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Digital Platforms and Ecosystems in Healthcare: Promises and pitfalls

Michael G Jacobides, London Business School (& Evolution Ltd)

Sergio Levi, Philips

Jeroen Tas, Philips

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Michael G Jacobides (mjacobides@london.edu) is the Sir Donald Gordon Professor of Entrepreneurship & Innovation and Professor of Strategy at London Business School. He is the Chief Expert Advisor on the Digital Economy at the Hellenic Competition Commission, Evolution Ltd's Lead Advisor and the co-author of the World Economic Forum's White Paper on Digital Platforms & Ecosystems. **Sergio Levi** (sergio.levi@philips.com) is the Head of Strategic Alliances at Philips, based in London. **Jeroen Tas** (jeroen.tas@philips.com) is the Chief Innovation and Chief Strategy Officer at Philips, based in Amsterdam. The paper expresses personal views of the authors and does not represent the views of the Hellenic Competition Commission or Royal Philips.

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Abstract

COVID-19 has shown how digitization can transform business and society. However, it has also exposed serious vulnerabilities in healthcare systems worldwide, manifested in issues with tracking, managing care pathways, supporting large-scale vaccine trials, and more. We argue that digital platforms and their associated ecosystems will have a key role to play in creating the responsive, flexible, and cost-effective healthcare provision of the future. We review recent advances made by digital platforms and ecosystems in healthcare systems around the world, and consider what is holding them back from their full potential. We find that, in Western economies at least, digital healthcare platforms face a range of challenges, including data privacy regulation, information silos, limited interoperability, intricate stakeholder networks, and complex payment arrangements. We consider how healthcare might be transformed in the future, using successful responses to the pandemic as exemplars, and propose some critical success factors for this transformation to succeed.

Executive Summary

Promises and pitfalls of platforms and digital ecosystems in healthcare

- The COVID-19 pandemic has shown how digitization can transform business and society. However, it has also exposed serious vulnerabilities in healthcare systems worldwide. Lives have sadly been lost due to problems with tracking, managing care pathways, supporting large-scale vaccine trials and more.
- The biggest problem in healthcare is fragmentation. Care is highly variable, both between countries and within them, and resources are often wasted. As a result, healthcare expenses in developed economies are becoming untenable.
- Digital platforms and ecosystems will be crucial to the healthcare of the future. But what role will Big Tech play? Why are some sectors doing better than others with digital? And why is China so far ahead of Europe and the US?
- This white paper aims to answer these questions to inform policy and strategy.

Platforms and ecosystems

- There are two main types of digital platform. Transaction platforms link supply and demand (like Uber), while innovation platforms link organizations with co-creators who contribute to innovation.
- Platforms are the technical foundation for ecosystems: groups of co-specialized firms that collaborate and compete to offer products and services to consumers.
- Some ecosystems are formed around particular products, or complementary products. Some involve firms working together to add value. Some are aimed at “customer grab”, or trying to lock users in. And others are all about innovation.
- Some platforms, like AirBnB, are global in scope. But others are more localised – Uber may be a global brand, but it operates and expands one city at a time.

Healthcare platforms: the story so far

- We have seen some progress with using digital platforms in healthcare, but it has been patchy.
- The best examples are based in China. They focus on services that are easily scalable, such as online consultations, health management, making appointments, insurance, drug delivery, and paying bills. Others link patients with practitioners for web-enabled diagnoses, or offer “match-making” between patients and healthcare providers.
- Some smaller ecosystems offer an all-in-one service, aiming to overcome fragmentation. In the US, for example, there is a rigid separation between access, payment, and delivery.
- Overall, while many professionals have high hopes for platforms and ecosystems, they have yet to fulfil their promise.

Why healthcare is different

- Most healthcare platforms have focused on areas that are easy to monetize – such as matching up patients and providers, rather like an online directory.
- They also tend to do things closer to the patient, and shy away from the tough challenge of delivering complex clinical care.
- Microsoft’s HealthVault aimed to harness patient data to build an ecosystem delivering patient-centric services. However, involving the healthcare providers who hold vital complementary data ultimately proved too difficult, and HealthVault was closed down due to low adoption.
- In healthcare, purchasing decisions are not down to the patient alone. Health outcomes are probabilistic, and most decisions are made by providers, insurers, and policymakers. So any digital healthcare platform must reach deep into the medical community.
- Healthcare platforms fail when network effects are constrained by industry-specific challenges such as local regulations and reimbursement policies, low interoperability among clinical IT systems, and a highly complex industry structure.
- Most healthcare IT is still deployed inside hospitals. In the same way, some benefits of platforms may be easier to realize within firms, rather than through networks of firms.
- Sharing information outside the “walled garden” of an institution can be a challenge. In theory, Big Tech platforms such as Amazon or Google should be well placed to emulate Chinese ventures such as Tencent. In practice, they face stricter regulations and customer reluctance to share data.
- In contrast, platforms have flourished in China, where there are fewer constraints on data and privacy, and healthcare professionals actively encourage patients to track healthcare data.

COVID-19 and the Hospital of the Future

- The pandemic has provided the impetus to reimagine healthcare.
- The crisis has shown that healthcare stakeholders can work together quickly and effectively when they need to. In the Netherlands, Phillips built a national online portal to share patient data seamlessly – albeit with government support.
- Projects like this give us a glimpse into the hospital of the future. Hospitals will not be bricks-and-mortar facilities, but interconnected networks blending digital and physical services. Their reach will extend across healthcare facilities, patients’ homes, retail malls, and areas currently underserved by healthcare.
- One example is the Mercy Virtual Care Center in Chesterfield, Missouri, which has over 300 medical professionals on site – but zero patients. It provides care for patients who are either at home or in 38 hospitals across seven states, coordinating services rather like an air traffic control tower controls airplanes.

- As these examples show, the digital transformation of healthcare will be about integrating consumer-facing technologies and traditional healthcare systems. Platforms will bring users and data together to offer better insights and wider choice.

Rethinking healthcare

- As costs rise, populations age and chronic disease becomes more common, global health systems are near breaking point. We need bold policy choices to rethink the healthcare sector.
- Our guiding principle should be value-based healthcare, which focuses on outcomes versus cost. Providers are paid based on patient health outcomes, and the benefits are widely shared. This contrasts with the existing “fee for service” model, which disregards outcomes.
- Managing costs in value-based healthcare depends on measuring outcomes and handling data. Platforms are well suited to both tasks – but there are still some challenges.
- One issue is the diversity of data. Healthcare data is often incomplete, unstructured, formatted in specialized ways or stored in non-interoperable repositories. Even Electronic Medical Records (EMR) kept at hospitals contain less than 40% of the patient’s data.
- If we wait for “the market” to solve these problems, Big Tech firms may use their technologies to build closed, exclusive, or proprietary ecosystems. We cannot afford such a “winner takes all” outcome.
- Only flexible, interoperable, dynamic ecosystems can ensure that patients, and not just private firms, benefit from digitization. We should look to sectors such as financial services, where initiatives such as the Payment Services Directive made platforms open, interoperable, and freely accessible.
- Given that ecosystems compete with each other, we also need to consider how to build an information infrastructure to support such competition.
- Healthcare providers will need to share resources – as they have shown they can during the pandemic.
- We will need open data standards such as FHIR (Fast Healthcare Interoperability Resources). Once data can be freely collected, analyzed, and exchanged, we will be able to unlock the massive opportunity of AI in healthcare.
- Data privacy laws must not stand in the way. The goal is a healthcare delivery system where information flows seamlessly and securely across platforms and ecosystems to support coordinated patient pathways and reward its participants based on outcomes.
- We also need to work on clearly defined outcomes and measurement standards, so we can measure performance, eliminate variance and enable shared pathways.
- Finally, we need reimbursement reform, so new ideas are rewarded and new structures can take root. Value-based care depends on fluidity in terms of what is paid for, and by whom. We must experiment with new payment modes that share risk and align incentives. Insurers and government payers will have a major role to play in this.

- There is much to do – yet the pandemic has shown that it can be done. Faced with COVID-19, the behavior of regulators, government, hospitals, suppliers, and healthcare providers changed almost overnight.
- Now, we need to keep what is good and build on that sense of urgency. The future of healthcare depends on it.

1. COVID-19's Silver Lining: Catalyzing Healthcare's Digital Platforms and Ecosystems

The need to respond to the COVID-19 pandemic has dramatically accelerated the process of digitization, reminding us of the great advances that we can make when we rethink how to do business, and even how to organize society. At the same time, it has highlighted the vulnerabilities of healthcare systems around the world, revealing them as uncoordinated, fragmented structures. Avoidable mistakes have been made, and lives have sadly been lost, because the spread of COVID was so difficult to track, and valuable insights so difficult to share across healthcare systems. And this, in turn, was partly because there were no efficient digital platforms with which to do so. The connections between healthcare providers and patients were hindered by a lack of standardized protocols linking digital ecosystems. As a result, it has been more difficult to stratify patient cohorts, manage COVID care pathways, monitor high-risk patients at home, provide regular care without infection risk, and support large-scale clinical trials and pharmacovigilance for a COVID vaccine.

These problems are neither new nor unique to COVID. In fact, they represent a problem that is endemic in healthcare: fragmentation and suboptimization. Healthcare is highly variable, both between countries—even in the same transnational bloc, or at the same level of development—and within them, as between UK regions or U.S. states. If healthcare were built from scratch today, it would surely be designed differently. The division of labor we see in the healthcare world is path-dependent, having been built up through historical development and local convention. The variety of local regulations that result means that many of the resources directed to healthcare wind up being wasted.¹ Now, though, this systemic and chronic inefficiency in healthcare is becoming unsustainable, as healthcare expenses grow to an untenably large share of GDP in developed economies.

Clearly, we need to support digital connections, data insights and improve the way healthcare is coordinated. But what can digital platforms and ecosystems offer? What substance lies beneath their promise, and what early signs we can see that it will be fulfilled? Will healthcare be subsumed by Big Tech, will it be the realm of HealthTech or will it remain dominated by the large hospitals? Which parts of the healthcare sector are renewing themselves with digital, and which remain stagnant? Also, why is there such great progress in China, while countries in Europe and the U.S. lag behind? What should be the priorities in terms of policy? And finally, beyond the specifics of healthcare, what can this sector teach us about digital platforms and ecosystems more broadly?

This paper begins by articulating some key principles that underpin digital platforms and ecosystems. It then offers a brief typology showing what they do, how they work, and when (and why) they are local vs. global. It then considers the developments in healthcare platforms to date, both successes and failures, and, after providing some more context in terms of the healthcare sector, asks why progress has been patchy. Next, we take a deep dive into COVID-19 and the challenges of building platforms around it, before turning to the policy implications that could help support digital platforms in healthcare and enhance both patient outcomes and competition.

¹ Pre-COVID, close to \$1 trillion, or 25% of the \$3.3 trillion total healthcare spending, is spent each year on non-value adding or wasteful aspects of the healthcare system in the U.S. alone. See W.H. Shrank, T.L., Rogstad, N. Parekh, Waste in the US Health Care System Estimated Costs and Potential for Savings. *JAMA*, 322: 1501–1509, 2019.

2. Understanding Platforms and Ecosystems

The last few years have seen a mushrooming of the literature on platforms², and, more recently, ecosystems.³ With all this excitement, it's easy to become confused about what platforms and ecosystems actually are, or what they do. But it's vital to distinguish between the different types of digital platforms and healthcare ecosystems, as each has different drivers, motivations, and applications.

There are two main types of platforms. First, *transaction platforms* bring participants together, linking supply and demand; examples include Mastercard, Uber and Airbnb. *Innovation platforms*, meanwhile, link organizations with a network of co-creators who contribute to innovation—like what ARM offers to its co-developers, or GitHub to its developers.⁴

Platforms form the technical foundations of *ecosystems*: groups of co-specialized firms that collaborate and compete to offer integrated sets of products and services to consumers (B2C) or businesses (B2B). While both platforms and ecosystems *can* exist without the other, the two are interrelated.⁵ And in healthcare, as in many other settings, the best way to understand platforms is to look at the ecosystems that they support.

Digital ecosystems involve some degree of interdependence between members, and some way to share services and data. They may also use one or more platforms to tie products and firms together. We all know the tech giants that operate this way: Google, Apple, Amazon, Facebook, or Tencent's WeChat in China.

However, on closer inspection, ecosystems have distinctions of their own. First, there are *multi-product* and *multi-actor* ecosystems. Big Tech firms combine complementary products to deliver a seamless suite of services to the customer—like Google's offerings of search, maps,

² See, e.g., A. Gawer, M.A. Cusumano, *Platform Leadership: How Intel, Microsoft, and Cisco Drive Industry Innovation*. Harvard Business School Press: Boston, MA, 2002. G. Parker, M. Van Alstyne, S.P. Choudary, *Platform revolution: How networked markets are transforming the economy – and how to make them work for you*. Norton & Company Inc: New York, 2016. M.A. Cusumano, A., Gawer, D.B. Yoffie, *The Business of Platforms: Strategy in the Age of Digital Competition, Innovation, and Power*. HarperBusiness, 2019.

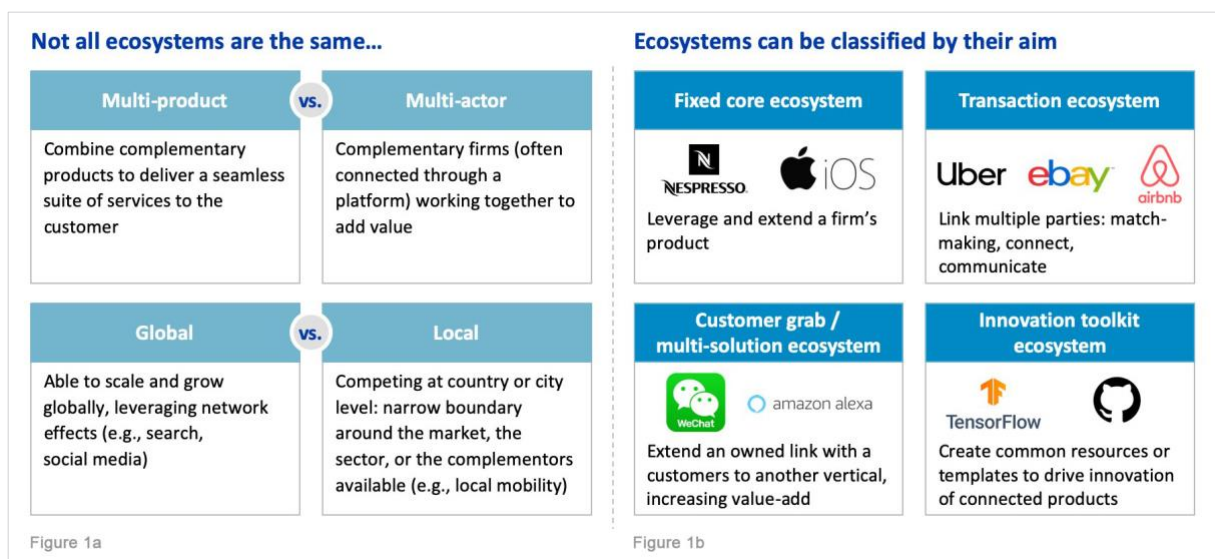
³ D.J. Teece, "Business Ecosystem," entry in the Palgrave Macmillan Encyclopaedia, 2014, DOI: 10.1057/9781137294678.0190. L.D.W. Thomas, E. Autio, D.M. Gann, "Architectural leverage: Putting platforms in context." *Academy of Management Perspectives* 28 (2): 198-219, 2014. R. Adner, *The Wide Lens: What Successful Innovators See that Others Miss*. Penguin Random House, 2013. M.G. Jacobides, C. Cennamo, A. Gawer, A. Towards a theory of ecosystems. *Strategic Management Journal* 39: 2255-2276, 2018. M.G. Jacobides, A. Sundararajan, M. Van Alstyne, *Platforms and Ecosystems: Enabling the Digital Economy*, World Economic Forum White Paper, 2019, p. 1-32. M.G. Jacobides, "In the ecosystem economy, what's your strategy?" *Harvard Business Review*, September–October, 2019.

⁴ "Platform" is also used to denote common designs used in manufacturing, like a common substructure of the car production; we steer clear of this engineering usage. See K. Ulrich K, "The role of product architecture in the manufacturing firm." *Research Policy* 24(3): 419-440, 1995. For a broader analysis of platforms, see Thomas et al, *supra*, 2014.

⁵ M.G. Jacobides, C. Cennamo, A. Gawer, "Distinguishing between Platforms and Ecosystems: Complementarities, Value Creation, and Coordination Mechanisms." Working paper (under review), 2020.

email, video (via YouTube), and potentially health (via its acquisition of FitBit). These are *multi-product* ecosystems, and they are all aimed at strengthening the value proposition and locking in the customer. Then there are *multi-actor* ecosystems, which consist of complementary firms (often connected through a platform) working together to add value—such as app developers helping Apple to enhance iPhone functionality. Thus, ecosystems are a substitute for using vertical integration or drawing on a supply chain, and they refer to the collaboration of different players to address a shared goal.⁶

Understanding different ecosystem types



Digital ecosystems can be further distinguished in terms of their aim. Some, like Uber, are based on **transaction-based ecosystems** that link multiple parties (for example, passengers and drivers). Beyond such “matchmaking,” they may also allow the parties to connect and communicate. Others are **fixed-core** ecosystems. These start with firms who want to leverage and extend a physical product—like Nespresso capsules, which have been leveraged with an ecosystem of makers of compatible coffee machines. Or, more typically, consider a device (like an iPhone) which requires not only an operating system (iOS) but also apps to use it; and, equivalently, a search engine (Google) whose success relies on an operating system (Android or iOS) and phones to rely on it. These digital complements support the core’s adoption.

Some ecosystems are focused on “**customer grab.**” They try to extend an owned link with customers to another vertical, either through a simple “solution-type” cross-sell, which increases the value-add to the customer and also generates growth, or because they increase the customers’ “stickiness,” and hence drive lock-in.⁷ Consider mobility platforms like SE Asia’s

⁶ See M.G. Jacobides, C. Cennamo, A. Gawer, *supra*, 2018; or, J. Fuller, M. G. Jacobides, M. Reeves, “The myths and realities of business ecosystems.” *Sloan Management Review* Digital Article, February, 2019.

⁷ This is what raises competition policy concerns, as customers are known to become “locked in” to the solutions that they like, and are most convenient to them. For more on the challenges of such lock-ins, see Richard H. Thaler, *Misbehaving: The Making of Behavioral Economics*, New York: WW Norton, 2015. For a broader treatment of the

Grab, which started from ride-hailing and moved into transport, food delivery and financial services, a trend echoed recently by all manner of firms trying to build “SuperApps” that extend their scope. They are emulating Tencent’s WeChat, which covers all users’ needs.⁸

Finally, some ecosystems are concerned with the creation of common resources or templates to **drive innovation**. An example is Google’s TensorFlow, an AI library that ultimately creates new solutions for innovative products that connect with Google, or Github, a software development ecosystem focused on supporting collaboration and innovation.

Not all digital ecosystems are global. It would be easy to imagine they are, as Big Tech firms give the impression that scale and growth are all that matters, and that network effects protect the “winner.” But these dynamics don’t always hold. While search and social media may be global and scalable, most businesses are not. Even Uber has learnt the hard way that competition happens locally, one city at a time: an impatient passenger in Chicago doesn’t care how many drivers are free in New York. And if competition is country- or even city-specific, there may be a narrow boundary around the market, the sector, or the complementors available.

Hence, contrary to popular wisdom, not all platforms and ecosystems benefit from network externalities,⁹ where the value for users increases the more users there are. While some platforms do work this way, many don’t—and most big players end up being a lot more contestable than might initially appear.¹⁰ What really works is an effective value proposition—and since platforms are a dynamic setting, “getting it right” is something that no would-be platform creator can take for granted. At the same time, ecosystems manage their scope—the breadth of their multi-product aspect, and the depth of their multi-actor complementors—so as to increase their chances of capturing the customer, which may turn them into gatekeepers who can then wield inordinate, potentially anticompetitive might.¹¹

3. Healthcare Platforms: The Story So Far

With the background laid out, let’s turn to platforms and ecosystems in healthcare. Given the systemic concerns of healthcare systems, and the particular demands of COVID-19, what has

exploitation of such tendencies, see the Stigler report in the U.S., in F. Scott Morton, P. Bouvier, A. Ezrachi, A. Jullien, R. Katz, G. Kimmelman, A.D. Melamed, J. Morgenstern, Committee for the Study of Digital Platforms, Market Structure and Antitrust, Stigler Center for the Study of the Economy and the State, 2019. <https://www.judiciary.senate.gov/imo/media/doc/market-structure-report%20-15-may-2019.pdf>; and M.G. Jacobides, I. Lianos. “Ecosystem Regulation in Theory and Practice.” Forthcoming 2021, *Industrial and Corporate Change*.

⁸ For an example, look at N. Teng, M.G. Jacobides. The Shape-Shifting Dynamics of Digital Platform Disruption: How Grab Leveraged Established Players in the Southeast Asian Mobility Ecosystem, 2021.

⁹ For a definition of network externalities in platforms, see <https://digitalregulation.org/explanation-of-externalities-on-digital-platforms/>

¹⁰ See M. Reeves, H. Lotan, J. Legrand, M.G. Jacobides, “How Business Ecosystems Rise (and Often Fall)”, *Sloan Management Review*, June 2019 (<https://sloanreview.mit.edu/article/how-business-ecosystems-rise-and-often-fall/>)

¹¹ See, e.g., M.G. Jacobides, *What Drives and Defines Digital Platform Power? A framework, with an application to the Apple/Tinder relationship*, White Paper, EvolutionLtd, 2021. <https://www.evolutionltd.net/post/what-drives-and-defines-digital-platform-power>

been achieved? The short answer is that while progress has been made, it has been patchy—and much remains to be done.

A few exemplars are frequently cited as evidence of change. While they share some interesting attributes, they are not universal; moreover, they focus on the scalable part of the healthcare sector.

PingAn is a Chinese insurance firm that has pushed the boundaries of technology and created some proprietary ways of identifying customers.¹² It operates GoodDoctor, which provides a mobile platform for online consultations, hospital referrals and appointments, health management, and wellness interaction services. This leverages PingAn's broad customer reach, complements its core business, and creates a broader multi-product ecosystem that relies on a number of multi-actor links: PingAn provides interfaces for several different providers, and complements their services with AI-enabled diagnostics for nearly 300,000,000 users.¹³

Tencent, the dominant Chinese tech player, has also leveraged unrivalled customer access to build a network of healthcare services including online consultations, prescriptions, referrals, appointment bookings, one-hour drug delivery, insurance, and bill payment. It has achieved this by using a customer grab strategy and leveraging its platforms. More than a billion people are active users of Tencent's WeChat mobile app, which allows users to send messages, make payments, and play games. As Tencent has expanded into healthcare, WeChat has been integrated into 38,000 accounts belonging to healthcare service providers, making more than 24,000 health and wellness programs available in the process. In parallel, WeDoctor, Tencent's online appointment scheduling app, allows users to connect with 290,000 doctors and 2,700 hospitals, while its investment in iCarbonX, one of China's unicorns, has enabled the collection of millions of data points for training advanced Artificial Intelligence (AI) algorithms.¹⁴ AI helps with solutions in domains such as precision medicine (including precision skincare, or diagnostics such as radiology) and precision health, which goes beyond medical conditions, and includes precision nutrition, exercise, and management of genetic predispositions.¹⁵

Beyond these two well-known giants, MedTech upstart Chunyu Yisheng assists with diagnosis, linking patients with practitioners (doctors and hospitals) for web-enabled diagnosis of ailments, but is primarily focused on creating a link between demand and supply. Less connected to other broader multi-product ecosystems, it offers an enhanced transaction-based ecosystem focused on diagnosis and consultation. Haodafu Online also claims over 100M partners, and a number of other smaller players also participate.¹⁶ On a smaller scale, AliHealth, Alibaba's

¹² PingAn quickly rose to become the world's most valuable insurance brand; see https://en.wikipedia.org/wiki/Ping_An_Insurance

¹³ Source: Roland Berger, 2019 (see below). Also, for a use case of AI, see <https://www.bioworld.com/articles/433530-china-uses-ai-in-medical-imaging-to-speed-up-covid-19-diagnosis>

¹⁴ Roland Berger, *Future of Health – The Rise of Healthcare Platforms*, December 2019. Available at <https://www.rolandberger.com/en/Publications/Future-of-Health-The-rise-of-healthcare-platforms.html>

¹⁵ On AI diagnostics, see the FDA's recent report at <https://www.fda.gov/media/142998/download> and <https://models.acrdsi.org/> for a review of recent FDA-approved AI-enabled mechanisms. For precision health, see <https://www.healthcareitnews.com/news/emea/precision-medicine-precision-health>

¹⁶ See <https://www.whatsonweibo.com/good-doctor-digital-hospitals-how-mobile-apps-are-alleviating-chinas-healthcare-problems/>

healthcare division, provides similar services, while linking them to the core offerings of the multi-product Alibaba ecosystem.

Outside China, user bases are smaller. Information portal ShareCare, built on a social content platform curating the collective knowledge of vetted medical experts, claims to have tens of millions of users, and beyond information provides matching with hospitals, doctors, and other health specialists. It also provides a customer portal and specialized technology to enable individuals to manage their own health, moving significantly further than information portals such as WebMD, whose revenue comes primarily from sponsors and advertisers.¹⁷

Some of the more tech-enabled healthcare companies are expanding their reach as they aim to add more value while also locking customers in. Kaiser Permanente, an Integrated Delivery Network (IDN),¹⁸ offers services including a matchmaking platform for its 12M+ customers, while United Healthcare provides a set of digitally enabled offerings, such as telehealth, patient records, and e-prescription.

Shifting the focus on platforms aimed to fuel innovation, Mayo Clinic, one of the most renowned (non-profit) healthcare provider in the United States, has announced the Mayo Clinic Platform, an initiative that enables innovative for profit ventures to improve health care through insights and knowledge derived from Mayo's de-identified and curated data lake.¹⁹ Other companies focus their platforms on areas where they can bridge multiple sides of the market, offering technology tools to empower some of the key stakeholder groups. France's Doctolib started as a scheduling service for health practitioners, and then moved into virtual care (and more cautiously into a matching platform), and there are a number of other, smaller and more fragmented efforts happening across the globe.²⁰

Creating a different type of platform, Teladoc Health, the largest telehealth company in the U.S., has just merged with Livongo, a leading provider of software tools and data-based coaching programs to manage conditions such as diabetes, in an \$18.5B deal that was heralded as a "great leap forward" in healthcare transformation. The merger is expected to combine Livongo's platform for managing chronic conditions such as diabetes and heart disease with virtual care. The two businesses are expected to complement each other, with Livongo's platform offering a way to keep patients engaged in their health over time, while using virtual care visits for human interaction. Such examples show how new combinations can

¹⁷ WebMD's last reported revenue, before being bought by PE firm KKR for \$2.8B, was \$705M. See <https://en.wikipedia.org/wiki/WebMD> (and, for ShareCare, <https://en.wikipedia.org/wiki/Sharecare>)

¹⁸ An integrated delivery network (IDN), a structure found in the USA, is a formal system of healthcare providers and facilities that offer both health care services and health insurance plans to patients in a defined geographic area (i.e. a defined patient population). Some IDNs also have an HMO (Healthcare Management Organization) component, meaning that they also have a medical insurance group that provides health services for a fixed annual fee.

¹⁹ "Platform business models have been a force of disruption in many sectors, and the rapid digitalization of health care is affording us an unprecedented opportunity to solve complex medical problems and improve lives of people on a global scale," said M.D. John Halamka, Mayo Clinic Platform president.. See the report in <https://newsnetwork.mayoclinic.org/discussion/mayo-clinic-launches-its-first-platform-initiative/>

²⁰ See Roland Berger, *supra*, 2019. and <https://digital.hbs.edu/platform-digit/submission/doctolib-fighting-covid-19-with-digital-transformation/>

add value for customers by creating an integrated service offering where a “fixed core” provides the basis for partners to leverage each other’s assets and services.²¹

Other companies are creating new, if smaller, ecosystems where collaborators offer specific, customized all-in-one services. This enables particular customer groups to access broader, all-in-one services, which are more convenient and overcome the traditional fragmentation of the healthcare market, and potentially lock customers in. At the same time, it enables the orchestrators of these ecosystems to get different participants involved.

For example, in the U.S., a number of firms are trying to overcome the limitations imposed by the rigid separation between healthcare access, payment, and care delivery, which are provided by industry giants such as Accolade, AetnaHealth (now owned by CVS), and Wellframe, respectively. New players are aiming to span all these functions in specific areas of healthcare, relying on selected complementors, while ensuring that the overall experience is more efficient for the patient. Thus, Omada, focused on chronic diseases; DevotedHealth, on care for the elderly; and Tia, on women’s health. This approach enables a new and different way to organize care, with a new level of customer-centricity and customization underpinned by the effective use of technology.²² It follows a consumer-oriented approach of bundling services to address the broader healthcare needs of a specific market segment. Figure 2 summarizes the key digital platforms & ecosystems in healthcare, noting their type, geography, and value proposition.

Examples of healthcare platforms and ecosystems

	Ecosystem type					Services offered
	Orchestrator	Fixed core	Transaction	Innovation	Customer grab	
China	平安好医生 PINGAN GOOD DOCTOR	✓	✓		✓	Provides a mobile platform for online consultations, hospital referrals and appointments, health management, and wellness interaction services
	Tencent 腾讯				✓	Integrated into ~38k accounts of healthcare service providers, making more than ~24k health and wellness programs available (incl. online consultations, prescriptions, referrals, drug delivery, insurance, etc.)
	Tencent 腾讯		✓			An online appointment scheduling app, allows users to connect with ~290k doctors and ~3k hospitals
	Tencent 腾讯 iCarbonX				✓	Investment in iCarbonX, has enabled the collection of millions of data points for training advanced AI algorithms
	春雨医生 CHUNYU YISHENG		✓			Assists with diagnosis, linking patients with practitioners for online diagnosis, but is primarily focused on matching demand and supply
	Haodafu		✓			Offers similar services to Chunyu Yisheng, claims over 100M partners
	Alibaba 阿里健康		✓			Provides similar services as Haodafu on a smaller scale, while linking them to the core offerings of the multi-product Alibaba ecosystem
USA	sharacare	✓	✓			Built on a social content platform curating the collective knowledge of vetted medical experts, claims to have tens of millions of users, and provides matching with hospitals, doctors, and other health specialists
	Kaiser Permanente	✓				An Integrated Delivery Network (IDN) that offers services including a matchmaking platform for its 12m+ customers
	United Healthcare	✓				Provides a set of digitally enabled offerings, such as telehealth, patient records, and e-prescription
	MAYO CLINIC	✓		✓		Has announced the Mayo Clinic Platform, an initiative that enables innovative for-profit ventures to improve health care through insights & knowledge derived from Mayo’s de-identified and curated data lake
Other	TELADOC Health Livongo	✓				A merger between a telehealth company and a leading provider of software tools & data-based coaching programs to manage chronic conditions such as diabetes
	Doctolib (France)		✓			Started as a scheduling service for health practitioners, and then moved into virtual care (and more cautiously into a matching platform)
	Multiple players	✓				New players are aiming to span all core functions in specific areas of healthcare, relying on selected complementors, while ensuring that the overall experience is more efficient for the patient E.g. Omada, focused on chronic diseases; DevotedHealth, on care for the elderly; and Tia, on women’s health

Figure 2

²¹ See, e.g. <https://research2guidance.com/learning-from-livongos-ipo-success-8-components-which-make-a-successful-digital-therapeutic-solution/> and <https://ir.livongo.com/>

²² See e.g., J. Yoo, 2020, at <https://a16z.com/2020/08/07/healthcare-technology-great-unlock/>

Overall, platforms and ecosystems are making inroads into healthcare. The hope is that they will help patients and reduce waste—yet they are no panacea, and several issues remain unaddressed. On the upside, a recent survey by Roland Berger found that 84% of professionals expect that “Platforms will steer patients to specific programs”; 77% that “Payors will offer digital diagnoses and therapies, insured members will use them”; 76% that “Patients will be the owners of their health data and will decide whom to grant access”; and only 57% that “Big tech players like Google or Amazon will be part of the healthcare system like insurers and hospitals today.”²³ A recent McKinsey study excitedly predicted patient-centric ecosystems that would support healthcare-related education and management, screening and diagnosis, access to care, care management and community, and core insurance services. Such ecosystems were expected to add value by offering new touch points, improving customer experience, improving healthcare value, enhancing technological innovation, increasing efficiency, and optimizing data quality.²⁴ Another McKinsey report, equally devoid of any healthcare specifics, mentioned that ecosystems could support clinical integration and population health, primary care, consumer-led “connected health,” infrastructure, and administrative services.²⁵ And a recent comprehensive review of the literature in healthcare operations management, speaking in general terms about ecosystems, notes that they “can usher in a ‘generative’ economy that is shifting from optimizing fixed operations into creating new combinations, new configurable offerings ... Technological innovations will create new business models and disrupt healthcare entities.”²⁶ Yet if expectations are so high, why hasn’t there been more activity?

4. What Hasn’t Happened—And Why Healthcare Is Tricky

Before considering how healthcare is different, it is worth briefly reviewing its own difficult past when it comes to digitization. Healthcare systems have long struggled with the exchange of information. A recent study shows that both developed and emerging countries face significant challenges in establishing information exchanges.²⁷ Countries such as China, which lack robust systems, have seen a more rapid growth of healthcare platforms, perhaps because the gap in seamless care was sufficiently large that a private player could come up with an arrangement that would make up for it. The checkered history of Health Information Exchanges

²³ Perhaps more interesting yet, compared to 2018, 2019 figures were up 5% for the first question; up 29% for the second; up 16% for the third; and down 5% for the fourth, speaking to the challenges of Big Tech even before regulation became such a hotly contested area. See Roland Berger, *supra*, 2019.

²⁴ See McKinsey & Co., *Digital health ecosystems: a payer perspective*, 2019, report available at <https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/digital-health-ecosystems-a-payer-perspective>. It is worth noting that these studies lack any concrete empirical references to healthcare platforms—presumably because data and evidence of their existence, let alone success is scant, while expectations and a rational analysis of the sector suggests opportunity aplenty.

²⁵ See E. Onitskansky, P. Reddy, S. Singhal, S. Velamoor, “Why the evolving healthcare services and technology market matters.” *McKinsey Quarterly*, 2019, accessed through <https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/why-the-evolving-healthcare-services-and-technology-market-matters>

²⁶ See T. Dai, S. Tayur, “OM Forum—Healthcare Operations Management: A Snapshot of Emerging Research”, *Manufacturing & Service Operations Management*, 22(5): 869-1106, 2019.

²⁷ T.H. Payne, C. Lovis, C. Gutteridge, C. Pagliar, S. Natarajan, C. Yong, L-P Zhao, “Status of health information exchange: a comparison of six countries”, *J Glob Health*. Dec; 9(2): 020427, 2019.

(HIEs) in the United States—which set up a number of Healthcare Information Organizations (HIOs) that were broadly publicly funded with the sole aim of facilitating such information exchange—shows just how difficult this process is, as technological challenges are amplified by the inherent differences of incentives between the key players, and the byzantine, if not insurmountable complexity of state and federal laws.²⁸ Similar challenges, albeit in a different institutional environment, can be seen around the globe.²⁹

Yet most of these HIE systems, whatever their specifics, tend to act like “switches” (i.e., passive conduits), supporting the transactional exchange of data for patient referrals and orders or prescriptions. They are useful stepping-stones, based around narrow uses of information, but they fall short of offering the potential benefits that contemporary healthcare platform ecosystems draw on. As such, of late, it is becoming clear that, rather than focusing effort and attention (only) on HIEs and the organizational challenges that they present,³⁰ we need to broaden out our purview. In the EU, for instance, the focus is now on a broader concept, the *Health Data Space*,³¹ which is the (ever-elusive) goal of federated longitudinal data that forms a basis for continuous rather than episodic care.³² Gaia-X, the recent coordinated EU effort to create the infrastructure for the industrial internet, is in the process of articulating the principles of such “information infrastructures” (or information ecosystems) that will enable the actual *multi-actor* ecosystems to operate.

Yet such information infrastructures alone cannot deliver the benefits that platforms are capable of. To reach this bar, platforms have to offer the quintessential ecosystem value-add of *orchestration*, which brings different participants together and revolves around the patient. In other words, healthcare ecosystems should facilitate matching patient needs with health services in a longitudinal pathway (e.g. for chronic care of cardiovascular or diabetes patients) and provide a seamless suite of services—a *limited* part of which we see operating today. And, over and above new services emerging, an ecosystem must do more than merely draw on data, and venture into creating and sharing it too, it has to deliver a comprehensive set of healthcare services efficiently addressing consumer needs.³³

Such bold preconditions might unlock productivity, and help the ever-elusive pursuit of value-based care. In their absence, however, the reality is that platforms have mostly been driven by individual firms, and have gravitated towards “low-hanging fruit.” In particular, digital healthcare platforms and their ecosystems are predictably concentrated in those areas where monetization

²⁸ M. M. Mello, J. Adler-Milstein, K. L. Ding, L. Savage, “Legal barriers to the growth of health information exchange—boulders or pebbles?” *The Milbank Quarterly*, 96(1): 110-143. 2018.

²⁹ Pavne et al., *supra*, 2019.

³⁰ For an example of HIO setup and analysis of what works and what has failed in this regard, see, e.g., Winkler, T.J., Brown, C.V., Ozturk, P. 2014. “The interplay of top-down and bottom-up: Approaches for achieving sustainable health information exchange”, ECIS Proceedings.

³¹ As the EU report notes, “a common European Health Data Space will promote better exchange and access to different types of health data (electronic health records, genomics data, data from patient registries etc.), not only to support healthcare delivery (so-called primary use of data) but also for health research and health policy making purposes (so-called secondary use of data)”

³² See https://ec.europa.eu/health/ehealth/dataspace_en for details.

³³ This can happen, e.g., with the creation of a *clinical registry*, which allows the sharing of clinical observations for research and evidence, which in turn enables researchers and institutional actors to evaluate and improve outcomes for a population defined by a particular condition, disease, or exposure.

is straightforward—that is, where firms can easily find a new way to generate revenues on top of an existing structure. More specifically, the most populous digital ecosystems in healthcare are those that facilitate more frictionless matchmaking between supply and demand.

There's also a strong emphasis on doing things that are closer to the patient—rather than the harder, but much more consequential challenge of effective clinical care. Moreover, many of the biggest steps forward have been made in China, especially when it comes to Big Tech. Before considering what does and doesn't work, it's worth comparing and contrasting this with some of the Western Big Tech experiences. Several big bets have been made on healthcare, but attempts to disrupt this fiendishly complex industry have led to some visible failures, such as Microsoft HealthVault and Google Health: two competing propositions for letting individuals manage a web-based personal health record (PHR) in a central location, which could be shared with healthcare professionals, family, friends, and care teams when required.

Microsoft already provided software to hospitals, but HealthVault, launched in 2007, was its first foray into consumer health. The aim was to capitalize on new legislation: the HITECH Act, which requires providers to allow patients to access, download, and transmit their electronic medical records (EMRs). HealthVault was launched with prominent partners (e.g. the American Heart Association, Johnson & Johnson, and Allscripts, an electronic hospital records company), and aimed at creating an ecosystem of software and device companies that could harness data to generate new insights and innovative patient-centric services. Yet, in spite of these promising auspices, HealthVault was eventually shut down in 2019 due to low adoption and lack of scale. Its fate echoed that of Google Health, which announced closure in 2012. These difficulties aptly illustrate the many challenges that platforms must overcome in order to succeed in healthcare.




The difficulties in healthcare platform ecosystem growth

Intrinsic features making digital healthcare platforms and ecosystems scaling difficult

- 1 **Fragmented** nature of healthcare systems
- 2 **Information silos:** difficult integration of user-generated data
- 3 **Low interoperability** among clinical IT systems
- 4 **Strict regulatory** environment and data privacy
- 5 **Intricate industry structure,** with multi-layered stakeholder decision networks
- 6 **Complex reimbursement** policies and payment structures
- 7 **Cultural barriers,** low patients and hospital preparedness

Figure 3

Examples of digital health platforms' connection of user data across multiple services in China

	 PingAn / GoodDoctor	 Tencent / WeDoctor	 Alibaba / AliHealth
Annual users (2020)	360M	210M	65M
Parent company core businesses and connected ecosystems	Insurance / financial services	Tech / entertainment / social media / mobile payments	E-commerce / digital payments / cloud services
Online consultations / internet hospital network	✓	✓	✓
Appointment booking	✓	✓	✓
Prescriptions	✓	✓	✓
Online pharmacy / drug delivery	✓	✓	✓
Healthcare e-commerce platform	✓	✓	✓
Health management and education	✓	✓	
Wellness / consumer health services (e.g., beauty care)	✓	✓ (via WeChat)	
Billing / online payment	✓	✓ WeChatPay	✓ Alipay
Health insurance	✓	✓	
Offline provider network and services	✓ Wanja clinics, Enterprise platform	✓ Doctor Work / Trusted Doctor	
Community screening and testing	✓ Check up Kiosks	✓	✓ iKang checkup centers
AI-enabled diagnostics / data backbone health cloud services	✓	✓ Miying Healthcare, WeDoctor Cloud	✓ via AlCloud

Sources: Companies' annual reports (2020) and websites, Roland Berger "Future of health 2 The rise of healthcare platforms", Literature review, Philips Analysis

Figure 4

So, what distinguishes these failures from the successes discussed above? First, it appears that the network effects typically associated with multi-sided platforms—such as improved connections among participants, end-to-end collection and sharing of information, and the matching of supply and demand—have been constrained by industry challenges such as local regulations and reimbursement policies, low levels of interoperability among clinical IT systems, and a highly complex industry structure, where purchasing decisions are seldom under the exclusive control of the end consumer (i.e. a patient).

It's also no coincidence that healthcare platforms have flourished in China, where Big Tech faces neither the skepticism, vested interests, nor the data regulations that it does in Europe or America. It's far easier to use information about a client (and potential patient) when one has an in-house information trove that is easy to use internally, but hard for others to replicate externally, as Figure 4 above demonstrates. To that, one should add a cultural dimension, and the preparedness of both patients and hospitals, let alone authorities, to support such innovation in the context of a relatively underdeveloped public health system given China's recent economic growth.

Finally, it is worth considering why in the US, which has one of the highest costs per capita in terms of healthcare, the abundance of funding overall has not led to more platforms and ecosystems. Other than a few progressive organizations such as Kaiser Permanente or United Healthcare and Mayo Clinic, few IDNs have established such digital platforms. The reason for this paucity is, we believe, three-fold. First, there is a need to invest heavily both to digitize information and to create an infrastructure that can take advantage of such platforms. This means that only the largest of these organizations will be able to afford the investments

necessary to usher in a valuable if transformative set of organizational innovations. Investments of Mayo clinic, for instance, in these new areas, are rumoured to be in the hundreds of millions.³⁴ This problem has been amplified by the local scope of many of these organizations. Second, where we see organizations expand their scope (whether IDNs, including HMOs or not, or Accountable Care Organizations / ACOs³⁵) the emphasis has been in broadening their scope and expanding into new verticals through M&A, leading to new *multi-product*, but not *multi-actor* organizations, as a result of their history, their smaller scope, their desire to control, and also the desire to respond to any funding available from payers that can be provided in an integrated fashion.³⁶ Third, regulatory complexity and the lack of standardization have combined to make the entry of national platforms harder. While we should expect that, over time, this problem to subside, it has limited (so far) the progress in the adoption of platforms and ecosystems in developed countries such as the US- but also, Europe which faces its own fragmentation and inertia issues in healthcare.

5. What Can We Learn from Considering What Worked in Healthcare Digital Platform Ecosystems and What Didn't?

Let us now take a step back, and dive more deeply into what we are seeing emerge in healthcare digital platform ecosystems. Returning to our analysis of ecosystems, we see that most healthcare ecosystems are national (and more often, regional), rather than global, and are focused around a particular institution that a country or region may have. The EU is trying hard to push for some international homogeneity between its members, but this is proving an uphill battle, certainly in terms of the data infrastructure. That said, the silver lining could be that inasmuch as there is international consistency in data, innovations in healthcare might become easier to export—a cool new ecosystem play from one part of the EU (or other countries with similar infrastructure) could be applicable in another. Yet it is less clear that systems with profoundly different approaches to data and its use will be transferrable, so that some of the Chinese innovations might be hard to replicate in the U.S. or the EU.

The second observation is that the real promise is in the creation of ecosystems that are both *multi-product* and *multi-actor*. Healthcare needs to shift from its traditional (perhaps even parochial) focus on one narrow vertical segment (e.g., acute care in a hospital) and equip itself to follow the patient wherever they go to get healthcare services. Doing so will support the patient's care pathway in a way that will be both more efficient and cost-effective. Such an

³⁴ In this regard, we see that digital technologies and AI in particular may push the sector into greater consolidation and differentiation between digital “haves” and “have nots”, which may have profound implications for strategy and policy. See related analysis in Jacobides, M.G., Brusoni, S., Candelon, F., “The Evolutionary Dynamics of the Artificial Intelligence Ecosystem”, *Strategy Science*, forthcoming, 2021.

³⁵ For the definition of HMOs and IDNs, see *supra*. ACOs (Accountable Health Organizations) are similar to “loose” IDNs without an HMO (insurance) component. Their providers are financially rewarded for coordinating all aspects of patient care. Patients, on the other hand, can be seen by any physician of their choice, without enrollment or lock in provisions that IDNs often entail.

³⁶ This is ironic, as conceptually an ACO is in itself an ecosystem of inter-dependent providers (e.g., hospitals, physicians, and others involved in client care) that work together to coordinate care. The challenge here is that current-day ACOs often lack the technological capability, let alone the requisite scale, to be able to sustain viable ecosystems, and tend to be much more localized.

ecosystem should bridge a number of different actors who are engaged in all aspects of health provision, supported by technology players. Yet, for a number of reasons we outline below, progress has been limited, and mostly focused around narrower multi-product ecosystems, without the necessary open infrastructure needed to unleash efficiency gains.

Third, while we see a need for a broad and ambitious ecosystem infrastructure that might deliver real societal value, and economic value to the healthcare system as a whole, there seems to be limited support for such “*meta-ecosystems*,” orchestrated or at least facilitated by state authorities.³⁷ Even in countries reputed for their forward-looking approach to digitization (and digital healthcare) such as Estonia, there has been limited state-level progress so far.³⁸ The focus has been primarily on ecosystems driven by firms to address market imperfections—sometimes even taking advantage of state-level inefficiencies (as in China). Private firms have entered the fray and delivered value to the healthcare system in delimited ways, by combining different actors and orchestrating narrower parts of healthcare.

In particular, we see a number of *transaction ecosystems* in healthcare. Here, profits are usually generated from commissions paid by professionals or hospitals for their listings—as with any other online directory. Many of the winners also already had a “core” that they wanted to expand, or a “captive audience” to whom they could provide a healthcare offering. And, true to the spirit of multi-product ecosystems, the aim is to keep the customer locked in, using a platform (or a platform-plus-technology combination) as the key.

Looking beyond matchmaking, healthcare platforms have, to date, also tried to work on *fixed core* solutions, which have tended to focus on certain relatively simple “B2C” activities, with mixed results. Some, like IDNs (such as Kaiser Permanente) have been able to take their core offering, leverage their multi-product scope and engage multi-actor complements. We should note the emergence of the new generation of some multi-product and multi-actor ecosystem focused on particular areas, like Omada, DevotedHealth, and Tia which provide clear solutions to populations in need. An analysis of Venture funding in healthcare suggests that such ventures have a disproportionate share of total VC funds in healthcare and MedTech.

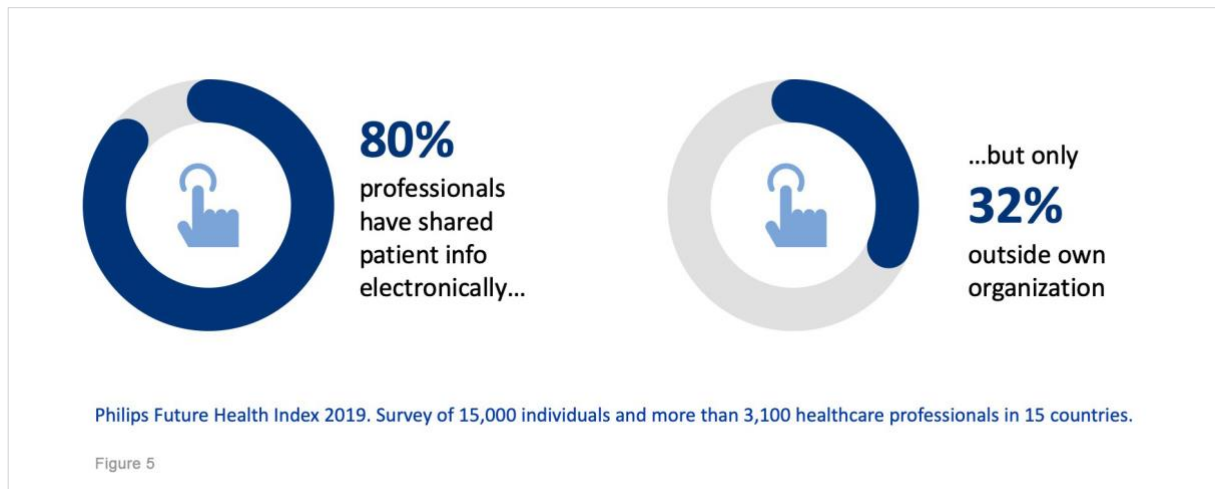
Not all fixed core efforts have worked, though. Electronic Medical Record systems (EMRs), for instance, failed as their core was not sufficient to be both operative and to connect to successful complementors. The issue is that EMRs provide only a limited and partial view of a person’s health, having originally been designed for the purpose of hospital operations and insurance reimbursement. The difficulty of creating such an ecosystem around a single platform led most patients to conclude that these platforms just didn’t solve enough problems to justify

³⁷ A brief historical aside may be useful here. Platforms and ecosystems developed in the world of software, which was characterized by modularity and interdependence (see Jacobides et al, 2018, on why this was crucial). In software, there were ecosystems like Linux that were intentionally not profit-driven, and some early analysts, such as Tiwana (2013), were optimistic that platform ecosystems could grow as federations, as opposed to being driven by single actors. This optimism, however, gradually faded, largely as a result of the development of Big Tech, which became one of the most dominant business forces in society in the late 2010s. This was also the time when regulation *about* platforms and ecosystems became one of society’s most pressing concerns. Even in software, platform ecosystems became much more centralized and managed by one entity; see, e.g., Janssen (2020). At the time of writing, this is one of the most hotly debated topics in the area, with the acknowledgment that there is a need to regulate, as articulated, e.g. by Jacobides & Lianos (2021). For more detail, see Tiwana, A., *Platform ecosystems: Aligning architecture, governance, and strategy*. Newnes, 2013. Janssen, S., Cusomano, M., Popp, K.M. Managing Software Platforms and Ecosystems, *IEEE Software*, (3): 17–21., 2018. Jacobides, M.G, Lianos, I. 2021, *supra*.

³⁸ See <https://www.healtheuropa.eu/estonian-e-health-system/89750/> for a summary of progress so far.

the effort of actively managing a consumer personal health record, such as integrating with existing workflows and complementary health data from sources outside the EMR, leading to limited progress. In China, on the other hand, the success of PingAn's Good Doctor can be ascribed to the fact that the system was much more clearly designed with the business objectives in mind.

The problem of sharing data across organizational boundaries



Healthcare's complex industry structure also played a part in the limited advance of platforms and ecosystems, especially in Western countries. In other sectors, marketing professionals are used to interacting with consumers who have control or significant influence over a purchasing decision. But healthcare's multi-layered decision-making process poses major challenges to scaling consumer-centric business models in digital health.³⁹

The challenge, in healthcare and more broadly, is that technology alone is not the solution; platforms and ecosystems take off when both incentive, technological and user-experience issues are solved. Because health outcomes are probabilistic, most decisions are uncertain and made on behalf of patients by other stakeholders such as providers, insurers, and policymakers, with the reimbursement model acting as a fundamental driver of behavior. In addition, in the relatively sub-scale and fragmented nature of many healthcare organizations, the orchestration of care is oftentimes based on personal referrals rather than optimized care pathways for the patient. This reality requires an aspiring digital healthcare platform to be able to reach deeply into a complex medical community. The failure of even Big Tech ventures demonstrates the challenges of achieving scale, and the need to navigate multiple stakeholder communities and potentially conflicting incentive systems.

³⁹ Relatedly, the limited inroads made by cloud-based digital solutions in healthcare shouldn't be a surprise. Adoption faces impediments on all sides, from reimbursement models and integration with healthcare professionals' ways of working through to data privacy and security concerns. (Most healthcare IT is still deployed inside hospitals.)

This leads us to another important observation, which is that some of the benefits of digital platforms and ecosystems may be easier to realize within firms, rather than through more “textbook” structures with interconnected organizations. It’s no accident that leading U.S. adopters have been the larger organizations like Kaiser Permanente and United Healthcare. The size of the investments that need to complement these ecosystems suggests that scale will be increasingly important. In Germany, for instance, we have seen the emergence of hospital groups such as Sana, Asklepios, Rhön, Helios, which are trying to consolidate sub-scale efficient constituent hospitals to allow them to survive in a much more competitive landscape. In addition to such concentration (or hospital grouping and resource pooling), it remains to be seen whether technologies will emerge that are available commercially, or whether ecosystems which are open will allow smaller firms to benefit from these structures.

These issues of concentration are also visible in China, where the rapid uptake of healthcare platforms tends to happen within the confines of mega-ecosystems that can manage patient data, with the critical difference that this is not only from insurance and healthcare players (such as PingAn) but also Big Tech (which, barring the new entry by Amazon into healthcare, has not been present in the West).

The analysis of Asian data and the role of Big Tech also suggests that successful healthcare ecosystems (limited as they are) have been closer to the “customer grab” approach that we see emerging in other parts of the economy through the development of “super apps.” The (limited) progress we see in healthcare comes from firms that are able to internalize the benefits for both their customers *and* themselves. This raises concerns that only a handful of more integrated organizations will be able to benefit, unless a broader healthcare platform-based ecosystem is created.

There are several reasons why this has happened. Sharing information outside the “walled garden” of an institution can be a challenge. According to research conducted by Philips,⁴⁰ 80% of healthcare professionals have shared patient information electronically with peers inside their health facility, but only 32% have done so outside of it. The research also shows significant interest among the general population in sharing health data with their healthcare professionals, which suggests the potential for individuals’ uptake of self-management using mobile health apps and (medical) devices, if recommended by healthcare professionals. Yet, in spite of evidence suggesting that patients who share data feel they receive better care, the adoption of such apps by medical professionals has so far been limited, as the sector struggles with ways to integrate user-generated data into existing healthcare workflows.

In several countries, healthcare systems are more centralized—such as the UK’s NHS. One might expect such a setting to be ideal for the safe and valuable sharing of centrally housed data, with enormous potential benefits for patients both current and future. However, the reality is that they consist of multiple fragmented and geographically dispersed data silos, with each data set containing multiple data types and formats.⁴¹ The impediments from coordination and

⁴⁰ Philips Future Health Index 2019. Survey of 15,000 individuals and more than 3,100 healthcare professionals in 15 countries.

⁴¹ To illustrate the opportunities missed, Ernst & Young (EY) has estimated in 2020 that data held by the NHS could be worth nearly £10bn a year of un-realized value through operational savings, improved patient outcomes and benefits to the wider economy.

ecosystem efficiencies are not just technological and organizational, limited to aggregation, cleaning, curating, hosting, analyzing and protecting transformed data sets. Generating the sort of data that underpins platforms and ecosystems also requires winning the trust of doctors and the public, to ensure that data is both willingly shared and effectively used—a key challenge for many a healthcare system.⁴²

Contrast that with China, where institutions, habits, and patients' willingness to share data all differ. There, healthcare professionals encourage their patients to track healthcare data. Chinese citizens who use digital health technology or mobile health apps are more likely to have contacted a healthcare professional as a result of that data.⁴³ This is why China's giant e-commerce platforms—like Alibaba, Tencent, and PingAn—have identified healthcare as an opportunity. They are in a unique position to leverage their scale and ability to centrally orchestrate ecosystems and data flows to address China's shortage of general practitioners and concentration of medical resources in wealthier urban areas.

In the United States, e-commerce platforms such as Amazon or Google should, in theory, be well placed to emulate Tencent in terms of a “customer grab” move into healthcare. This very real possibility means that while IDNs like Kaiser Permanente (and, perhaps in the future, progressive and well-run ACOs, like Intermountain or Mayo Clinic) might want to expand and fill that gap, Big Tech can do the same, as we saw in China. In practice, however, they face a stricter regulatory environment, in addition to consumer reservations about who has access to personal health data. This was evidenced by the public outcry and subsequent federal enquiry after revelations that a partnership agreement between Google and Ascension (one of the country's largest nonprofit health systems) included the collection and analysis of patient data.

In such an environment, technology platform providers such as AWS, Microsoft, or Google Cloud seem to be focusing on creating technology infrastructure that others can build on. They have also experimented with “walled gardens” for their employee base, as evidenced by the creation of Haven Healthcare—a joint venture among Amazon, Berkshire Hathaway, and J.P. Morgan that aimed at leveraging technology to change patients' experience, reduce costs, and improve outcomes. Despite representing 1.2 million employees, this seemed to be hard to pull off and was recently shut down. Another example is Apple's launch of health clinics (AC Wellness) dedicated to serving its employees in Santa Clara with high-quality, technology-enabled care and experiences. And, rather than focus on the core of healthcare, Big Tech firms like Google redeploy their analytics capabilities (through their spinoff Verily) to work on the analytics of trial and drug development alongside pharma giants such as Novartis and Pfizer.

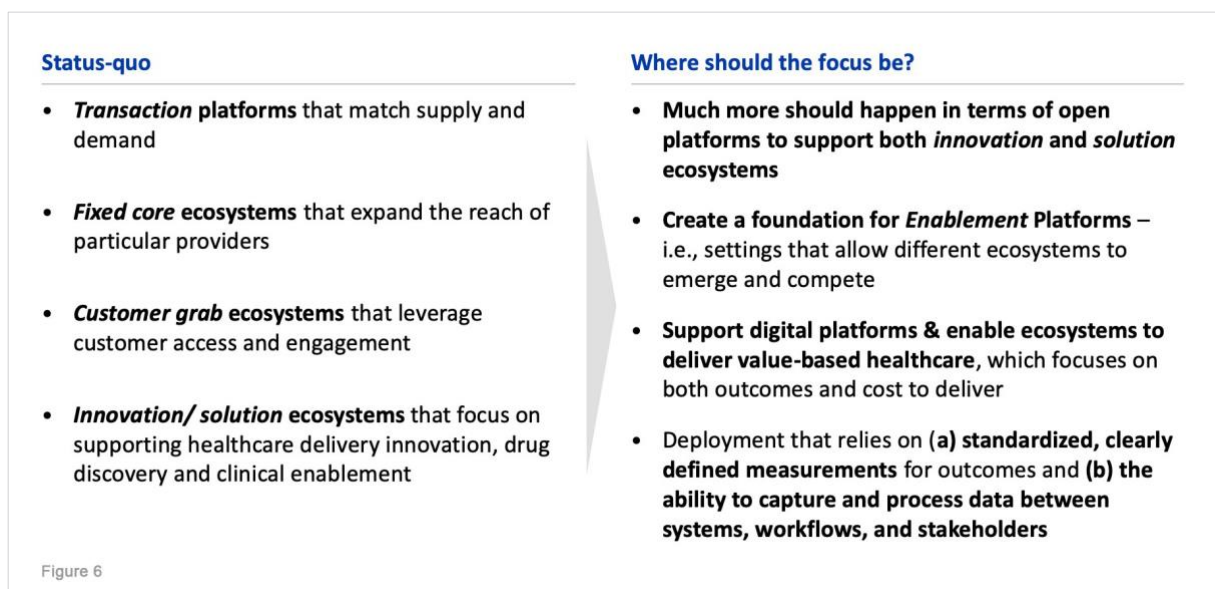
In all, we observe most of the successful healthcare platforms have, so far, relied on one central, strong player—perhaps even more so than, say, software platforms. This has been Big Tech, or occasionally, HealthTech or an IDN—even though many IDNs do not provide platforms or ecosystems at all. Being an IDN does not guarantee the use of a platform. More important, perhaps, few other organizations in the (value) healthcare space, such as ACOs

⁴² To continue with the UK example, consider the failure of the NHS' 2013 care data program, intended to extract data from GP surgeries into a central database. Despite the fact that their data would be anonymized, patients decided to opt out. Benefits were never clearly articulated, and the system had to be terminated by mid-2014.

⁴³ Philips Future Health Index 2019. China at 80% vs. 47% 15-country average. Base: Total individuals in China who use digital health technology or mobile health apps (n=946).

(Accountable Care Organizations) have managed to orchestrate such ecosystems, as a result of the massive scale, investment, capabilities and scope needed to orchestrate them. While one might expect ACOs to be proactive, orchestration requires tremendous (and often under-appreciated skills)⁴⁴ and is even more difficult to sustain in a more distributed organization. The local focus, and administrative heritage on controlling and consolidating has meant that there has been limited appetite for multi-actor ecosystems, even where platforms have facilitated multi-product offerings, and even then, under a strong orchestrating hand. And, finally, we are only recently seeing an interest in creating a set of templates that might allow *new* ecosystems to emerge—i.e., for the data and legal preconditions necessary for ecosystems to leverage a common, cross-institutional interoperable infrastructure, such as could be imposed by a country or a group of countries such as the EU (e.g., the Gaia-X initiative, if fully implemented). Ironically, delay on this front facilitates organizations that try to leverage their links to customers to offer some basic, small scale healthcare features, as opposed to resolving the exciting pragmatic challenges ahead. This leaves us with an exciting challenge, summarized in Figure 5 below.

The unfulfilled promise of digital platforms & ecosystems in healthcare



As noted above, the intrinsic, fragmented and local nature of the healthcare sector has made achieving scale a significant challenge for digital platforms. However, these initiatives from Apple and Amazon suggest that particularly US employers have strong economic incentives to encourage a new push to break through the scale barrier with a digital platform for providers that goes beyond the existing, limited EMR offerings and focused on the health of their employees, rather than sickness. The opportunities are there, even if the landscape is rugged. What may make a difference is a sense of urgency—such as COVID-19 has ushered in.

⁴⁴ See Fuller, Jacobides, Reeves, 2019, *supra*.

6. COVID-19 as a Wake-Up Call

The COVID-19 pandemic has been a rude wake-up call, as it has laid bare inefficiencies around the world. In particular, the side-effects from a lack of data interoperability have highlighted the limitations of the healthcare system when confronted with emergency situations that require the sharing of patient records, pathways, protocols and clinical trials in a more collaborative way across multiple institutions.

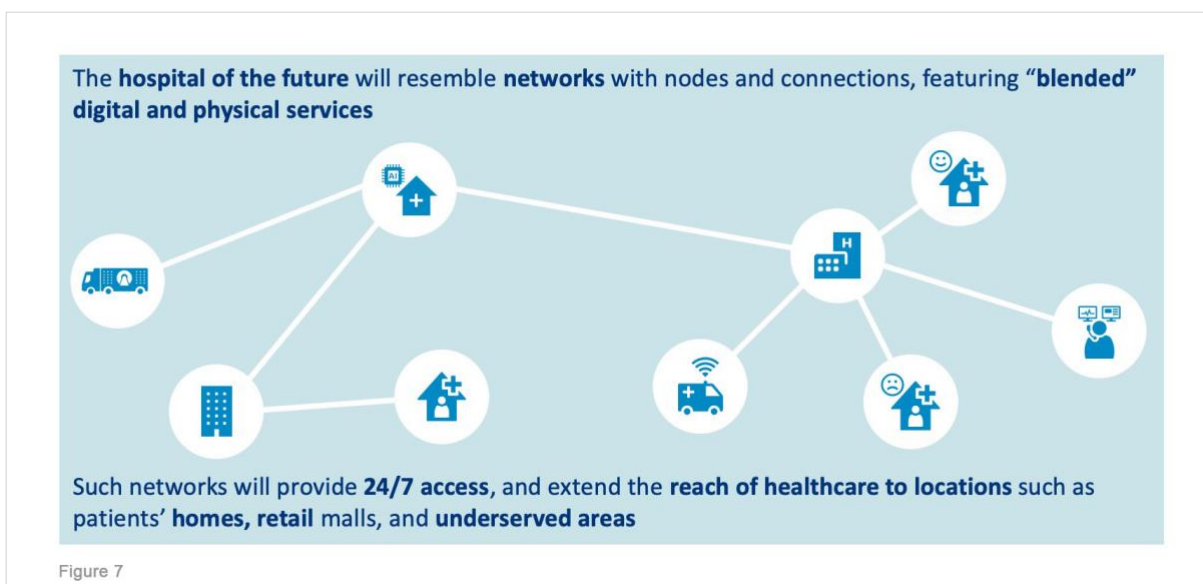
Paradoxically, the unprecedented crisis triggered by COVID-19 has also shown that healthcare stakeholders *can* come together quickly and achieve objectives that would have previously taken years. In doing so, they can facilitate or catalyze the development of new platforms to form the basis of the ecosystems of the future. For example, as the pandemic took hold, Philips was able to work with the Dutch authorities and clinical partners to support the dynamic referral flow of patients across different hospitals throughout the Netherlands, in order to optimize the care of COVID patients and the utilization of intensive care units (ICUs).

By building a national online portal and data exchange that enables Dutch hospitals to seamlessly share patient data, Philips was able to overcome several commonly identified barriers to scaling clinical platforms, such as sharing patient data extracted from different hospital systems across multiple facilities within the constraints of privacy rules, and combining insights into bed capacity (ICU and non-ICU) with real-time patient data to organize transfers as quickly and efficiently as possible. Yet, arriving at this platform was no mean feat, and required an orchestrated push from the Dutch government. It was however fully deployed in in matter of weeks, rather than years.

COVID will be remembered as the “great accelerator” of digital transformation. Within weeks, the slow adoption of virtual and remote technology platforms exploded into exponential expansion of applications spanning from the consumer domain to in-hospital acute care settings. One example is Philips’ solutions for virtual care and remotely guided ICUs to free up frontline workers, which have been used extensively to scale care. Another example of technology in action – but also, of the benefit of seeking collaborative solutions for systemic problems comes from the analysis of the vaccination rollout programmes, and the stark contrast of countries like Israel – which started with a solid information infrastructure, shared openly, and those of EU states trapped in their narrow agendas.⁴⁵

⁴⁵ See <https://www.linkedin.com/pulse/data-ecosystem-approach-accelerate-vaccinations-jeroen-tas/>

The distributed nature of the Hospital of the Future



These developments give us a preview of the hospital of the future, and the type of ecosystems and platforms that might emerge. Hospitals will be less about bricks and mortar, waiting rooms, beds, and labs. Instead, they will increasingly resemble networks with nodes and connections, featuring “blended” digital and physical services. Such networks will provide 24/7 access and extend the reach of healthcare to locations such as patients’ homes, retail malls, and underserved areas. One very visible example of this future is the Mercy Virtual Care Center In Chesterfield, Missouri. This \$54 million, 125,000-square-foot facility has over 300 medical professionals on site—and zero patients. Instead, it provides care for patients who are either at home or in beds in 38 hospitals across seven states, using a model that very much resembles that of an air traffic control tower.

The COVID-19 pandemic has clearly demonstrated that the driving force in the transformation of healthcare will be a seamless integration of consumer-facing technologies and traditional healthcare systems. Multi-sided platforms will play a critical role in bringing together users with similar needs and leveraging connectivity technologies and large data pools that enable better insights and a wider choice of services. Examples of what this future could look like are already starting to emerge and reveal marked differences across geographies.

7. Leveraging Platforms and Digital Ecosystems to Rethink Healthcare

Although digital technologies are making great strides, institutional factors limit their ability to improve patient outcomes. Clearly, we need some bold policy choices to unleash the potential of the healthcare sector. We cannot afford to wait: all stakeholders agree that global health systems are near breaking point in most countries. The ageing population and increasing incidence of chronic disease, alongside innovative technologies and powerful new drugs, have

ignited an unsustainable explosion in costs—and the COVID-19 pandemic has added a new sense of urgency. To achieve our goals, we must cultivate truly patient-centric ecosystems.

The problem is that so far, most platforms and ecosystems in healthcare have understandably focused on the “easy” parts: “**Transaction platforms**” matching supply and demand; “**customer grab**” ecosystems, primarily driven by tech players who can leverage customer access and engagement to enter healthcare, especially in Asia; a few “**fixed core**” **ecosystems** which expand the reach of particular providers, from tech sellers to some more sophisticated IDNs such as Kaiser Permanente; a few “**innovation ecosystems**” by organizations such as Mayo Clinic, or alliances such as Novartis, Pfizer and Google focusing on supporting innovation, drug discovery and clinical enablement; and some “**solution ecosystems**”, also used by IDNs like Kaiser or Mercy Virtual Care. We think that much more should happen in terms of both innovation and solution ecosystems; and we should strive to create *meta-ecosystems*—i.e., settings that allow different ecosystems to emerge and compete, which might be described as “enablement ecosystems” which can allow new solutions to emerge. Doing so will require a serious look both to the *technology* of underlying platforms, and the *governance and incentive design* of the ecosystems that are built on them.

Such a radical approach can help us deliver the elusive goal *value-based healthcare*, which focuses on outcomes versus cost to deliver.⁴⁶ In a value-based delivery model, providers (e.g., hospitals and physicians) are paid based on (risk-adjusted) patient health outcomes, and the benefits are shared among patients, providers, payors, suppliers, and society as a whole. This approach contrasts with the existing “fee for service” model, where payment is based on the amount of care delivered, regardless of success.⁴⁷ The challenge with this model is that it is associated with a number of highly complex, segregated, and often incompatible administrative systems to control cost and quality.⁴⁸

Implementation concerns aside, the promise of value-based care has been evident for some time. However, in many observers’ eyes, the structures and processes of the healthcare system have stood in the way of its adoption—which only a large-scale, systemic reorganization will achieve. In healthcare, it is not acceptable to “move fast and break things.” Changing entrenched incentives and reimbursement policies is extremely complex and requires nothing less than *systemic* change—which is hard to design and difficult to push through effectively.⁴⁹

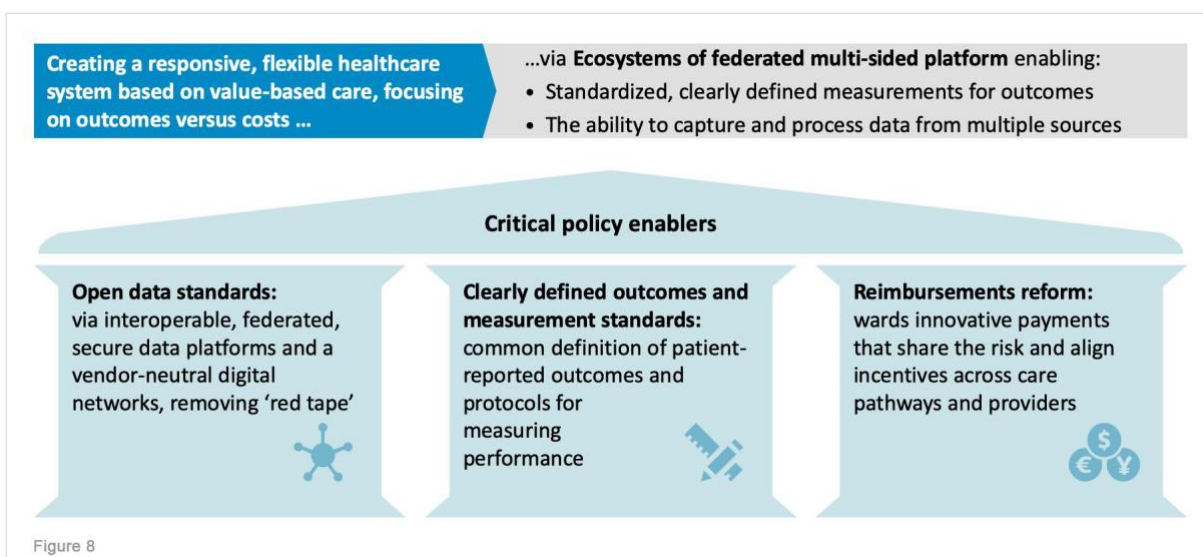
⁴⁶ See Porter M.E., Olmsted Teisberg, E., 2006. *Redefining Healthcare: Creating Value Based Competition on Results*, Boston: Harvard Business School Press.

⁴⁷ In this paper, we take value-based care to be a vital pursuit, if a challenging one. The organization of two of the authors—alongside many others—are supporters of this approach and members of the World Economic Forum group on value-based care. (For this, see Burns, L.R., Pauly, M., “Transformation of the Health Care Industry: Curb Your Enthusiasm?” *Milbank Q.*; 96(1): 57–109, 2018.; and, for a more upbeat assessment, Song, Z., Ji, Y., Safran, D.G., Chernew, M.E., “Health Care Spending, Utilization, and Quality 8 Years into Global Payment.” *N Engl J Med* 381: 252–263), 2019. We do acknowledge, though, that there the value-based approach has its critics—such as U. Reinhardt, who hold that “fee for service” is defensible. On balance, we consider that platform ecosystems and an interoperable world may be able to unlock the elusive potential of value-based care.

⁴⁸ To illustrate, of the roughly 2,000 metrics that guide such systems, only 7% are related to outcomes, and a mere 2% are patient-reported. See World Economic Forum, *Value in Healthcare: Laying the Foundation for Health System Transformation* Insight Report (in collaboration with BCG), April, 2017..

⁴⁹ On systemic change, and how it relates to firm boundaries, see Teece, D.J., “Firm Organization, Industrial Structure, and Technological Innovation” *Journal of Economic Behavior and Organization* 31:2, 1996..

Rethinking Healthcare: a patient-centric system leveraging platforms and digital ecosystems



So, how could platforms and ecosystems help? The “value” in value-based care is derived from measuring health outcomes against the cost of delivering them. Its implementation relies on two pillars: standardized, clearly defined measurements for outcomes (both clinical and patient-reported) and the ability to capture and process data between systems, workflows, and stakeholders.⁵⁰ Multi-sided platforms are potentially well suited to address both these challenges, as they promise the interoperability and network effects that can unlock the transformational benefits of value-based care models. However, significant challenges remain.

For example, improving information through access to data is often cited as a critical success factor in platform economics. It depends on platform owners having exclusive control over a broad and detailed repository of data. In most industries, this has served the largest technology platforms well—but healthcare is unlikely to behave in a similar way. Beyond the well-known regulatory and privacy constraints, healthcare data is also extremely diverse, and stored across multiple, frequently non-interoperable repositories—as noted earlier. In order to support customer-focused, value-enhancing platforms and ecosystems, healthcare information must be standardized, and made available irrespective of the provider.

To drive systemic change and move to value-based care, we need to combine the initiative of ecosystem orchestrators with that of the public sector. The demand of standardization and

⁵⁰ As Teece (2014) notes in his lemma, “A business ecosystem is a group of interdependent organizations collectively providing goods and services to their customers. Shared standards and interfaces are inherent features of platform-based ecosystems. They permit the members of the ecosystem to innovate independently while competing collectively against other firms and/or ecosystems in the relevant market.” We agree that the creation of shared standards and interfaces are critical in helping underpin ecosystems, and, especially in healthcare, do not take them for granted. See Teece, D.J., “Business Ecosystem”, entry in the *Palgrave Macmillan Encyclopedia*, DOI: 10.1057/9781137294678.0190, 2014.

coordination go beyond what any individual orchestrator can offer.⁵¹ Of course, we could equally choose not to engage, and wait for “the market” to find the solution. Yet such a laissez-faire response disregards the externalities that the healthcare crisis places on society. More important, it could allow the largest firms to build closed, exclusive, or proprietary ecosystems, using their own technology, customer data, or “walled gardens.” The story in China suggests that it may well be the tech giants, inasmuch as they are able to leverage healthcare information, who come up with effective solutions. Alternatively, it may be the more integrated, large-scale organizations that prove able to impose standards and leverage information, thus potentially leading to a more uneven playing field.

As digitization and AI in particular is pushing us into an ever more uneven world, where a few firms may be able to both afford to invest in, and reap the majority of the benefits from these new technologies, there is a risk that not only will we forego valuable health innovations, but also that a very small set of firms will dominate the healthcare space, with many other healthcare organizations missing out, and a few new complementors surviving.⁵² Technology-induced concentration has already risen, but whether this pessimistic scenario happens or not is in our own hands. The creation of more open standards, and the support of a more equitable infrastructure may be able to allow for a “market for technology” to emerge, enabling healthcare organizations to leverage outside providers. This, though, will also require some bold strategic changes in a sector all too comfortable with controlling and owning all complements. We hope that the current turbulent setup will ignite entrepreneurial thinking and strategic initiative in a traditionally conservative setting.

Organizational changes, though, are not enough. Data access and interoperability will require some state intervention. Without concerted state (or supra-state) action,⁵³ patient health benefits (and societal cost savings) may be delayed. Such inaction may also encourage greater integration and scale, so that private firms benefit most from new technology. As virtual care is supported by the rapid growth of monitoring and therapeutic devices connected to consumers and their smartphones, integrated, all-in-one services become easier within walled gardens—unless we create the conditions for flexible, interoperable, dynamic ecosystems instead.

Competition within and between ecosystems is becoming a hot topic.⁵⁴ In the healthcare arena, we should reflect on how to best create the information infrastructure that will enable inter- and intra-ecosystem competition to drive better patient outcomes. Our view is that value-based health delivery networks will need to rely on an ecosystem of federated platforms that

⁵¹ This differs from the emphasis in, e.g. Adner (2013, *supra*) or Iansiti and Levien (2004, *supra*) on the role of an orchestrator driving the coordination needed to support and sustain an ecosystem. The reason for this difference is, we believe, that healthcare changes require systemic, economy-wide innovation (see Teece, 1996, *supra*).

⁵² See Jacobides, Brusoni & Candelon, 2021, *supra*.

⁵³ Such efforts may originate from business before obtaining governmental support. One interesting example is Gaia-X, which is a “project for the development of an efficient and competitive, secure and trustworthy federation of data infrastructure and service providers for Europe.” This initiative originated from a group of industry players in Germany, obtained French support, and has quickly become a European initiative that has received strong support and commitment from the EU leadership. It also has the potential to have an impact in healthcare. See <https://www.data-infrastructure.eu/> and www.gaia-x.eu

⁵⁴ See Furman, J., Coyle, D., Fletcher, A., McAuley, D., Marsden, P. *Unlocking digital competition: Report of the digital competition expert panel*. Report prepared for the Government of the United Kingdom, March 2019; Crémer, J., de Montjoye, Y.A., Schweitzer, H. *Competition policy for the digital era*. Report for the European Commission. April 201. House Committee Report (2020), *supra* Jacobides, M.G., Lianos, I. (2021), *supra*.

can connect care pathways and exchange data in an interoperable way—rather than the “winner takes all” model typically associated with multi-sided platforms. Health data platforms should be considered critical infrastructure—just like physical infrastructure such as hospitals, labs, and clinics. We have made great strides in other areas, such as financial services data—and, through initiatives such as the Payment Services Directive, made platforms open, interoperable, and freely accessible.⁵⁵ Now we should do the same for healthcare.

To ensure that this infrastructure is put to work, we must also push to build the skills and incentives to collaborate and share clinical resources and data. During the pandemic, hospitals have been forced to work together, sharing medical records and freeing up beds. From the Netherlands to New York state, red tape has been cut to allow data sharing and greater coordination. This should facilitate the adoption of healthcare platforms and ecosystems and show the way forward to shared data. We should leverage the current regulatory flexibility as we move into a data-enabled, platform-mediated, ecosystem-driven future. There are some encouraging signs already: The Centers for Medicare & Medicaid Services (CMS) have made solid progress in enabling new forms of reimbursement (e.g. Medicare Advantage) and transitioning to more value-based models. There is growing flexibility from changing telehealth reimbursement, allowing the FDA to accelerate the approval of diagnostics. Changes in regulation and incentives (reimbursement) could accelerate new business models and pave the way for new entrants that can leverage digital technologies and multi-sided platforms.

Policy will play a key role here. Data privacy and HIPAA regulation have historically supported data silos, rather than data access. The public health crisis has rebalanced the perception of risks vs. benefits, and the pandemic may further accelerate changes to ensure that data privacy laws do not stand in the way of innovative tech-enabled healthcare. Regulatory initiatives on data access and interoperability (e.g. the U.S. ONC’s final rule, CMS Interoperability and Patient Access) will be critical in enabling the growth of healthcare platforms and ecosystems, by forcing IT providers to open up access to data. Our goal should be a healthcare delivery system where information flows seamlessly and securely across platforms and their associated ecosystems to support coordinated patient pathways and reward its participants based on outcomes.

Industry actors understand that no single company can “do it all,” and that companies need to partner around shared goals, for instance the quadruple aim of better health outcomes, a more seamless patient experience, more efficient care with a better provider experience, and shared infrastructure (secure, open data platforms). Regulators should also consider the risks of inaction, which will reinforce the inherent advantages of scale and scope, and simply lead to greater exclusion and more wasted opportunities for inclusive population health. To ensure that platforms and ecosystems do not devolve into narrow B2C setups, where firms seek scale and easy monetization, we’ll need to push towards *open data access, supported by interoperability and security/ privacy standards*. Interoperable, federated, and secure data platforms are the basis for the high-impact and scalable use of digital technologies (virtual care at scale, AI-enabled clinical and operational services, health informatics, etc). Moreover, they will fuel innovation and research. To overcome data fragmentation, we will need a full-ecosystem approach to achieve an open and vendor-neutral approach to digital networks. Modern

⁵⁵ See, e.g., https://ec.europa.eu/info/law/payment-services-psd-2-directive-eu-2015-2366_en and <https://www.pymnts.com/news/international/europe/2020/eu-wants-psd2-like-reqs-for-big-tech-data/>

standards like FHIR (Fast Healthcare Interoperability Resources) can pave the way, but require full extendibility to achieve the semantical interoperability that will encourage the necessary insights and collaboration between ecosystem players.

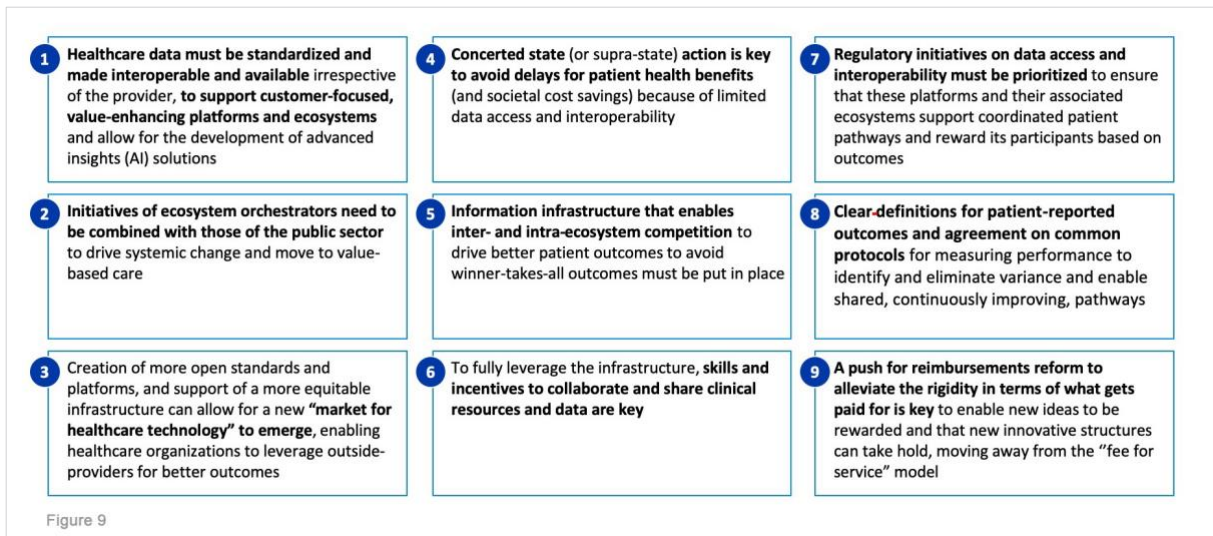
When true access and interoperability is achieved, the healthcare world will be able to collect, contextualize, cleanse, annotate, analyze, and exchange data and insights. This will empower consumers, patients, care providers, and payors to make timely and informed decisions, and automate and scale up high-quality care. It will also allow us to leverage the massive opportunity of AI in healthcare. Deep (machine) learning relies on large, well-annotated datasets. Only open standards and platforms will yield datasets that are large enough to build reliable predictive algorithms. Efforts to do so are already under way—and we should encourage them. The Gaia-X initiative in Europe suggests an interesting joint government/industry approach to this problem with a focus on federated data, data portability, interoperability and semantic harmonization.⁵⁶

Another requirement is for *clearly defined outcomes and measurement standards to drive toward better outcomes*. We will need to create clear definitions for patient-reported outcomes and agree common protocols for measuring performance to identify and eliminate variance and enable shared, continuously improving, pathways. ICHOM is an example of an industry organization that aims “to define global standard sets of outcome measures that matter most to patients and driving adoption and reporting of these measures worldwide to create better value for all stakeholders.” (www.ichom.org). Pre-competitive agreements between all healthcare stakeholders will help to enable the automatic capture of outcome data from multiple sources, whilst also boosting data-sharing among systems. This will allow differentiated reimbursement according to quality to be administered with consistency and transparency.

Finally, to support dynamic ecosystems, where new ideas are rewarded and new structures can take hold, we need to push for reimbursements reform. Rigidity in terms of what gets paid for is one of the most significant barriers to value-based care—and to the kind of innovation that can flow from transformative new platforms. As we have seen, ease of monetization has critically constrained ecosystems and platforms to date. Thus, we need to move away from the “fee for service” model that providers, clinicians, and payors have come to rely on. Given the unmet potential, and the pressing need to make healthcare more sustainable, we must seek out and experiment with innovative payments that share the risk and align incentives across care pathways and providers to jointly achieve better outcomes. Health insurance providers and government payors have a major role to play in expanding value-based care from pilot projects into an operational model that can scale. Figure 9 summarizes our bold proposed change agenda which can unleash the power of digital platforms and ecosystems.

⁵⁶ See, e.g., <https://www.data-infrastructure.eu/GAIAX/Redaktion/EN/Artikel/UseCases/framework-of-medical-records-in-europe.html>

What should be done to unleash the power of ecosystems and transform healthcare?



This may seem like a tall order—and in truth, it probably is. Yet, at the same time, we have seen how the current global healthcare emergency has changed the behavior of regulators, government, hospitals, suppliers, and healthcare providers almost overnight. As the COVID crisis exposes flaws and weaknesses in the healthcare system, so institutions have had to change the ways they operate, regulate, and reimburse. We are seeing unprecedented flexibility and cooperation to meet urgent needs, and while some changes will be temporary, many will stick, as they have proven that better outcomes and efficiencies are possible. We need to leverage the same sense of urgency that allowed us, within just a few weeks, to come up with changes in regulation that transformed virtual care (telehealth) from a secondary point solution into a critical enabler of frontline primary care. Now, our priorities must be to open up health data and build the infrastructure for open, interoperable, competitive ecosystems that are genuinely focused on patients and their caregivers. It’s no exaggeration to say that the future of healthcare depends on it.

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