's only a matter of time before we totally digitise health, too."³ In the following section we will focus on the emerging situation in developed markets, and the directions that digital health is likely to take in the next few years.

¹ The Tincture Collective. August 2018. *Disruption is Healthcare's New Normal*

² Accenture. August 2018. *Exponential Technologies Driving Big Bang Disruption in Healthcare*

³ The Journal of mHealth. 6 August 2018. *How Digital Health is Taking the Industry by Storm*

5.0 | Digital Health: The Situation in Developed Markets

For decades the United States has been the global leader in health technology development, with a market size of approximately

EUR 107 billion.

However, two other developed countries, the United Kingdom and Canada, are fast catching up through the adoption of aggressive new policies aimed at expanding their reach in healthcare technology⁴.

The United Kingdom has committed

EUR 131 billion

to health technology innovation, based largely on public-private partnership.

Canada has launched the 'Canada Biotechnology Strategy' as a framework for coordinating public and private partnerships in digital health R&D and national market size is set to reach

EUR 60 million

this year.

These may be the global front runners however similar efforts are clearly under way in a number of other markets across the world.



⁴ According to metrics in the internationally recognised Biotech Industry Organisation's Innovation Scoreboard

What factors are driving this growth?

In **developed markets** the key drivers for this digital health revolution include:

Rising healthcare demand coupled with severe cost pressures: these factors are now making it essential for healthcare systems to innovate and deliver improved outcomes at lower cost.

An increase in health spending after the slowdown following the financial crisis: health expenditure in 2017 grew by its fastest rate in seven years with further growth forecast until 2022⁵.

The arrival of multiple game-changing technologies which are accessible, powerful and cheap: technologies such as smart-phones, genomic sequencing and editing tools, machine learning and advanced sensors are converging to make the investigation and treatment of disease radically different.

The fact that many of these technologies can ride on smartphone technology and wearable devices place the individual at the very centre of these changes, neutralising the perception of health tech as being impersonal: The rapid rise of such devices is enabling patient-empowerment and normalising such technology in the health sphere, further boosted by the fast-growing consumer interest in health and well-being.



⁵ OECD. June 2018. *Spending on Health: Latest Trends*

5.1 | Digital Health: Clinical Application

The clinical area is where most of the innovations make the headlines and which patients can readily experience at first hand. These are the digital tools and devices that use ICT technologies in the prevention, diagnosis, treatment, monitoring and management of diseases and medical conditions. The growth in this segment in developed economies is aligned with the digital transformation that has impacted consumer expectations in these markets: consumers are now accustomed to engaging with technology in practically every aspect of their day-to-day lives and are increasingly expecting it as the norm.

This growing demand is now impacting the health industry: as health consumers are increasingly paying a larger percentage of their care with their own money, enhancing customer experience and offering quality care in line with consumer expectations is now regarded as a strong driver of hospital performance. To go back to the value chain concept that is the basis of this report, this means that technology is taking on ever greater importance as a critical element in enhancing the value of the health industry's primary activity.

One element of this trend is a greater readiness on the part of health service providers to invest in the tools and technologies that are steadily becoming part of mainstream care. A report issued earlier this year by the Deloitte Centre for Health Solutions analysing the global healthcare industry indicates that this investment in data access and data sharing through digital solutions is well underway ⁶.



This report finds that this investment is already showing results in terms of:

- **Improved personalisation;**
- **Better self-service;**
- **Better patient experience.**

⁶ Deloitte Centre for Health Solutions. 2019. *2019 Global Health Survey*

Top New Clinical Technologies of 2019:

Smart inhalers

Bluetooth-enabled smart inhalers for asthma patients collect data on dosage administration and transmit this to the patient's smartphone to enable better monitoring of their condition.



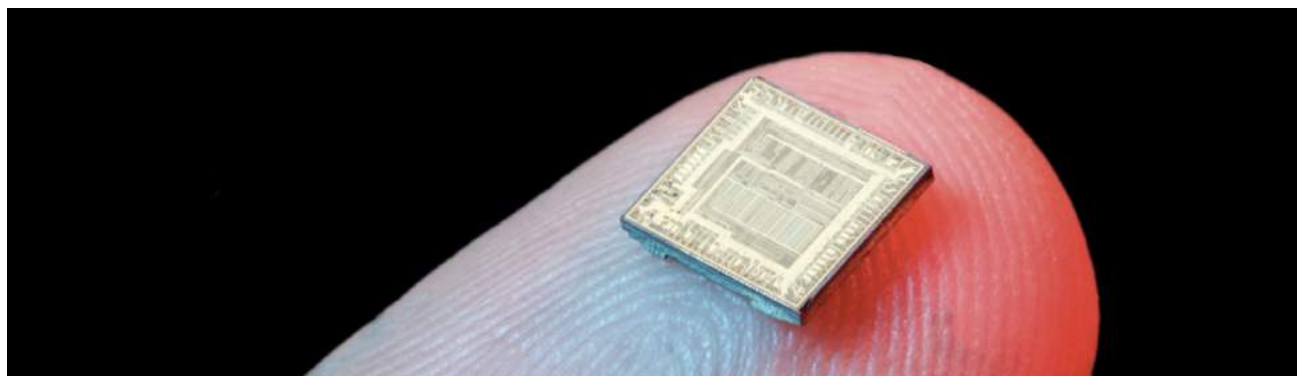
Robotic Surgery

Used to enhance surgeon's capability in complex microsurgery.



Wireless Brain Sensors

Using plastics, these are bioresorbable electronics that can be placed in the brain to measure biodata and then dissolve when no longer needed.



3-D Printing

Can be used to create implants to be used during surgery and increasingly to produce bespoke prosthetics.



Artificial Organs

Using bio-printing to produce artificial organs which vastly reduce the risk of rejection by the body's immune system.



Health Wearables

First introduced with the release of Bluetooth in 2000, the use of smartphones to track anything from heart rates to sleeping patterns is now central to prevention and early detection of many life-threatening conditions.



Precision medicine

Using highly personalised data, such as genetic make-up, to plan individual treatments and therapies.



Telehealth

A fast-developing area that allows patients to receive medical care by engaging with medical staff through digital devices rather than through face-to-face appointments.



Current forecasts indicate that based on the results achieved and given the ongoing consumer demand – particularly from the millennial demographic – digital health investment is likely to grow into the medium-term.

The core question is which technologies are set to have the biggest impact on the industry?

It is vital that any Malta-based enterprises gearing up to enter this market monitor any developments closely and analytically.

Reaction Data, a leading US-based firm specialising in global healthcare research has recently issued the results of a comprehensive survey of the latest developments in digital health ⁷. This included an analysis of the technologies that service providers consider will have the biggest impact on the health industry going forward. Figure 2 below outlines the results based on the responses received from the decision makers at leading hospitals across the United States.

Which technologies will have the biggest impact on the Health industry?

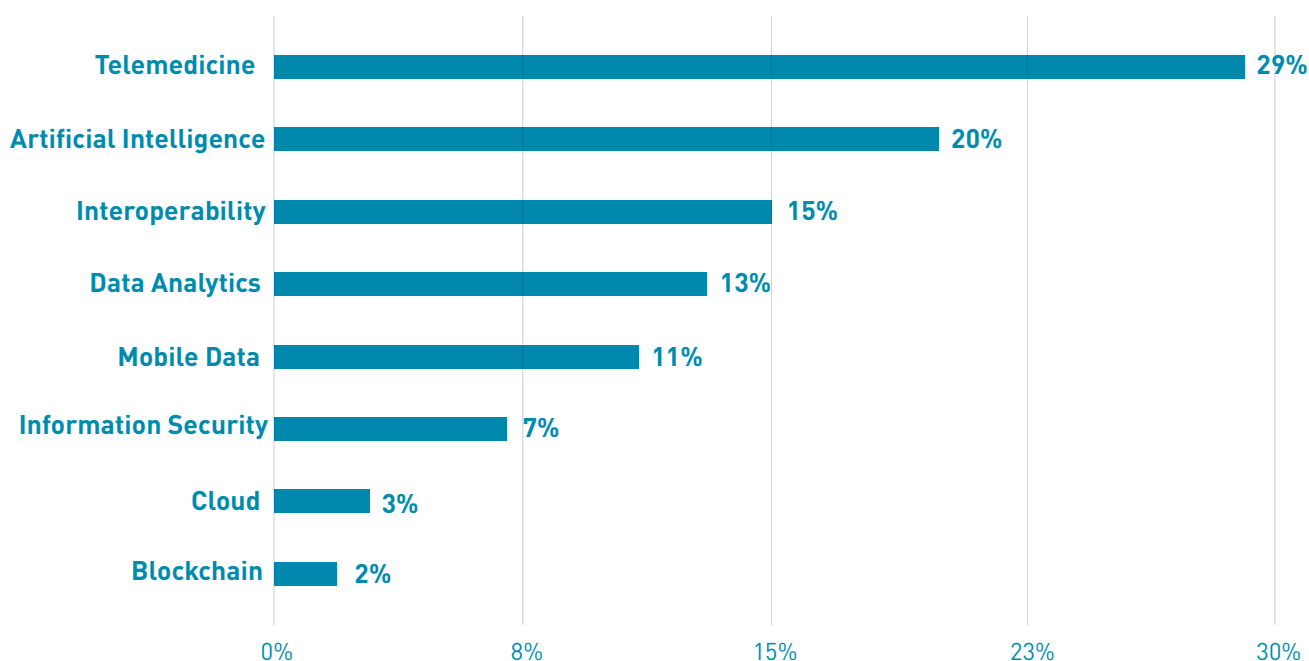


Figure 2: Key Emerging Technologies
Source: ReactionData 2018

⁷ Reaction Data, February 2019. *Healthcare Disruption: The Future of the Healthcare Market*

The key take-away here is that providers and consumers tend to feel more comfortable rolling out enhancements of technologies they have already experienced: this is probably the main reason why telemedicine and artificial intelligence (AI) account for nearly half the responses. A core reason for this finding is that telemedicine is already established across the hospital system while the patient community is now growing accustomed to AI primarily through the voice assistants provided by Apple and Android smartphones and tablets. In fact, a trend identified as being “one to watch” in 2019 is the fast-increasing use of voice-driven patient communications through the adoption of phone-based Voice User Interface (VUI) technology to ensure better engagement with outpatients following specific care plans. The emphasis will be on improving the quality of this interface: moving from the ‘robo-call’ effect to a more personalised and realistic tone and style⁸.

An example of AI-assisted workflow management is DeloitteASSIST, a patient communication solution that combines the capabilities of speech recognition, natural language processing and AI to enable patients to request assistance by simply speaking their request. Nurses are alerted to their need with AI prioritising and smart-routing requests to the right resource (nurses, orderlies, carers etc.)

AI and robotics applications are still at the early-adoption stage among healthcare stakeholders and patients. Increased uptake will depend on the producer’s ability to cut costs and improve the accuracy of technologies such as natural language processing, big data and cognitive technologies. Acceptance and trust on the part of patients and healthcare professionals is also critical.



⁸ Becker's Health IT & CIO Report, December 2018. *Health IT: 5 Healthcare trends to watch in 2019*

The Internet of Things- sometimes referred to as the Internet of Medical Things (IoMT) by some observers in the health technology industry - is another emerging area with significant disruptor potential

Its key selling-point is connectivity and integration by bringing together people (patients, caregivers and clinicians), data (patient or performance data), processes (care delivery and patient support) and enablers (sensors, connected medical devices and mobile apps).

IoMT is set to grow in line with the increased demand for connected medical devices that can generate, collect and analyse data. This then connects with provider networks, transmitting health data to either a cloud repository or internal servers.



5.2 | Digital Health: Business Uses

Investment and innovation in technology at the core of healthcare organisations has seen a drastic increase in recent years, driven primarily by the ongoing need to improve cost-efficiency in every aspect of service delivery. Back-office systems, and the quality of their connections with front-end, patient-facing functions are now viewed as critical infrastructure ensuring efficiency without compromising service quality, and, as importantly, providing real-time information wherever it is needed. Once again, a clear example of technology's support role shifting in importance along the healthcare value chain.

The 2019 Global Health Review issued by the Deloitte Centre for Health Solutions referred to above describe as being 'heart of the business' information and argues that, although health organisations may be implementing technology in different ways and with varying priorities, the consistent bottom-line appears to be a commitment to "harnessing emerging technologies to enable core systems and back-office processes to reinvent how daily work gets done."

This is consolidating the rise of wholly-integrated Hospital Information Systems (HIS) software which promises to:

- **Increase Revenue;**
- **Optimise Productivity;**
- **Simplify Operations.**

A core objective of these software systems is to provide operational visibility on every aspect of the service chain, integrating all departments across different geographic locations where required. An increasing number of these solutions are Cloud-based to eliminate costly hardware investment.

Desk research indicated that current leaders in hospital management software offer the following common functions integrated into a single system:

- **Outpatient and Inpatient Management**
- **Pharmacy**
- **Laboratory**
- **Radiology**
- **Ward Management**
- **Mobile Application**
- **Online Appointments Scheduling**
- **Secured Messaging**
- **Doctor Portal**
- **Patient and Family Portals**
- **Medical Electronic Billing**
- **Accounting**
- **HR/Payroll**
- **Procurement**



Figure 3 below presents a typical HIS workflow.

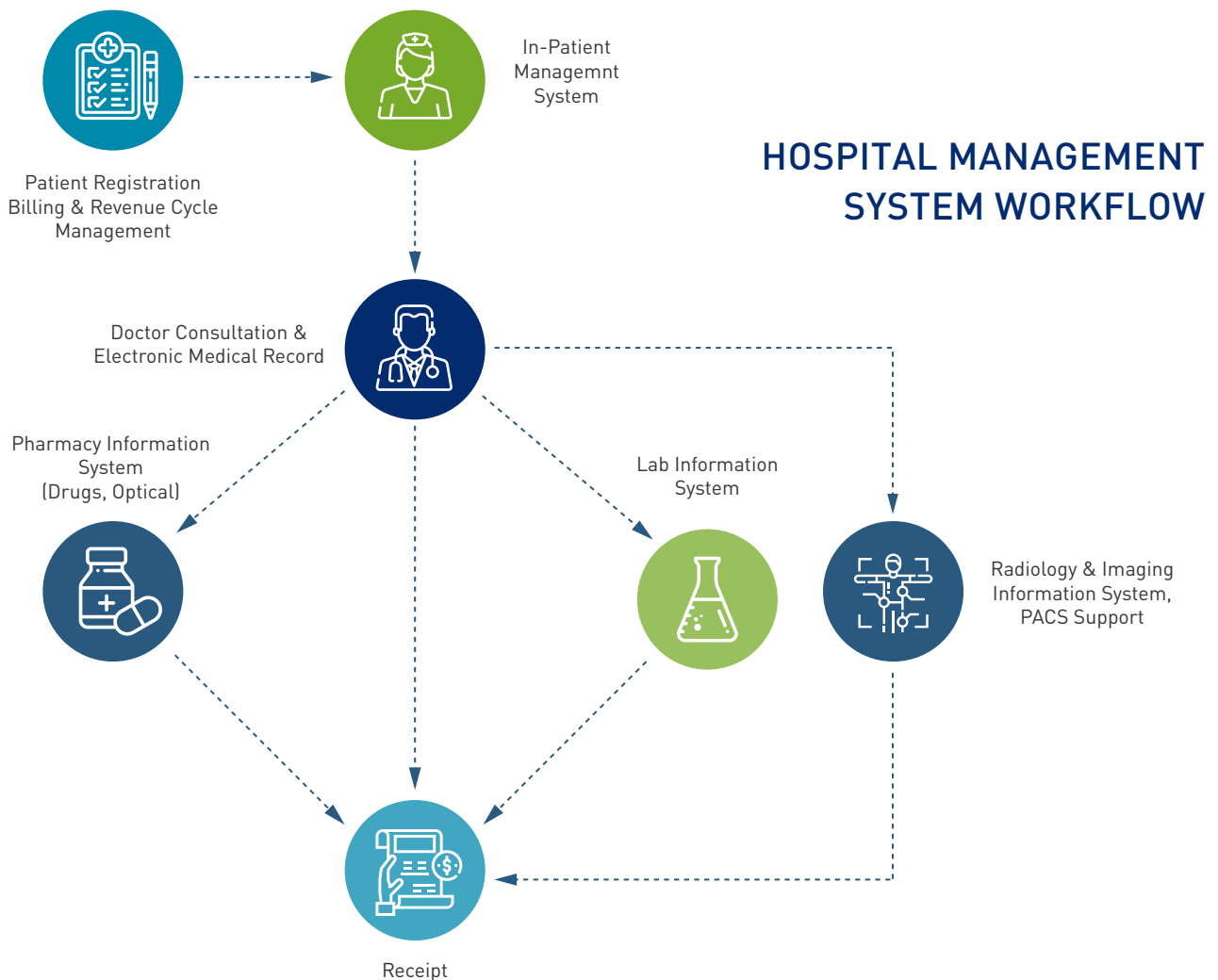


Figure 3: Typical Health Information System Workflow
Source: McKinsey

A market leader in the HIS space is Microsoft. Its recently launched Azure API programme is an interoperable fully-integrated solution which emphasises connection and collaboration between practically every aspect of the entire health care service chain, from health records to pharmacy and laboratory systems, right up to fitness devices worn by individual patients.

Key emerging technologies in this space are machine-learning and robotic process automation (RPA), cloud-based software-as-a-service (SaaS) offerings and predictive tools to improve two primary core functions: **revenue cycle** and **supply chain**.

One key emerging disruptor in health systems management is Blockchain. The responses captured in Figure 2 registered a negligible reference to this technology. However, beyond these results the potential of blockchain to achieve precisely the drastic 'reinvention' referred to above is increasingly recognised by industry analysts and there is a growing consensus that blockchain holds enormous potential for the health sector. The Deloitte 2019 Global Health Survey states that:

“

Blockchain has the potential to enhance collaboration, trust, interoperability, traceability and auditability across a range of functions such as clinical trials, supply chain management, financial transactions, credentialing and claims processing. The shift from blockchain to blockchains – to network of networks – is particularly compelling in life sciences and health care, where the distinct sectors work together in one broadly interdependent ecosystem. ”

On this point it is interesting to note is that a survey it carried out in 2017 into the expansion of blockchain beyond financial services, Deloitte found that while the health industry's adoption of this technology is in its early stages, the number of health organisations that expressed concrete plans to deploy blockchain outpaced similar outlooks from every other industry⁹.

⁹ Deloitte Consulting. 2017. *Deloitte Survey: Blockchain reaches beyond financial services with some industries moving faster*

Notable examples of how health systems around the world are investing in digital technologies to reinvent their operations: data sharing and integration is a key element, not least to factor this data into national health policy making.

Japan has enacted legislation to significantly increase shared use of Electronic Medical Records (EMR) data. While almost all hospitals in Japan have EMRs, the issue is that each hospital implements different systems and the data is not designed to be aggregated at the national level – this works against the growing need to base better national health management on stronger national health data.

India is investing heavily in introducing online patient registration and service delivery systems in both public and private hospitals, extending to mobile apps for appointment booking, online payment, downloading of test reports and general health education.

Australia is rolling out My Health Record, which links patient data in a personalised health record (PHR) across different parts of the health care value chain.

5.3 | A Shifting Market Landscape: Non-Traditional Players Enter the Scene

A further disruptor in the health care value chain has been the market entry of non-traditional companies from the consumer, retail and technology sectors.

The rise of these alternatives to traditional service providers was particularly significant in 2018 and the trend is set to intensify into the medium-term.



As can be seen in some of the most significant developments below, these **new players are taking on both aspects of the digital health transformation**: the front ‘patient-facing’ end as well as the back-end concerned with **systems management and operations**.

These are some of the most salient developments:

- Apple announced it is entering the personal health record (PHR) space with Apple Health, a new platform that will interface with electronic health records (EHRs) in 39 major US hospitals.
- Apple is also clearly seeking to take the lead in the consumer devices space and has launched a new Apple Watch feature called the ‘Elektrocardiogram’ with advanced heart monitoring capability. Apart from its core patient monitoring function at an individual level, the aim is also to gather data that will then feed into a machine-learning system to help physicians spot disease. It is also embarking on similar applications to track Parkinson’s Disease patients in terms of data collected on patients’ tremors.
- Amazon joined with JP Morgan Chase and Berkshire Hathaway to establish an independent, not-for-profit healthcare company for their one million US employees. If this proves to be a success, it could act as a new model for other corporations to adopt.
- Amazon is also looking into leveraging voice assistant Alexa in the healthcare space by initiating an initiative to help people with diabetes manage their condition. US hospitals are also piloting initiatives to use Alexa to facilitate post-discharge patient management.
- Through its cloud business, AWS, Amazon also is pitching its services to health-care customers starting with enabling hospitals and health insurance companies to use the cloud service to track the status of claims submissions and remittances. In September 2018 it was announced that this service will now also be enabled for blockchain.
- In a further move into the health sphere, Amazon has announced its entry into the hospital management software market and will be launching software that can ‘read’ medical records and make suggestions for improving treatment or saving money. Using algorithms, the software will scan multiple records to pick out information related to medical condition, procedures and prescriptions.

- Google is also gathering stride in the health technology market, focusing primarily on AI-powered speech recognition to help physicians take notes during hospital visits and the use of data analytics in medical research. It also appears to be taking a significant interest in health tech for the elderly.

6.0 | Shifts in the Health Value Chain: Impact on the Technology Sector

As discussed above, the rapid rise of digital health in the last couple of years has thrust technology to the forefront of the support activities defined in the traditional health industry value chain. A report issued in April 2018 by McKinsey & Company indicates that this growth is creating significant opportunities for companies in the ICT sector and confirm that, based on their data, services and technology have become the fastest-growing profit pool in the healthcare industry¹⁰.

According to McKinsey's data, companies in this sector earned an aggregate EBITDA¹¹ of approximately USD 35 billion, rivalling other major segments of the healthcare economy. For the past five years aggregate EBITDA has in fact grown faster among healthcare services and technology companies (at 7% per annum) than among traditional players and providers.

This is reflected in the overall growth of the global digital health market, which accounted for

USD 182.6 billion in 2017

and is expected to reach

USD 665 billion by 2026

growing at a Compound Annual Growth Rate

(CAGR) of 15.4%

during that period¹².

¹⁰ McKinsey & Company. April 2018. *Why the evolving healthcare services and technology market matters*

¹¹ 'earnings before interest, taxes, depreciation, and amortization'

¹² Market Research Consulting (MRC). April 2018. *Digital Health Market Size, Share, Trends & Forecasts to 2026*

6.1 | The Telehealth Segment

A key segment in the health technology space is 'telehealth' or 'telemedicine'. This is defined by the World Health Organisation as:

“

The delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities¹³.

”



¹³ World Health Organisation. 11–16 December, Geneva, 1997. A health telematics policy in support of WHO's Health-For-All strategy for global health development: report of the WHO group consultation on health telematics.

Telehealth solutions are divided into three main areas:



1 Remote Patient Monitoring (RPM)

Also referred to as 'telemonitoring,' RPM are essentially health tracking tools that allow healthcare providers to track and monitor patients with chronic diseases (diabetes, hypertension etc.). This depends on the transmission of patient data such as blood sugar or blood pressure levels in real time to caregivers with notifications of any abnormal measurements.

Examples of RPM applications:

- Glucose Trackers
- Wearable devices that track blood pressure
- Smart beds that monitor patients' health, communicate with hospital devices and equipment and automatically make the necessary adjustments
- Sensors that monitor the balance of patients with walkers and canes

2 Store-And-Forward

Enables primary healthcare providers to store and share patient data with other providers across different locations to ensure continuity of care and eliminate time-lags in treatment.

Examples of Store-And-Forward applications:

- Teleradiology solutions that send patient X-rays to another radiologist
- Teledermatology solutions that send patient photos for remote diagnosis
- Telepsychiatry solutions that enable remote behavioural health treatment

3 Real-Time Health

Facilitates real-time communication between physician and patient generally through audio and video communication between caregiver and patient.

In all cases, applications and solutions must be compliant with the health data privacy regulations in force in a given country. Any applicable health data privacy regulations, similar to the Health Insurance Portability and Accountability Act in the US and the General Data Protection Regulation in the EU, must be closely consulted before developing any health-oriented software solutions for any market.

6.2 | The Telehealth Segment: Future Prospects

As discussed above, recent research data indicates that this segment will lead health technology development over the next five years (Figure 2). **This has important implications for software providers since this segment is dependent on the development of customised software applications, particularly mobile applications.**

Significant growth is in fact envisaged for the telehealth market, valued at **USD 6 billion in 2016** and forecast to expand at an **average CAGR of 15.7%** to reach a total value of USD 25 million in 2020.

North America and Europe are projected to dominate the market during this period given the increased demand for services and cost-efficiency in those regions: the increased prevalence of chronic diseases such as diabetes and cardiovascular diseases is also a driver for this growth.

Significant growth is also expected in Asia Pacific, driven by the increased adoption of technology and rising demand for self-care devices and solutions from an increasingly tech-savvy consumer base – the digital health market in the region is expected to expand at a CAGR of 15% from 2017 to 2025. This is a faster rate of growth than the established markets over the same period. These opportunities will be discussed further when reviewing digital health trends in developing markets.

Which telehealth applications will lead the way?

- **Remote Patient Monitoring** dominates the Telehealth technology segment with a 65% market share that is forecast to remain high through to 2022.
- **mHealth** holds the second largest share with a **CAGR of 18% 2018-2022**.
- **Video Telemedicine** contributes the least market share with a CAGR of 13%.
- In terms of medical applications **Teledermatology** is the largest segment but the one with the slowest rate of growth running up to 2022.
- **Teleradiology** contributes the second highest share with an average CAGR of 12%.
- **Telecardiology** is assuming a more dominant position, and expected to lead the application segment in 2022.
- **Telepathology** holds the least share throughout 2014-2022.

Source: Future Generic Reports. September 2018. Global Telehealth Market 2018-2025

¹⁴ Transparency Market Research. March 2018. Telehealth Market – Global Industry Analysis, Size, Share, Growth, Trends and Forecast 2017-2025

In terms of technology components, the services segment is set to account for the **leading share of the telehealth market** during this same period, driven mainly by the **increased adoption of remote monitoring solutions** by patients in remote rural areas.



This is followed by the software segment that is anticipated to expand at a comparatively higher growth rate than the hardware segment in terms of revenue owing to continuous innovations in software by major players.

Key players in the telehealth market

Some of the key players operating in the telehealth market include Koninklijke Philips N.V., Medtronic plc, Tunstall Healthcare Group Ltd, McKesson Corporation, Medvivo Group Ltd., AMD Global Telemedicine, Inc., Vidyo, Inc., Cisco Systems, Inc., Care Innovations, LLC, Hon-eywell Life Care Solutions, and General Electric Company.

7.0 | The Evolving Healthcare Services and Technology Market

The healthcare services and technology market consists of a wide range of companies active in the different segments of the industry and the intersections between the different technology activities may at times be blurred. In industry terms the three main segments are:

- **Data, analytics and information services**
- **Software, platforms and technology**
- **Clinical solutions and healthcare value services**

The latest market intelligence indicates that all three segments are growing and will continue to grow over the next five years, albeit at different rates¹⁵.

Data, analytics and information services are likely to continue to have the fastest growth with a forecast **EBITDA CAGR of 16% to 18%** over the next five years; the key driver here is increasing business and public sector demand for analytical capability.

Software, platforms and technology are also expected to have rapid growth in the region of **10% to 12% EBITDA CAGR** over the next five years.

Clinical solutions and healthcare value services, such as medical cost and population health management solutions, are also likely to grow rapidly due to cost concerns at an estimated **7% to 9% EBITDA CAGR** over the next five years.

¹⁵ McKinsey & Company 2018; Mordor Intelligence 2018; the Economist Intelligence Unit 2018

7.1 | Implications for the Software Segment

As seen in the previous section, software as a product or service is an integral part of the ongoing digital transformation in the health industry, and one which will continue to grow as that transformation gains traction. The core reason for this is that these services are increasing in importance, given that many processes are becoming more standardised and enabled by artificial intelligence, robotic process automation, machine learning etc.

This avalanche of new technology is raising the bar in what is essentially developing into an increasingly software-driven health care space. This is blurring the boundaries between software, platforms and technology services and changing the health technology ecosystem as we know it.

A number of industry observers are referring to this current state as a major transition point for health technology, describing “a new generation in health IT that puts software at the core of the entire ecosystem.”¹⁶ It is being referred to in some quarters as ‘Software 4.0’.

This reference relates to the Fourth Industrial Revolution, or ‘Industry 4.0’, which is focused on automation and data exchange in manufacturing technologies. It combines cognitive computing, the internet of things, cyber-physical systems and cloud computing to enable a smart factory.



¹⁶ Forbes Technology Council. July 2018. How a New Generation of Software Could Reshape the Future of Health Care

In the same way, Software 4.0 can be used to describe the new evolution in the digital health care ecosystem. Comprised of many facets, this new generation of software brings together key methodologies and best practices, such as continuous integration, hackathons, DevOps and agile development, to deliver hyper-personalised user experiences that make digital transformation a reality.

This requires a more collaborative and iterative approach to software development than the more fragmented software development processes that have often been the rule to date. Today, software development must be a collective team effort with a framework that enables collaborative ideation. In order to accomplish this at speed, design thinking must become an essential part of the work culture.



The concept of Software 4.0 is to unify multi-tiered concepts into one holistic working model that serves the broad needs of a software-driven health care universe.

8.0 | The Healthcare Situation in Developing Markets

The global health industry continues to grow at an increasingly rapid rate. This is reflected by the upturn in healthcare spending that is being seen in practically every region across the world – this upward trend has been apparent year on year since the global economy started its gradual recovery after the recession of 2007-2009. The very latest statistics issued by the World Health Organisation in fact indicate that spending on health is growing faster than the rest of the global economy, accounting for 10% of the global Gross Domestic Product (GDP)¹⁷.

Across all regions, expenditure continues to increase and is projected to rise from a total value of USD 7 trillion in 2017 to USD 10 trillion in 2022: an annual rate of 5.4% over that period. The global average for the share of GDP allocated to health will stand at around 10.4% over this same period¹⁸.

Figure 4 below presents the projected regional healthcare spend, comparing actual figures for 2017 against 2022 projections. While expenditure is clearly expected to increase across all regions, there is clearly a wide disparity between advanced and developing economies reflected in the varying levels of investment in health systems.

Healthcare Spending (USD billion) and CAGR 2017 - 2022

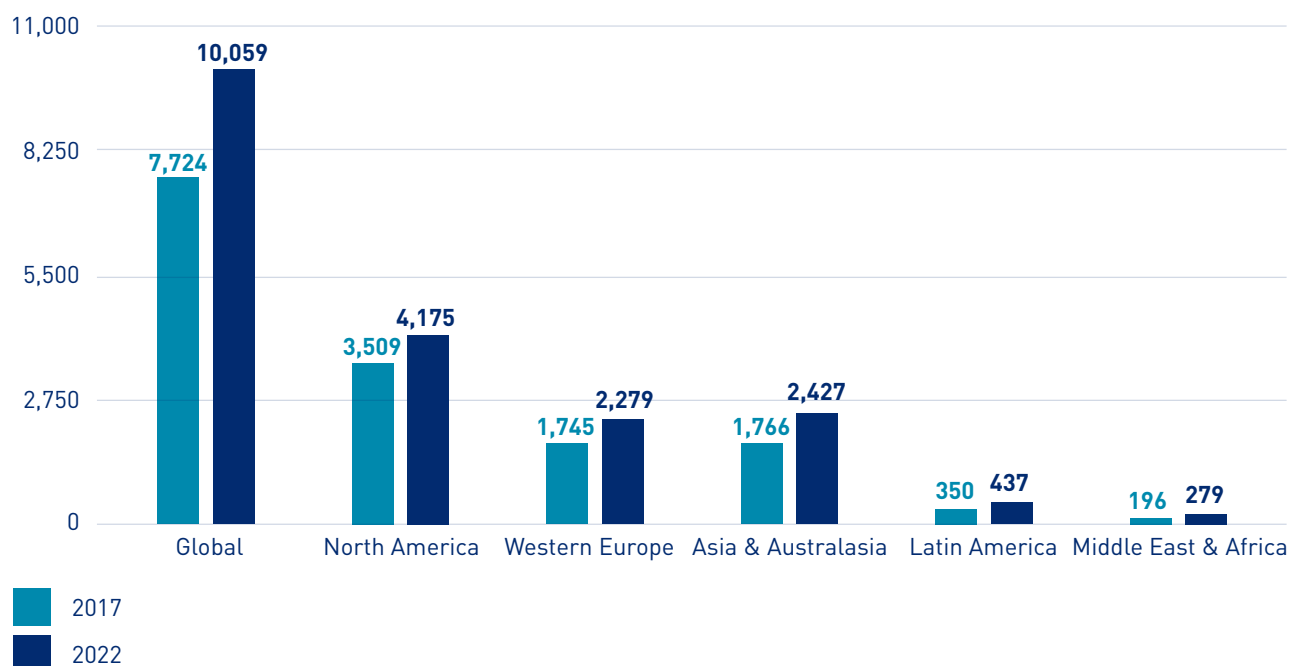


Figure 4: Healthcare spending and CAGR (2017-2022)
Source: The Economist Intelligence Unit, Data Tools accessed on 1 March 2019

¹⁷ World Health Organisation. February 2019. *Public Spending on Health: A Closer Look at Global Trends*

¹⁸ Deloitte Centre for Health Solutions. 2019. *2019 Global Health Survey*

The main global drivers for this increased expenditure are:

- Growing populations
- Ageing populations
- An increase in chronic illnesses
- An expanding global middle class
- Economic growth in emerging markets
- Expansion of universal healthcare in several countries

To a greater or lesser extent, these drivers are common to both developed and developing countries, however the emphasis in each scenario can be very different: in advanced economies, rising labour and technological innovation costs have a significant impact on the levels of investment required, while in demographic terms, it is an ageing rather than a growing population that is having the most effect on healthcare service provision.

In developing countries, the scenario is one where growing and ageing populations is a mix that is increasing the demand for health services. This is causing immense challenges in this sector mainly centring around a chronic lack of funding and how this is impeding access to quality healthcare.

The comparison of health expenditure presented in Figure 4 does illustrate a very real disparity in healthcare spending between the advanced and developing regions, with this concentrated mainly in the former. However, when drilling down to the current situation in developing economies, the prognosis is encouraging.

The World Health Organisation statistics referred to above reveal that the upward trajectory of global health spending is particularly noticeable in low and middle-income countries where health spending is growing, on average, at 6% annually compared with 4% in high-income countries.



These are the conditions lining up in developing countries that are set to sustain and accelerate the current trend of increased healthcare spending:

Fast population growth, far exceeding that in developed economies: the highest population growth rates will continue to be in developing regions, accounting for 97% of the global population increase up to 2030. The world's developing regions will see an increase of 1.2 billion people - a 20.7% increase - while the population of developed countries will increase by only 3.3%¹⁹.

Ageing populations, a key driver of increased expenditure across all regions, is increasingly becoming a factor in developing countries: with the global population aged 65 or older expected to rise from 524 million in 2010 to 1.5 billion in 2050, most of this increase will be in developing countries.

The **longer life expectancy** in developing markets is increasing the prevalence of chronic conditions and non-communicable diseases: this will demand significant investment in the management of such diseases.

Growing economies in a number of low- and middle-income countries: this prosperity will further boost the efforts of various governments to improve the quality and reach of primary healthcare and health education.

Stronger economic growth will also bring with it an **expanding middle class**: it is forecast that the global middle class, estimated to number around 3.2 million people in 2016, will grow by around 140-170 million per year in the coming decades and this expansion will be concentrated in developing countries²⁰. A larger middle class drives increased consumer demand for health services.



¹⁹ World Economic Forum. 2016. *Trend Compendium 2030: Demographic dynamics*

²⁰ Brookings Institute. 2017. *The Unprecedented Expansion of the Global Middle Class*.

8.1 | Digital Health: Relevance to Developing Markets

“Harnessing the power of digital technologies is essential for achieving universal health coverage. Ultimately, digital technologies are not ends in themselves; they are vital tools to promote health, keep the world safe, and serve the vulnerable.”

WHO Director-General Dr Tedros Adhanom Ghebreyesus.

The healthcare landscape in developing countries, and the health value chain it creates, is markedly different from that seen in the advanced economies featured in the first section of this report.

The health priorities among low- and middle-income countries are focused on addressing fundamental access and quality issues, as well as tackling cost inefficiencies. Currently, approximately 400 million people across the world do not have access to essential healthcare services, mostly in Africa and South Asia. This lack of access is exacerbated by a major short-fall of health professionals and facilities and this situation, if left unaddressed, is only set to go from bad to worse as demographic pressures intensify.

Technology is increasingly being recognised as a major solution to these issues and, on this basis, is making significant inroads in many developing countries. This recognition was in fact reinforced very recently by the World Health Organisation, which is now driving a global strategy for digital health based on an updated set of recommendations and guidelines²¹.

The way it is being applied however is different to the path observed in advanced economies, reflecting the different realities at work in developing countries: while higher-income countries are exploring the use of advanced technologies in medicine, priorities among low- and middle-income countries are focused on fundamental access and quality issues as well as cost inefficiencies.

²¹ World Health Organisation (WHO). April 2019. *Recommendations on Digital Interventions for Health System Strengthening*

Does this therefore make digitisation of health services a luxury they cannot afford, or an effective solution that can change these embedded inadequacies once and for all?

A recent report by the GSMA (the global organisation representing mobile operators) recently issued a report which focused on this issue entitled 'Scaling Digital Health in Developing Markets.'²² Based on intensive primary research in developing countries in Africa, Asia and Latin America, it identifies three core issues that appear to be common to all developing healthcare markets. These are access, quality and cost.

The study concludes that digitisation can effectively tackle these issues, translating them into key objectives for strategic health reforms over the next five to ten years, as summed up in Figure 5 below.

How widescale digital health can help address key health-care issues in developing countries



Figure 5: Top objectives for digital health in developing countries (as identified by the GSMA)
Source: GSMA 2017

According to the GSMA, digital health can:

Improve access by widening the reach of healthcare through the remote delivery of certain services (such as patient monitoring and diagnostics); it also allows better and faster patient access to health information.

Improve quality by enabling better and faster coordination of care, especially through timely data sharing.

Improve cost efficiency by digitising health management systems to ensure that health resources are used as efficiently as possible.

²² GSMA. (September 2017). *Scaling Digital Health in Developing Markets: Opportunities and Recommendations for Mobile Operators and Other Stakeholders*

In terms of the health technology discussed above, these findings point to telehealth solutions, as well as back-end integrated health management systems, as being priority segments in many developing markets.

For the purposes of this report independent evaluations of the digital health opportunities in a developing country context were verified with other independent sources. These included the most recent global health surveys issued by leading research companies such as Deloitte, PwC and Accenture²³. This review confirmed a growing consensus that technology is an increasingly successful driver of healthcare reform in many developing markets, with the successes achieved to date now driving further investment.

8.2 | Digital Health Opportunities in Developing Markets

In researching this report, we assessed developing markets across the globe to identify the region which presents the best export opportunities for Malta-based enterprises engaged in health technology products and services. This assessment focused on the regions of Latin America and the Caribbean, Asia and Africa given that each contains a concentration of developing and emerging markets.

This review was based on a number of criteria, including:

- Demographic trends;
- General technological readiness level;
- Socio-economic trends;
- The current level of digital health penetration;
- Forecast levels of digital health penetration;
- The general healthcare landscape;
- Current and forecast trends in the regional digital health market.

Based on this assessment it was concluded that the developing markets in Asia appear to offer the best opportunities at the current time.

The sections below will outline how this conclusion was reached, using some of the above indicators to draw out the characteristics of the region. Where appropriate, comparisons are drawn with the other two regions under review as well as with advanced economies. Initially, the individual emerging and developing markets within the Asia Pacific region are identified for ease of reference.

²³ Accenture. 2016. *How will data and digital platforms transform sustainable development*; PwC. 2017. *The Digital Healthcare Leap*; Deloitte Centre for Health Solutions. 2019. *2019 Global Health Survey*

8.2.1 | Identifying the Developing and Emerging Markets in Asia

Table 2 below lists the markets in Asia classified by income level. The definition of these markets as 'emerging' or 'developing' is based on the International Monetary Fund's current classification of the Asia region (as at 1 April 2019) which is in turn based on the Fund's latest country-level economic and financial surveys.

These markets are further classified in terms of income levels – this is carried out using the standard World Bank Atlas method which, for the current 2019 fiscal year, categorises economies on the basis of Gross National Income (GNI) as follows:

Electronic health (e-health)	GNI per capita (USD)
Low-Income	USD 995 or less
Lower Middle-Income	USD 996 – USD 3,895
Upper Middle-Income	USD 3,896 – USD 12,055
High-Income	Above USD 12,056

Table 2: World Bank Atlas method of country classifications
Source: World Bank



HIGH-INCOME ECONOMIES	UPPER-MIDDLE-INCOME ECONOMIES	LOWER-MIDDLE-INCOME ECONOMIES
Brunei Darussalam	China	Bangladesh
Palau	Fiji	Bhutan
	Malaysia	Cambodia
	Maldives	India
	Marshall Islands	Indonesia
	Nauru	Kiribati
	Samoa	Lao P.D.R.
	Thailand	Micronesia
	Tonga	Mongolia
	Tuvalu	Myanmar
		Papua New Guinea
		Philippines
		Solomon Islands
		Sri Lanka
		Timor-Leste
		Vanuatu
		Vietnam

Table 3: Emerging and developing markets in Asia classified by income levels
Source: Adapted from World Bank and International Monetary Fund Data Tools (retrieved on 25 April 2019)

8.3 | Asia: Key Characteristics Contributing to Digital Health Development

8.3.1 | Demographic Trends

8.3.1.1 | Population growth

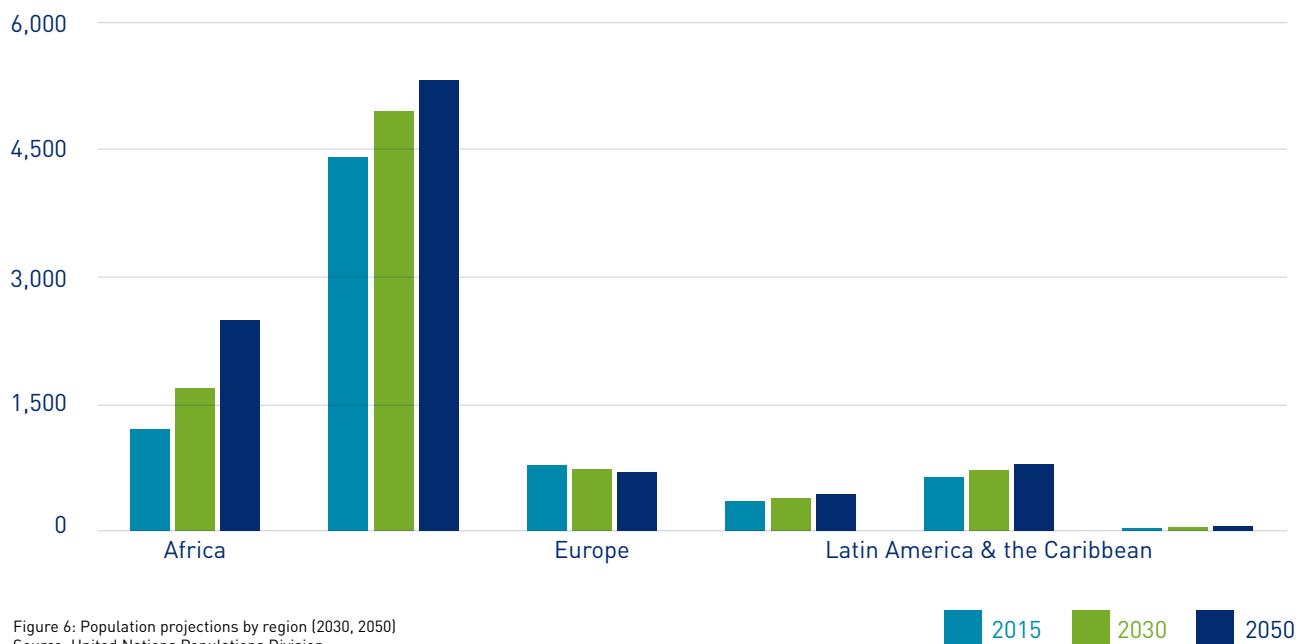
Compared to the developed regions of the world, the populations of developing regions are continuing to increase rapidly. This trend is particularly striking in Africa and Asia. Africa is forecast to be the largest contributor to global population growth up to 2050, with Asia following closely in second place. On the other hand, growth is projected to be modest in the developed regions of North America and Europe, with the latter emerging as the only region that is likely to have a smaller population in 2050 compared to 2017.

In terms of current total population, Asia, with 60% of the world's population, is by far the largest when compared to all other regions with the largest populations within that region living in India and China.

Looking ahead to the next ten years, a critical time-frame for the purposes of this report, it is clear that the population of Asia will continue to grow, rising from **4,393 million in 2015 to 4,923 million in 2030.**

This rate of growth is somewhat slower than that forecast for Africa in the same period, however in terms of total population **Asia will remain by far the largest compared to any other region.** India, in particular, will see an impressive rate of growth and is set to surpass China in terms of **total population by 2022;** it is further estimated that the current population will increase by **17% by 2050.**

Population Projections by Region (millions of people)



8.3.1.2 | Ageing Population

This demographic indicator is particularly important when evaluating the growth prospects for the health industry in any given region. An ageing population triggers an increasing demand for healthcare services, mainly because the chronic, noncommunicable diseases that are closely linked with older people tend to impose the greatest burden on health systems. This has been, and remains, a key factor in healthcare expansion in the advanced economies and is increasingly becoming a driver for similar growth in developing regions.

Globally, the population aged 60 or over is growing faster than all younger age groups: this trend in itself is one of the major pressures now facing healthcare systems across the world.

In 2017 the population aged over 60 amounted to **962 million people**. It is estimated that this will rise sharply to:
1.4 billion in 2030 and 2.1 billion in 2050.

Although this shift is evident across all regions, it is a transition that is most acute in developing countries, where improving socio-economic conditions in several markets are increasing life expectancy at a rapid rate.

The latest population study issued by the United Nations concludes that this trend will be concentrated mainly in Asia, which will account for an overwhelming 65% of the global increase between 2017 and 2050 leading the population aged 60 and over to more than double in that period. This is followed by Africa (14%), Latin America and the Caribbean (11%) and the rest of the world (10%)²⁴.

8.3.2 | Socio-economic trends

8.3.2.1 | Economic Growth

We are currently seeing the most intensive economic growth in the economies of emerging and developing markets - these are forging ahead at a much faster pace compared to the advanced economies that have traditionally and consistently been the highest global performers.

The latest data issued by the IMF, clearly illustrates this growing trend which is captured in Figure 7 below²⁵.

Real GDP Growth (annual percent change)

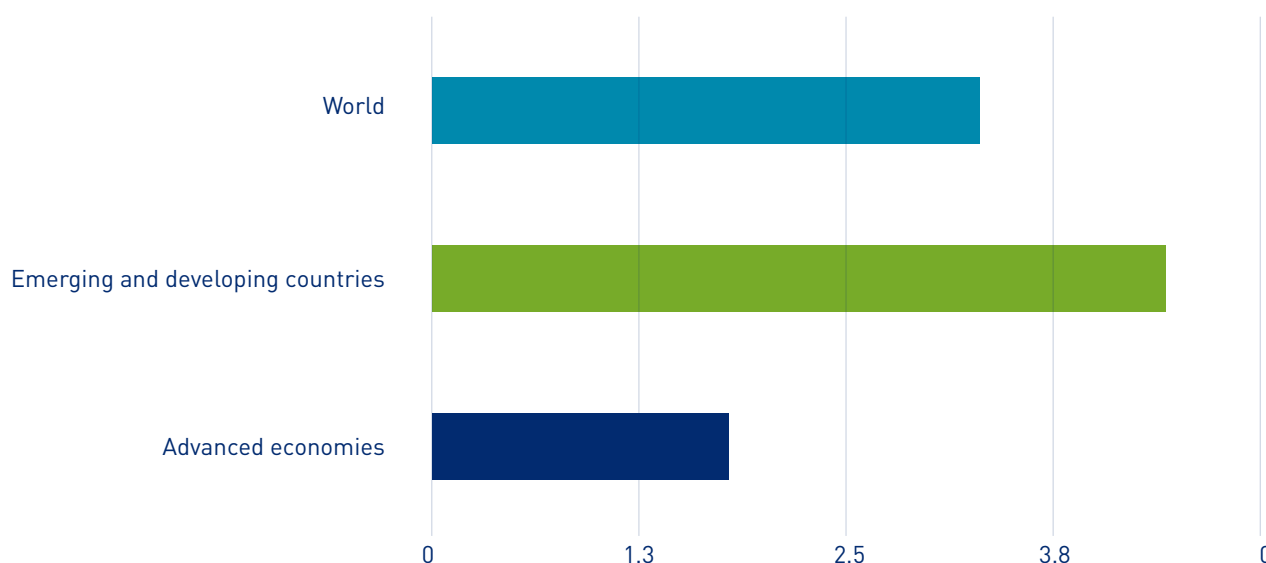


Figure 7: Comparison of GDP growth – advanced vs. emerging economies
Source: IMF DataMapper

²⁴ United Nations Population Division. 2017. *World Population Prospects The 2017 Revision, Key Findings and Advance Tables*

²⁵ International Monetary Fund. April 2019. *World Economic Outlook* [Retrieved on 28 April 2019 from https://www.imf.org/external/datamapper/NGDP_RPCH@WE0/OEMDC/ADVEC/WEOWORLD/ADO]

Breaking down this data further, the strong performance of the developing markets in Asia emerges very clearly relative to other regions. This is highlighted in Figure 8 below.

Average Growth: Real GDP (annual percent change)

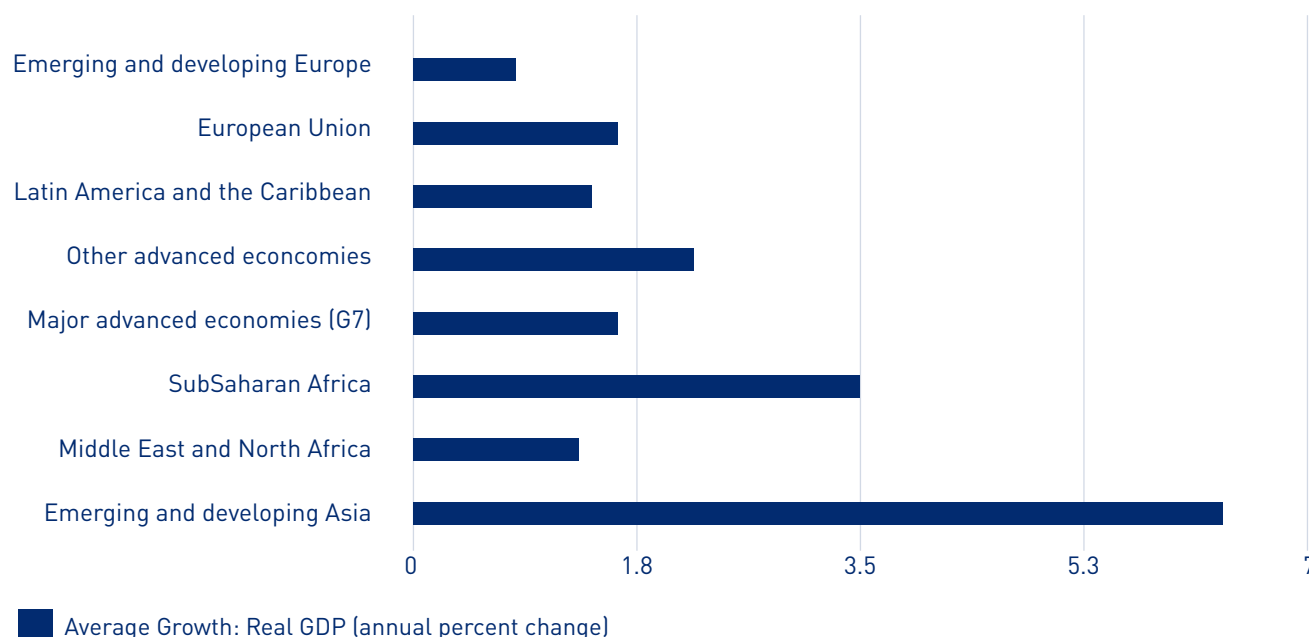


Figure 8: Comparative rates of real GDP growth - regional

Asia's strong economic performance is highlighted by the World Bank and the IMF in their latest reviews, with the IMF concluding that although overall per capita income still lags behind that of North America and Europe, in growth terms the region is "very much at the forefront of the global economy."²⁶ The IMF estimates that it accounts for 60% of world growth and forecasts sustained growth continuing into 2020. Long-term projections point to a possible slowing of the major momentum seen to date, however the region's strong economic credentials, relative to other regions, will remain.

8.3.2.2 | Social trends triggered by economic growth

As has been the trend in developed markets, an upturn in economic prosperity causes social changes that have significant effects on the characteristics of that market. Developments such as urbanisation, better education and higher levels of income are linked with economic growth and these combine to create new consumers with new demands.

One such change that is closely associated with increased demands for quality healthcare services is an expanding middle-class. This social group typically has the income and the awareness to seek out medical care in a timely manner and more frequently than consumers with lower levels of income. They are also more likely to be informed about health issues, leading them to expect a higher standard of care and access to more innovative practices. This demand can be expected to drive the further growth of the health sector, in terms of services, facilities and technology.

²⁶ International Monetary Fund, October 2018, *Regional Economic Outlook: Asia and Pacific*

On this basis, Asia presents a positive prospect for the health industry.

The most drastic **increase in the size of the global middle class** is in fact seen in Asia, with this region accounting for an overwhelming **88% of this growth**. It is estimated that, by 2030, Asians could represent **two-thirds of the global middle-class population**. Of these, **380 million** will be living in India, **350 million** in China and **210 million** in other areas of Asia²⁷.

8.3.3 | General technological readiness

The application of digital health solutions in any market depends to some degree on having an adequate infrastructure in place, as well as receptive consumers that are more likely to trust such solutions and have access to their use. A crucial indicator in this regard is mobile phone and internet subscription, since these are imperative for the successful implementation of digital healthcare in any economy. Therefore, a general look at a region's technological readiness is an important consideration for the purposes of this report.

Compared to other developing regions, particularly Latin America and Africa, Asia's digital landscape is relatively advanced, and this does not only apply to the innovation powerhouses - Japan, Singapore and China - but also to emerging markets such as India, Malaysia and the Philippines. The latest IMF report referred to above in fact pointed to digitalisation as a major contributor to the region's economic growth, stating that Asia is at the "forefront of global digitalisation."

Top Innovation Achievers: Emerging Economies in Asia

- India
- Indonesia
- Malaysia
- Thailand
- Vietnam

Source: Global Innovation Index 2018

²⁷ Brookings Institute. 2017. *The Unprecedented Expansion of the Global Middle Class*.

The major indicator of readiness for digital health solutions is the level of internet access and connectivity within a given region or market. Here again, due to the sheer size of the total population as well as a robust infrastructure, Asia forges ahead of all other contenders. As illustrated in Figure 9 below, this region now accounts for 49% of internet users across the globe, with the two other regions assessed for the purposes of this report trailing at 11% (Africa) and 10.4% (Latin America and the Caribbean).

Internet Users in the World by Region - December 2018

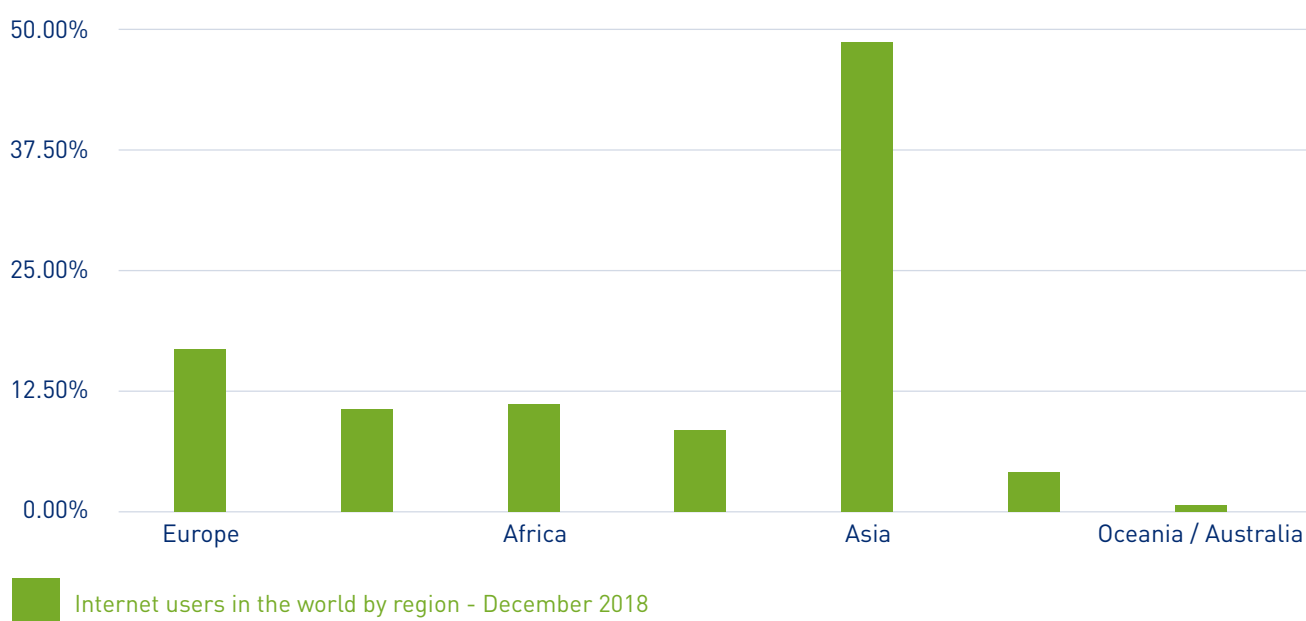


Figure 9: Internet users in the world by regions - December 2018
Source: Internet World Stats

Even more relevant for the purposes of this report is that there is no real gap between developed economies in Asia and emerging countries. In fact, the latter have recently overtaken the developed markets in terms of mobile cellular subscriptions.

8.4 | Asia: An Overview of the Healthcare Landscape

Asia's economic progress in recent decades has resulted in major social changes in the region, including a positive effect on its health status. As discussed above, life expectancy has increased significantly, infant and maternal mortality rates are decreasing, while improving health systems are better placed to treat and prevent disease.

On this basis, Asia's developing economies have clearly made further inroads towards the goal of better healthcare than the two other regions under review. However, pressing challenges remain and these are under the spotlight as governments in the region's developing countries move to integrate and strengthen their health infrastructure and service delivery.

The region's rapidly ageing population, together with the onset of greater affluence across virtually all Asian developing markets are two key factors that are driving stronger public and private investment in the healthcare system. As discussed above, both of these trends are linked to a higher prevalence of chronic non-communicable chronic diseases which will challenge health care systems in the coming decades. These conditions include cancer, dementia, an increase in the number of falls, obesity and diabetes.

According to the World Health Organisation, rates of cardiovascular disease are projected to at least double in several Asian countries over the next two decades. Another major concern is diabetes, already widespread in the region, which is expected to increase drastically over the coming decade as seen in Figure 10.

Prevalence of diabetes as percentage of total population - selected developing economies

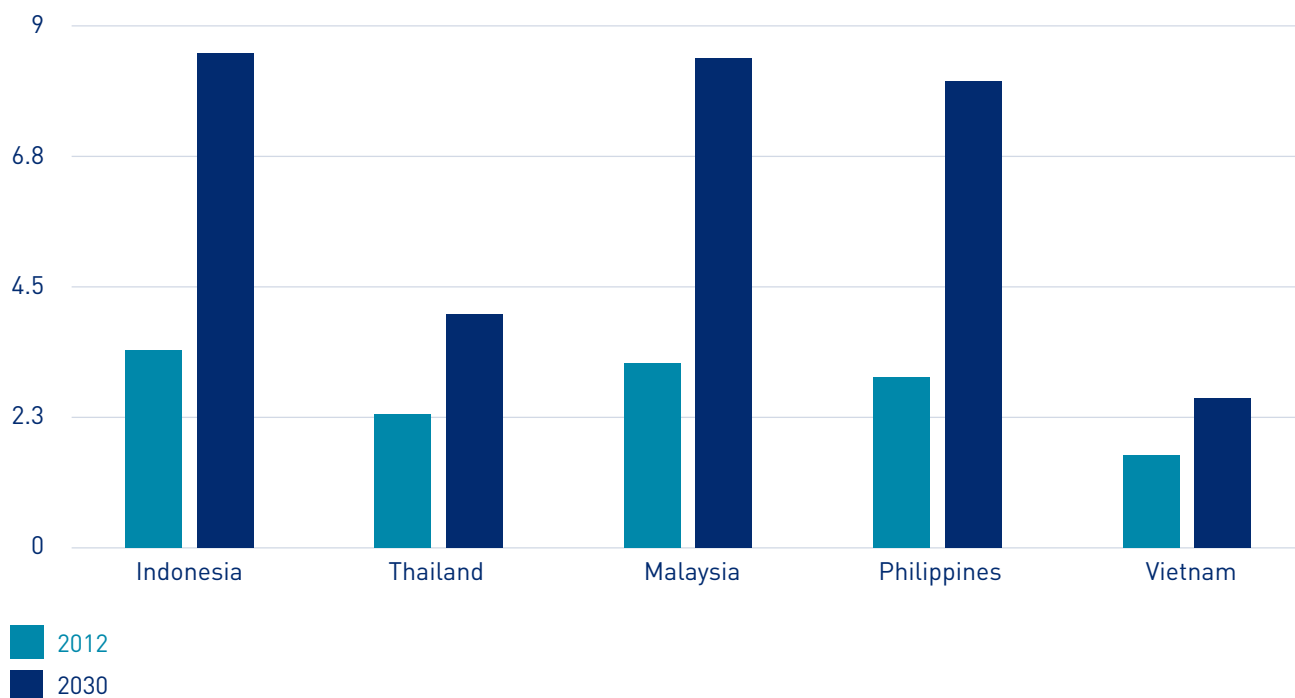


Figure 10: Prevalence of diabetes as a percentage of the total population
Source: World Health Organisation

8.4.1 | Key Drivers for the Expansion of Health Services: Asia

The Asian health industry is growing rapidly, estimated to expand from **USD1,690 billion** in 2019 to **USD2,271 billion** with an **8.1% CAGR** through to 2021²⁸.

The key drivers for this investment and expansion, many of which have been touched upon above, are:

- Fast population growth leading to a larger consumer base for health services;
- Large rural population requiring improved access to healthcare;
- Expanding middle class resulting in higher demand for quality healthcare;
- Ageing population triggering a surge in chronic, noncommunicable diseases;
- Focused efforts to introduce universal health coverage across a number of developing markets in line with the United Nations' Sustainable Development Goals.

²⁸ BMI Research. April 2019. *Asia-Pacific Healthcare Industry Outlook, 2019*

Universal healthcare made significant advances in some Asian countries in 2018

In the **Philippines**, the Senate passed a Universal Health Care Bill.

India launched 'Ayushman Bharat', a major initiative that will integrate the various national health schemes under one ambitious programme.

Singapore increased coverage of Medishield Life at a more sustainable cost, and also introduced CareShield Life, one of the region's first long-term care plans.

Thailand invested further in its Universal Coverage Scheme, which has proved to be such a success that many other developing countries starting out on the route to universal health care are using it as a template.

In this context, the three priorities identified in section 8.1 for digital health in developing countries - improved access, improved quality, improved cost efficiency - are very closely aligned with those of decision and policy makers in Asia's emerging economies. These priorities, and how they relate to the Asian context, are presented in Figure 11 below.

ACCESS	QUALITY	COST EFFICIENCY
• Urban-rural divide: 50% of the population in Asia emerging markets live in rural areas. • Total population growth driving up number of consumers. • Increase in chronic diseases leading to increasing demand for long-term and accessible care. • Public initiatives to introduce and sustain universal health care are heightening the need for wider and easier access, particularly to primary care.	• Rising income levels and more informed consumers raising quality expectations. • Rising levels of public and private investment in healthcare are driving demand for innovation and quality rather than just 'making do'. • The need for informed policies based on accurate population health data increase the need for effective patient tracking and data harvesting.	• Public and private service providers are scaling up to meet increasing demand. • Lack of resources, particularly health professionals, and adequate infrastructure pose a challenge to this effort. • System integration and effective resource management is vital to manage costs and sustain investment.

Figure 11: Inter-related health priorities in the developing markets of Asia

²⁸ BMI Research. April 2019. *Asia-Pacific Healthcare Industry Outlook, 2019*

How is the health industry in developing countries in Asia responding to these needs, and where does digital health stand in the process?

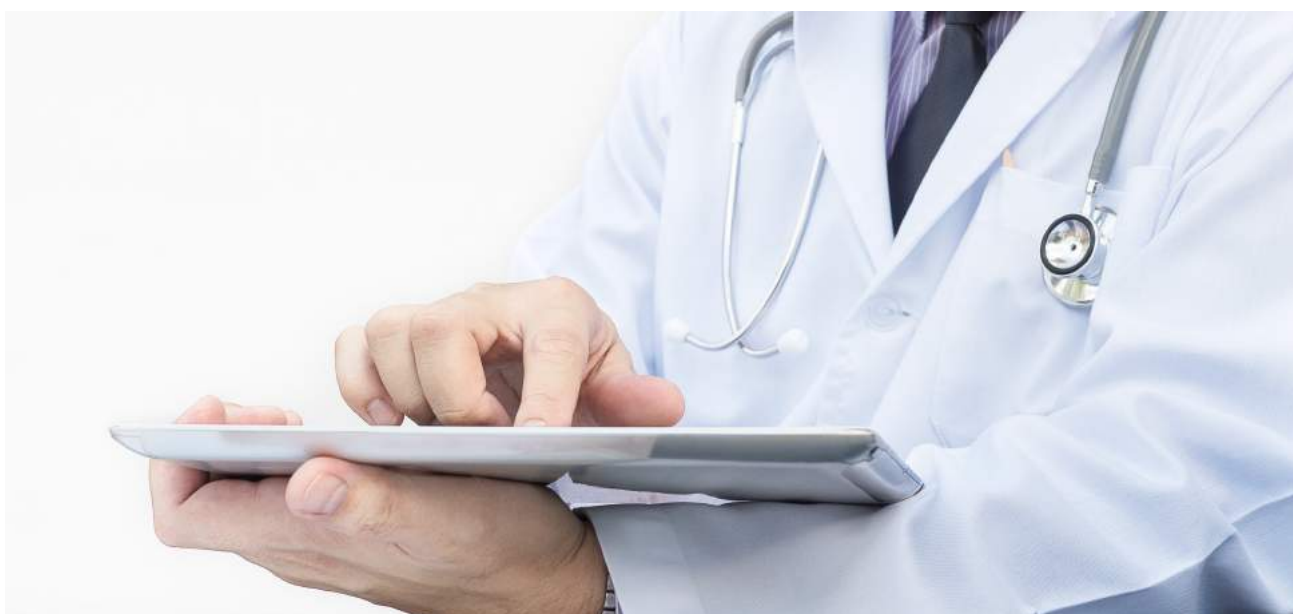
The health market in a number of developing Asian countries is shifting to address the three priorities. The most significant shifts are:

More public investment as governments seek to roll out universal health coverage, particularly in terms of primary care.

New business models to improve quality and coverage: private health initiatives and public private partnerships are gaining traction as an alternative to slower public systems; a core driver in this process are the new demands posed by a larger middle-class expecting better quality services.

Acceleration in the adoption and application of digital health in the clinical area as the key to the comprehensive systems upgrade required to address access and quality issues.

Acceleration in the adoption and application of digital health in the business area with a greater focus on back-end health information systems to provide the integration, efficiency and data required to protect public and private investment optimising resources.



New Health Business Models

One very interesting emerging trend is the move by established players, such as pharmaceutical companies, to defend their market positions through digital partnerships to enter new parts of the health value chain. This is driving innovation and digitisation.

Notable examples include **Ping An Good Doctor**, a China-based healthcare and medical mobile app backed by Ping An Insurance Group that is now investing in AI and machine learning.

This is now partnering with **Grab**, a top multipurpose app (similar to Uber) across South-East Asia, to expand the reach and distribution channels of the medical online platform. This will extend to Malaysia, Indonesia, Philippines, Vietnam, Thailand, Myanmar and Cambodia.

It is still too early to assess the impact of these innovative partnerships.

There is also a clear trend towards health ministries and state-owned private hospitals engaging with the private sector in health initiatives.



The bottom line is that the Asian health industry is growing and growing fast.

This is not only the case in the high-income, advanced countries such as Japan and Singapore, but also extends to lower-middle- income and upper-middle income countries. Given the demographic trends outlined above, as well as the forecast economic stability and growth that will sustain such initiatives, this upward trajectory is likely to be maintained into the medium-term.

The key difference between the developed and developing countries in the region lies in the particular challenges that they face, and this will direct the course of healthcare investment.

In the case of the advanced economies, the focus is on intensive R&D and innovation in medical technology, to the point that there is now cautious talk of China, Japan and Singapore being a global leader for a number of cutting-edge innovations in precision medicine, particularly in genomics.

In the case of the emerging economies, the priorities are more practical and immediate, centring around the three objectives discussed above: improve access, improve quality and optimise cost-efficiency.

The following section will review the very latest market data to assess how digital health is featuring in this transformation taking place in the developing and emerging markets, and how it is likely to take shape over the next few years. This will highlight probable growth segments that Malta-based enterprises could consider focusing on, should they be interested in entering those markets.



8.4.2 | Digital Health Market in Asia

The rapid growth of the health industry in the region has accelerated the adoption of digital health technology at an intense pace. As a result, Asia is emerging as the fastest growing digital health market in the world. The very latest market intelligence highlights the massive leap in the value of the digital health market share forecast up to 2025²⁹.

This is highlighted in Figure 12 below.

Asia Digital Health Market, 2018 & 2025 (USD Bn)

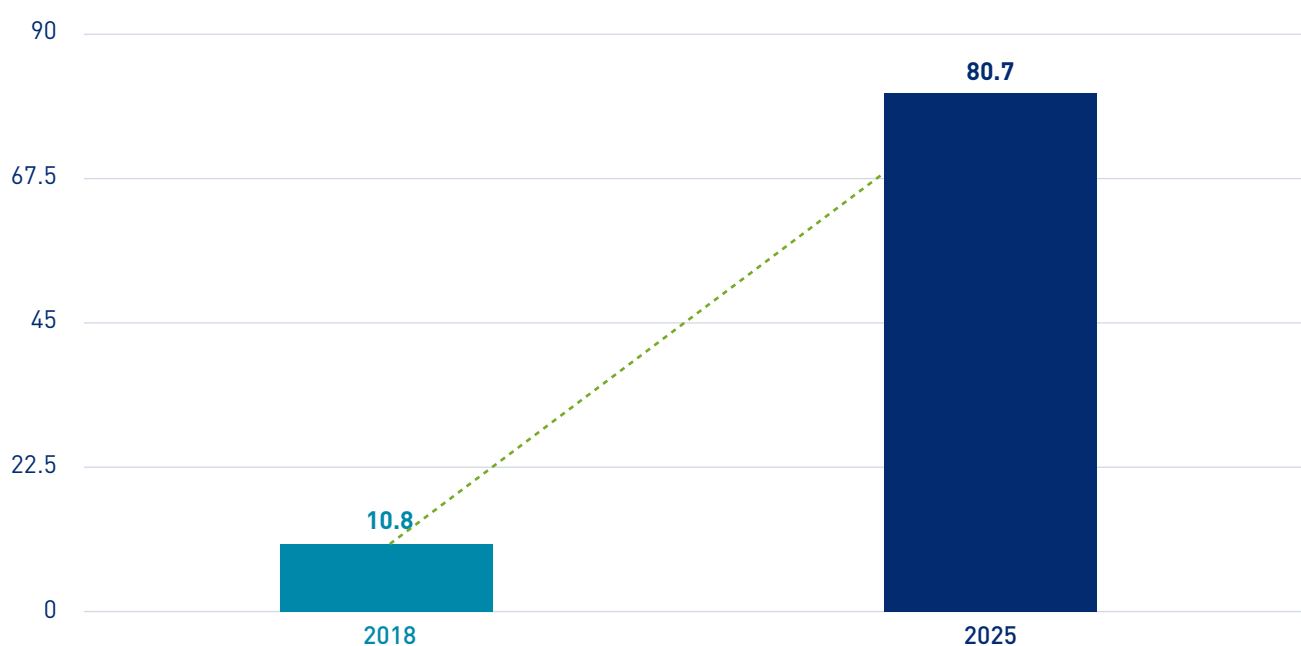


Figure 12: Asia Digital Health Market, 2018 & 2025

The following are emerging as the health technology segments that will see the most intense growth in Asia's developing markets until 2025:

- Telehealth and mHealth
- 'Heart of Business' Solutions

²⁹ Graphical Research, April 2019, *Asia Pacific Digital Health Industry Forecast 2019-2025*

8.4.2.1 | Telehealth and mHealth

As is the case with the advanced economies, such as North America and Europe, telehealth and mobile health are among the leading technology segments that are set to expand further.

The main drivers for these segments' growth are:

- the need to **improve access to quality primary healthcare**, particularly given the ongoing drive to consolidate universal health coverage;
- the fact that **50% of the population in these markets remain rural**, without easy access to health facilities;
- the seemingly **chronic shortage of doctors** that is unable to meet the demands of the growing population.

Telehealth and mobile healthcare are therefore being applied to deliver services remotely.

These technologies are harnessing web and mobile applications to connect patients and care providers with an emphasis on making this connection as seamless and 'human' as possible; improved streaming functionality and real-time communications are increasingly sought after as well as improved voice capability where applicable.

Future trends

So far telehealth apps in developing markets have focused on primary consultations, however going forward additional functionalities, including data generation and transmission, will be a priority.

Although mHealth and telehealth platforms are probably the earliest examples of digital health applications in developing countries across Asia, having first entered many of these markets some years ago, there are clear signals that innovation and enhancement will be increasingly evident in this segment.



With an increasingly informed and demanding consumer base, this applies to enhancements that improve the quality and level of user engagement to deliver truly patient-centric care. Artificial intelligence may feature in this (see side-box), as well as other enhancements that improve communications and provide a generally seamless experience.

Other features may not be as immediately associated with the consumer experience aspect but lean more towards the rising need to establish strategic health planning on a more informed and data-driven basis. Data and analytics will therefore come to the fore, as well as more focus on the opportunities presented by mobile health applications to move beyond the remote consultation model and closer to a widely available means of gathering and tracking patient data. This data, shared in as close to

real-time as possible among the relevant health professionals, will not only vastly improve the quality of any medical intervention required, but will also feed into the health population data that is so vital for effective health policy formulation.

Particularly since this facility is especially relevant to noncommunicable diseases, a health concern that is rising to the top of the regional health agenda given the ageing population, it is likely that applications that include these and other functionalities will make headway in what can at times be a crowded market.

A further benefit, and one that is tied closely to the objective of resource optimisation, is that effective remote monitoring and tracking will ease the burden on clinics and hospitals.

Telehealth apps on the rise in Asia due to doctor scarcity

In Singapore, Halodoc is one example and acts as a remote consultation service which allows users to consult a doctor remotely rather than visit a clinic or hospital. The user can seek advice through a video call with a doctor that he or she selects from a list. The same app can also then be used to buy medicines, which will be delivered to the user's home or business. The app can also be linked to the user's health insurance policy so that payment can be made with health insurance.

Halodoc has over 2 million users and a database of 20,000 doctors.

China's Ping An Good Doctor, well established in its home country, will also be extending its services across South East Asia starting later this year. This app will now feature AI-assisted consultation services, with consultations starting via an AI-assisted chatbot which will assess the user's needs and direct him or her to an appropriate doctor. It is likely that this relatively new AI component will be explored by other players offering similar applications.

A somewhat different application which is more data-oriented is mClinica, active in the Philippines, Indonesia and Vietnam. This application's objective is to track the use of medicines, data which is then used by health planners to detect outbreaks and for general policy-making. It works through the registration of consumers through their mobile phones and is linked to pharmacies across these three markets so that every consumer purchase (data is desensitised to protect individual privacy) is recorded for analysis purposes.

8.4.2.2 | 'Heart of Business' Solutions

One other segment of interest, this time one that is at the core business end of operations rather than patient-facing, is that of integrated health services management systems. These applications are key to addressing the third objective beyond access and quality: cost management through resource optimisation.

Comprehensive and connected systems that cover all aspects of health service delivery and encompass the various elements of the operation are the 'heart of business' solutions discussed above, which are vital for cost management and enhanced efficiency.

This segment is set to grow in the next few years across developing markets in Asia, as public and private service providers face rising demands from consumers while limited by inadequate physical infrastructure and skilled human resources. This situation raises the priority of implementing robust and efficient systems to ensure that each and every resource along the service value chain is optimised.

One particularly important segment within this general framework is that of Electronic Health Records (EHR) – many developing countries are still reliant on paper-based solutions or unreliable and outdated legacy IT equipment and this inadequate framework is causing widely acknowledged issues that ultimately affect the cost of service provision, while also diminishing the quality of the service itself.

Hospitals and clinics are therefore keen on investing in technology that helps to reduce the time required to process medical documentation - this allows medical staff to focus more on diagnostic procedures. The adoption of EHR and e-prescription systems also enables healthcare providers to save costs on patient data management. Various government initiatives to increase adoption rates of digital health solutions will spur market growth.

Cloud-based technologies offer a cost-effective solution in this regard and one that is likely to be viewed very favourably in developing markets, given the successful roll-out of similar EHR systems in developed countries in the region.

In Singapore, the National Electronic Health Record (NEHR) System was rolled out in 2015. It allows patient healthcare records to be shared across the entire healthcare system. Currently all community hospitals, most community healthcare providers and close to 80% of GP clinics have access to NEHR. Singapore is now transitioning to a new digital health model, based on the cloud. Named as hCloud, this new model should also reduce the cost of operating the current IT system. Plans are also in place to include the use of data analytics to support both decision-making at the point of care national planning for the Ministry of Health.

GLOBAL PLAYERS

Global leaders such as Philips Healthcare, Cisco Systems, Cerner Corporation and AT & T are very active in Asia. Microsoft is also very present, particularly in India, and is increasingly focusing on AI applications in clinical settings working in partnership with leading area hospitals. Cardiology, a prime health issue in India, is an emerging focus and the company recently announced the launch of the first ever AI-powered Cardiovascular Disease Risk Score application, designed specifically to predict the risk of Cardiovascular Disease in the Indian population.

NEW REGIONAL LEADERS

In another development similar to the North American market, regional internet giants more usually associated with the retail or leisure industries have also entered the health space. The leader is China's Tencent, which launched 'WeChat' a mobile app that enables patients to book medical appointments and purchase medicines.

Alibaba, also China-based, is also offering appointment booking and medical bill payment services on its app 'Alipay.'

Although it is not surprising that both of these companies are based in China, itself a leader in health technology, they are influential players and these developments are likely to encourage service providers in other countries to explore similar options.



8.4.2.3 | Potential Risks and Challenges

Lack of Regulation

One unknown factor for healthcare apps in Asia is future regulation. Since app-based healthcare is a new area, there are few clear laws regulating its use in developing markets. This is allowing businesses to flourish however there are indications that some governments will be moving towards some form of regulation and this should be borne in mind by any new entrants to this space. Singapore's Ministry of Health, for example, has created a regulatory sandbox for telehealth, in which the ministry is working with service providers to formulate initial regulations.

It is important that any Malta-based enterprises assessing opportunities in Asian developing markets consults the very latest information on the regulatory framework in a given market, since this is a legislative area which is evolving very fast.

Cybersecurity

A further challenge is cybersecurity. 2018 was marked by a number of high-profile leaks and breaches in the Asian health industry: Singapore's normally robust public healthcare system experienced a high-profile data breach affecting 1.5 million patients, as did the system in Hong Kong. According to a recent study by research firm Frost & Sullivan, almost half (45%) of healthcare organisations in Asia have either experienced a security incident or are not even sure if they have even had a security incident as they have not performed proper forensics or data breach assessments³⁰.

This is leading to more discussions and debates in a number of countries on the increasing need to safeguard patient data. Governments are increasingly beginning to understand the risks and looking at how to mitigate them. Singapore, for instance, has responded swiftly and strengthened its healthcare cybersecurity introducing several new measures.

Given this context, it is essential for Malta-based companies pitching to export their products or services to the region to prioritise security compliance and best practices in any application they develop, starting with a clear understanding of the concerns and threats in the region.

³⁰ Microsoft Asia News. February 2019. Understanding the Cybersecurity Threat Landscape in Asia Pacific

It is also evident that, given this rising concern, applications and technologies that have solid, built-in security features could have a distinct competitive advantage over other offerings.

In a recent update, Microsoft Asia highlighted this risk once again and put forward two key recommendations³¹:

- **Leverage cloud as a platform:**

Through cloud services, healthcare organisations will be able to implement an in-depth cyber-defence strategy across data and networks while enhancing the protection of apps and infrastructure using built-in security services. Cloud platforms also deliver comprehensive security intelligence by monitoring billions of cloud app events daily. This enables organisations to detect rapidly evolving threats early by identifying abnormal file and user behaviour, allowing them to swiftly respond, investigate and remediate the situation.

- **Tap into AI and automation:**

The complexity of today's healthcare operations often make it hard for management to oversee it effectively – this at times compromises the organisation's capability to detect, let alone prevent, breaches and threats. AI and automation can help these organisations extend their cybersecurity capabilities, allowing them to free up more resources and time to focus on their core duties.



³¹ Microsoft Asia News Centre, February 2019. *Cybersecurity needs to be at the heart of healthcare sector's digital transformation*

8.5 | Market Recommendations

Following the research carried out in compiling this report, the following markets have been identified as the leading options for any Malta-based technology firms interested in exploring trade opportunities in the digital health sector. These recommendations are based on:

- the current and forecast appetite for digital health solutions in that market;
- demographic and socio-economic indicators;
- the level of national security and political stability;
- the level of government investment in health, including the implementation of universal health coverage;
- the relative market dynamics, including the level of private investment in the health sector;
- the relative sophistication of mobile and internet infrastructure.

On this basis the following markets are recommended:

- **Thailand**
- **Philippines**
- **Malaysia**
- **Indonesia**
- **Vietnam**

³¹ Microsoft Asia News Centre, February 2019. Cybersecurity needs to be at the heart of healthcare sector's digital transformation

9.0 | Key take-aways

For the purposes of this report it was considered advisable to provide a general overview of the digital technology market as it is evolving in developed countries, notably in the US which is undeniably the global leader in this arena. It is indicative that other developed countries, including the UK, Canada and many European states, are closely following the US model in their own digital health initiatives. Although these are investing heavily in healthcare innovation and cornering some interesting new initiatives under their own steam, they are generally following the trajectory set by the US.

This also indicates that, with digital health making inroads in various developing and emerging economies, this process may also follow a similar path. For this reason, it is important for Malta-based companies considering entry into developing markets to first gain a clear understanding of how health technology has evolved in the advanced economies, as well as where the global industry seems to be heading.

The market research conducted for the purposes of this report therefore consulted a range of reliable and reputable sources to verify the current and forecast status of the health care technology market. This included consulting global and market-specific surveys carried out in 2018 to obtain some oversight of current and forecast trends. This research clearly indicated the technologies and innovations that are set to grow over the next five years. These findings can inform Malta-based ICT and software firms in terms of prioritising the technologies and applications they invest in.

Although health was one of the last major industries to be impacted by digitisation, we can now definitely talk of digital disruption in this sector. In developed markets digital health is transforming the industry. Trust barriers on the part of patients and health professionals that may have slowed its progress in the recent past appear to have fallen, particularly since consumers have now grown so accustomed to technology being an integral part of their daily lives that their health is no longer an exception.

This rate of progress and innovation has pushed technology to the forefront of the activities that have traditionally supported the healthcare value chain. It is now perceived as imperative for adding value to the level of service provided to the consumer, while optimising cost-efficiency in an industry that has been hit by ever-rising costs. This is creating immense opportunities for technology service providers entering this market.



This applies particularly to software products and services. There is a growing sense that whereas until recently innovation may have focused more on hardware and devices, the full benefit of digitisation will only be achieved when we unlock the full potential of what these devices can do, particularly in terms of how to manage the data that can be generated. In this context, software takes centre stage by developing highly specialised and specific applications that will continue to advance innovation.

There is a mix of technologies within the digital health space, from big data and analytics, through AI and machine learning, to genomics and the Internet of Things. 'Newcomers' such as blockchain are also entering the equation, while Cloud-based applications are ever more popular particularly from a cost management perspective.

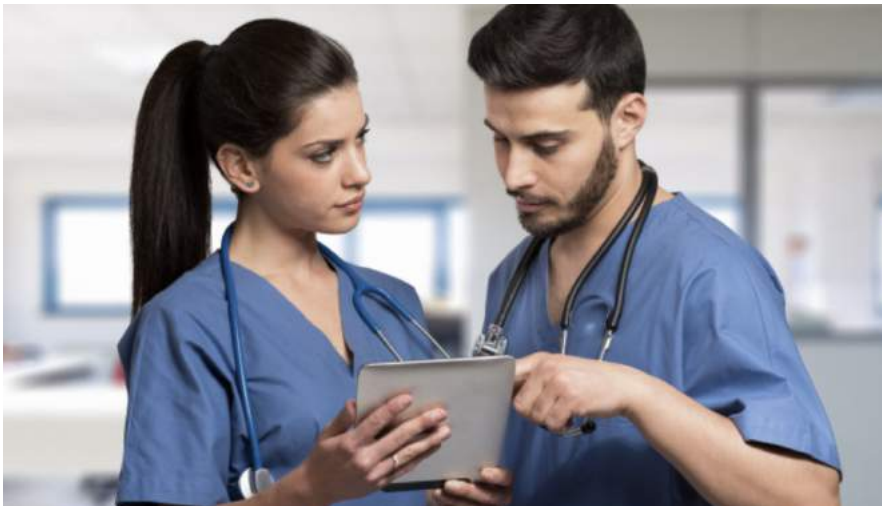
These are being applied to both clinical and business uses within the industry, with a number of opportunities emerging in each case:

At a time of increasing preoccupation with healthcare costs across the developed and developing world, integrated hospital management software is a fast-growing segment with an emphasis on generating meaningful data and using this intelligently.

At the front-end of service delivery, telehealth is the frontrunner in terms of growth. It is responding to the need for more patient empowerment and is also riding the wave of wearable devices and smartphone technology to provide massive opportunities for the collection and transmission of valuable patient data.

There is no sign that the digital health industry will be slowing down any time soon and market forecasts until 2025 project significant growth.

This is particularly the case for developing and emerging markets, which are now discovering the benefits of digital health. This report assessed the current and forecast situation in three regions with significant clusters of such markets: Asia, Latin America and Africa. Although digital health is rolling out across all three regions, Asia emerges very clearly as a region which will experience major digital health penetration. This is in fact set to happen at an even faster rate than in the advanced economies.



In developing countries however there is a different set of priorities that direct the focus of digital innovation. Health infrastructure and professional resources may be limited even as they try and cope with the demands imposed by a growing and ageing population. The efforts of various governments, including in Asia, to introduce universal health coverage is also a further challenge. In this context therefore, the priorities are to improve access to healthcare, improve the quality of health services and maximise the limited resources available by optimising cost efficiency. These objectives are shaping how digital health is being applied in these countries.



On this basis different forms of telehealth and mobile health that tackle the ‘access’ and ‘quality’ objectives are gaining traction fast. Similarly, back-end management systems which streamline and integrate operations are a priority from a cost-efficiency perspective. This includes electronic health records systems which are increasing in importance as governments move towards improving the quality and quantity of patient data. As health systems grow more sophisticated, access to such data at a national level is critical for effective health planning and for implementing universal health coverage schemes.



This report concludes that based on the research carried out, the emerging and developing markets in Asia provide various opportunities for players in the digital health industry. A careful assessment of the path that digitisation is taking in these markets, and the priorities that are driving it, should provide enough information for a potential developer to identify products and services that are truly aligned with these priorities. In many cases, it may not be sufficient to export a solution that has worked well in other markets: to gain a truly competitive edge development should cater for the particular needs of the health service providers in that market, public or private.

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