



## The tectonic shift: what new contenders in healthcare must know about digital ecosystems

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### Introduction

Over the last decade, as new technology has been developed and integrated into the healthcare sector, non-health “traditional” technology companies, whether tech giants or small start-ups, have taken great interest in this market. These new entrants offer everything from new tools for healthcare workers to direct-to-consumer solutions that bypass traditional provider- and hospital-to-patient care models. Some of these examples include a tech company partnering with the UK’s National Health Service (NHS) to both share data and develop AI-powered healthcare services; another tech company is offering cloud services specifically tailored for healthcare; a social media service is quietly pushing into health tracking software; and an online retailer is purchasing One Medical, a chain of primary health clinics in the United States.<sup>1,2,3,4</sup> These forays into healthcare are motivated by a significant unmet need as well as the opportunity for profit. In the US, healthcare is a \$4 trillion industry that makes up 20% of the country’s GDP, and the rapidly aging and large demographic of baby boomers offers all the more potential for the industry’s expansion.<sup>5,6</sup>

The many new players scrambling for opportunities in emerging and developed markets foreground new considerations: strategies to evaluate the viability of their products in the clinical context, the sustainability of their business models and partnerships, and managing concerns about data security and privacy.

### Are digital ecosystems achievable in healthcare?

Digital ecosystems offer new players an opportunity to connect their technologies to a wider, dynamic network, empowering patients and providers alike to leverage data to improve health outcomes. Despite scant evidence in scientific journals, digital ecosystems show much promise in practice. Digital ecosystems allow the exchange of secure information among healthcare providers, patients and services—enabling a patient-centric model instead of a disease-centered approach.<sup>7</sup> Digital tools connected to this wider network have the potential to increase operational efficiency, reduce administrative burden, increase time spent on healthcare and obtain better data quality, at patients’ convenience. Data collected can offer actionable insights when using data analytics tools, leading to innovation and overall improvements in health systems.<sup>8</sup>

Tan Tock Seng Hospital (TTSH) in Singapore offers one example of such a network. TTSH is a world-class hospital that is beginning to create a digital ecosystem using cutting-edge technology and operational and process redesign to promote value-based healthcare. Leveraging hospital-wide digital command systems, next-generation electronic medical records, robotics, 3D printers and smart sensors, TTSH has seen positive initial results: improved care coordination, more time spent on direct patient care and improvements in patient safety.<sup>9,10,11</sup> Digital ecosystems will allow healthcare organizations to innovate

and optimize patient care, improving patient outcomes and achieving operational excellence.

To reach the next level of interconnectivity, systemic challenges must be overcome. Among many, silos should be considered a top priority. A digital ecosystem's success relies on the collection, storing, processing and sharing of massive amounts of data from various sources.<sup>12</sup> To connect devices and technologies, information systems must be integrated, with sophisticated interoperability. Fragmented health systems that still rely on pen and paper for administrative and operational processes and continue to use legacy systems face many challenges.<sup>13</sup> Silos are not exclusive to information systems, and they stifle innovation. Silo mentalities among key stakeholders—health workforce, decision-makers and organizations—present a significant threat to collaboration, innovation and information sharing.<sup>14,15,16</sup> Silos must be deconstructed if ecosystems are to take hold. New players in the healthcare market will need to find ways to collaborate and connect across public-private health systems and nontraditional healthcare companies.

### Developing technology for a sustainable and efficient digital ecosystem

Digital infrastructure is an all-encompassing but not widely agreed-upon term that includes aspects of physical infrastructure plus hardware and software components.<sup>17,18</sup> However, basic network connectivity, provided by a fusion of physical and digital infrastructure, must be established to move toward digital ecosystems. Many hospitals and healthcare institutions in developing markets do not have that foundation for technological innovation in the provision of care. Without basic network connectivity, it will not be possible to achieve solutions that integrate point-of-care testing, laboratory technologies and hospital-wide systems. A lack of network coverage is the “single most prevalent roadblock to the deployment of interconnected medical devices and other smarts.”<sup>19</sup> Beyond providing the infrastructure that undergirds the healthcare system itself, individual connectivity in homes and communities (Table 1) impacts people's abilities to maintain their health and stay connected to clinical environments.

**Table 1: Impacts of information and communication technology infrastructure, 2020**

	Proportion of population using the internet <sup>20</sup>	Number of fixed broadband subscriptions <sup>21</sup>	Number of mobile cellular subscriptions <sup>22</sup>
<b>North America</b>	92%	137m	383.9m
<b>Latin America &amp; Caribbean</b>	74%	96.7m	668.4m
<b>Europe &amp; Central Asia</b>	84%	274.7m	1.1bn
<b>Middle East &amp; North Africa</b>	78%	51.1m	514.1m
<b>Sub-Saharan Africa</b>	30%	6.6m	943.9m
<b>East Asia &amp; Pacific</b>	69%	624.2m	3bn
<b>South Asia</b>	39%	38.6m	1.6bn



The WHO's Global Strategy for Digital Health 2020-2025 recognizes the urgent need to address roadblocks for low-income countries seeking to implement digital health technologies.<sup>23</sup> These obstacles include but are not limited to infrastructure to support the digital transformation, regulatory and legal barriers, financial investment, and internet connectivity, as well as issues related to legacy infrastructure, technology ownership, privacy, security and adapting and implementing global standards and technology flows.<sup>24</sup> Harold (Hal) Wolf, president and CEO of the Healthcare Information and Management Systems Society (HIMSS), a not-for-profit organization that works on global digital health transformation, echoes these concerns and points out the need for companies to think bottom-up and go with the "most simplistic layer of application capability," thus allowing innovations to be scaled up, dependent on specific infrastructure and accessibility. Companies need to think about individuals living in rural settings who might not have 5G, or even 3G. They must find ways to penetrate those areas and allow individuals to access digital information to support their health or healthcare.

Cybersecurity considerations around data safety and privacy are also priorities as data analytics becomes more important in a changing healthcare landscape. Understanding trends in

health is more essential than ever, demonstrated powerfully by the covid-19 pandemic.<sup>25</sup> With this need for analytics come issues of public trust. "There's [a] balance that we have to have between the need for and access to the information [while also] ensuring that individuals have confidence that their information is being used appropriately," says Mr Wolf, emphasizing that companies need individuals to trust that their data and information are secure and that they can count on their information being used to support their health needs.<sup>26</sup> Regulations guiding personal data protection vary among countries and even within them. The EU has made strides to protect data privacy, but the US does not have a singular law that covers data privacy and instead relies on a mix of laws that protect only specific types of data.<sup>27</sup> Despite great strides, challenges still exist in regions such as Europe, where there are also legal barriers to sharing data across borders; as the covid-19 pandemic so potently displayed, disease burden, viruses and pandemics do not care about borders. Regulation needs to adapt in response.<sup>28</sup>

Companies seeking to enter the healthcare space should also educate themselves on how to navigate existing infrastructure. Rather than trying to force their own hardware or solutions on the healthcare landscape, companies should look for gaps that need filling in the

component parts of the system.<sup>29</sup> As an example, one company allows people to find and book appointments for medical care. This company built calendar integrations that pull real-time availability from many systems, obviating the need for many different logins. It created a record that remains with patients when their insurance, city or provider changes, and it facilitates bookings across more than 12,000 insurance plans, offering more organization in a sprawling and often-opaque healthcare marketplace.<sup>30</sup>

Another option is the acquisition of systems or companies that are already working in healthcare and improve on them.<sup>31</sup> One large tech company was interested in an at-home healthcare technology company in a bid to acquire thousands of trained clinicians and pre-existing technology.<sup>32</sup> This example suggests that rather than building services from the ground up, companies can also explore integrating existing systems.<sup>33</sup>

Companies should also be conscious of how existing systems fit into the healthcare landscape and clarify how they will navigate the issues posed. One example is knowledge of the diagnostic and clinical contexts that are key to providing solutions in a healthcare market—which means traditional technology companies might want to consider partnering with healthcare experts as they work on digital solutions. Another example is the Internet of Things, a system of wireless, interrelated and

connected digital technologies that “collects, sends and stores data over a network without requiring human-to-human or human-to-computer interaction.”<sup>34</sup> The ability to work with this system requires, among other considerations, constant technological and infrastructure updates, along with training healthcare professionals to use the infrastructure or connected devices.<sup>35</sup>

### Learning from what does not work

Unsuccessful ventures can illustrate what not to do. One company’s partnership with a conglomerate and another bank<sup>36</sup> to create their own healthcare company for employees collapsed in 2021,<sup>37</sup> showcasing the difficulty of integrating into a very complex existing system—in this case, the American healthcare network. Another tech company tried to create its own primary care services, but employees flagged issues with data integrity,<sup>38</sup> derailing the project and highlighting broader issues with Big Tech companies around data protection. Many Big Tech efforts to enter the market in response to the covid-19 pandemic showed that these companies, despite their innovation, cannot provide all the answers to problems in public health. Existing public infrastructure issues such as network connectivity—and a lack of emphasis on designing data analytics for the public good—immensely complicate the healthcare landscape.<sup>39</sup>





## Conclusion: the way forward

Successfully and sustainably entering the healthcare space requires shifting focus from the technology itself to the larger process of creating more efficient and effective patient care, improving health outcomes and decreasing costs.<sup>40</sup> There are three direct actions that non-health technology companies should consider when entering the healthcare market.

First, collaboration is vital to create interoperable and dynamic digital ecosystems that facilitate seamless exchanges of health data across various devices and platforms. Bringing together system managers, policymakers, patients and healthcare providers is the first step to find ways to break silos. Diverse stakeholders will be needed to innovate ways to overcome health system fragmentation. Only then will new players understand how to solve the problems of silos: health system structure, socioeconomic and political context, and market restrictions.

Second, new players must contextualize the building of digital ecosystems based on the local realities of existing infrastructure and resources. New players can leverage local stakeholders

and understand the complex nuances of local health systems. No one-size-fits-all approach will succeed. Therefore, non-health technology companies must pursue bottom-up thinking to take advantage of existing infrastructure and allow innovations to scale up according to local context.

A final consideration is understanding the legal and regulatory parameters that may impact digital ecosystem operations and affect public trust. Patients are at the centre of a digital ecosystem, and new entrants must establish and maintain patients' trust if they are to offer solutions in local markets. As Mr Wolf pointed out, a balance must be reached between access to information and cultivating public trust. Any operations will have to take into account the local context of privacy and trust, especially in areas with more-developed laws and regulations.

The future of digital ecosystems is promising, yet the challenges are many. Success will require a shared commitment to progress and breaking systemic barriers that limit collaboration and integration. By understanding the context of the solutions within the broader ecosystem, and by putting the patient at the centre of digital ecosystems, new entrants will find their role in efficiently promoting better health outcomes while establishing a significant presence in local markets.

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