First Steps, Far to Go:
The Promises and Pitfalls of Platforms and Digital Ecosystems in Healthcare

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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 cost 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.

Sett COVID-19: A Tragedy and an Opportunity

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 by rethinking how we do business, and even how we organize society. At the same time, however, it has highlighted the vulnerabilities of healthcare systems around the world, revealing them as antiquated, fragmented structures. Avoidable mistakes have been made, and lives have sadly been lost, because we could not track the spread of COVID or share valuable insights with each other—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 manage COVID care pathways, monitor high-risk patients at home, support regular care without infection risk, and support large-scale clinical trials 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. 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 we were building healthcare from scratch, we would surely design it differently, but 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 urgently need to rethink digital connections and the way we coordinate healthcare. But what can we expect from digital platforms and ecosystems? 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, or will it be the realm of MedTech? Which parts of the healthcare sector are renewing themselves with digital, and which remain stagnant? Also, why do we see such great progress in China, while countries in Europe and the US lag behind? What should be the priorities in terms of policy? And finally, beyond the specifics of healthcare, what can this sector teaches us about digital platforms and ecosystems?

We start by articulating some key principles that underpin digital platforms and ecosystems. We provide a brief typology showing what they do, how they work, and when (and why) they are local vs. global. We then look at the developments in healthcare platforms to date, both successes and failures, and ask 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.

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

Understanding Platforms and Ecosystems

The last few years have seen a mushrooming of the literature on platforms,[2] 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 ecosystems and platforms, 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 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 IBM Watson to its analysts. [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. While both platforms and ecosystems *can* exist without the other, the two tend to be interrelated.[5] And in healthcare, as in many other settings, the best way to understand platforms is to look at the ecosystems that drive them.

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, we have *multi-product* and *multi-actor* ecosystems.[6] Big Tech firms combine complementary products to deliver a seamless suite of services to the customer—like Google's search, maps, email, video (via YouTube), and potentially health (via FitBit, if the deal goes through). These are *multi-product* ecosystems, and they are all aimed at strengthening the value proposition and locking in the customer. Then we have *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

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

[3] Adner R. 2013. *The Wide Lens: What Successful Innovators See that Others Miss*. Penguin Random House. Jacobides MG, Cennamo C, Gawer A. 2018. Towards a theory of ecosystems. Strategic Management Journal **39:** 2255-2276. Jacobides M, Sundararajan A, Van Alstyne M. 2019. *Platforms and Ecosystems: Enabling the Digital Economy*, World Economic Forum White Paper 1-32. Jacobides MG, 2019, In the ecosystem economy, what's your strategy? *Harvard Business Review*, September-October.

[4] "Platform" is also used to denote common designs used in manufacturing, like a common chassis for car production; we steer clear of this engineering usage. See Ulrich K. 1995. The role of product architecture in the manufacturing firm. *Research Policy* **24**(3): 419-440.

[5] Jacobides MG, Cennamo C, Gawer A. 2020, *Distinguishing between Platforms and Ecosystems:Complementarities, Value Creation, and Coordination Mechanisms* Working Paper (Under Review)

[6] See Jacobides, Gawer & Cennamo, 2020, ibid, for details.

vertical integration or drawing on a supply chain, and they refer to the collaboration of different players to address a shared goal.[7]
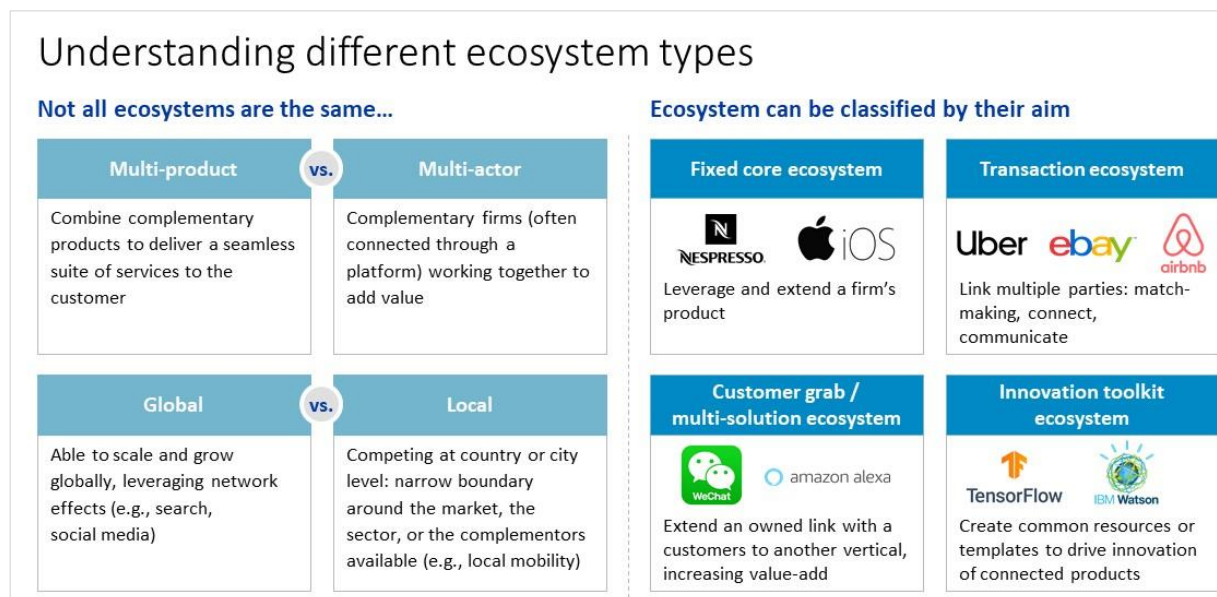
We can distinguish digital ecosystems further in terms of their aim. Some, like Uber, are based on *transaction-based ecosystems* that link multiple parties (for example, passengers and drivers). Beyond such "match-making," they may also allow the parties to connect and communicate. Others are *fixed-core* ecosystems. These start with firms who want to leverage and extend a product—like Nespresso capsules, which have been leveraged with a ecosystem of makers of compatible coffee machines.

Some ecosystems are focused on "customer grab." They try to extend an owned link with a 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.[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.

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

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[7] See Jacobides, Cennamo & Gawer, 2018, ibid; or, Fuller J, Jacobides MG, Reeves M, 2019. The myths and realities of business ecosystems, Sloan Management Review Digital Article, February.

[8] 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 Thaler, Richard H (2015) *Misbehaving: The Making of Behavioral Economics*, New York: WW Norton. For a broader issue of the exploitation of such tendencies, see the Stigler report in the US, in Scott Morton F, Bouvier P, Ezrachi A, Jullien A, Katz R, Kimmelman G, Melamed AD, Morgenstern J. 2019. Committee for the Study of Digital Platforms, Market Structure and Antitrust Subcommittee, Stigler Center for the Study of the Economy and the State.
https://www.judiciary.senate.gov/imo/media/doc/market-structure-report%20-15-may-2019.pdf

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, 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.[9] 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 the chance to capture the customer, which may turn them into gatekeepers who can then wield inordinate, potentially anticompetitive might.[10]

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 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, and 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. It has built 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.

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 payment of bills. It has achieved this by using a customer grab strategy and leveraging its platforms. More than 1 billion people are active users of Tencent's WeChat mobile app, which allows users to send messages, make

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

[10] See, e.g., Jacobides, M.G. 2020, *What Drives and Defines Digital Platform Power? A framework, and why Apple's strategic success should stop resting on competitive dominance*, Working Paper, LBS/EvolutionLtd.

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 that offer solutions in domains such as precision skincare, precision nutrition, precision health, and precision medicine.[11]

Beyond these two well-known giants, MedTech upstart Chunyu Yisheng assists with diagnosis, linking nearly 290,000,000 patients with practitioners (doctors and hospitals) for web-enabled diagnosis of ailments, but 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.[12] On a smaller scale, AliHealth, AliBaba's 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 claims to be approaching 100M users in the USA, and 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. Some guidance is obtained on the web, and used in the context of their phone or computer, and guidance and matching is provided on top.

Some of the more tech-enabled insurance companies are expanding their reach as they aim to add more value while also customers in. Kaiser Permanente offers services including a match-making platform for its 12M+ customers, while United Healthcare provides a more limited set of digitally enabled offerings, such as telemedicine, patient records, and e-prescription. More platforms are emerging in Europe, albeit in a more limited way. France's Doctolib started as a scheduling service for health practitioners, and then moved into telemedicine (and more cautiously into a matching platform), and there are a number of other, smaller and more fragmented efforts happening across the globe.[13]

Creating a different type of platform, Teladoc Health (the largest telemedicine company in the US) has just merged with Livongo (a leading provider of software tools and data-based coaching programs to manage conditions such as diabetes), in a $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 telemedicine. The two businesses are expected to complement each other, with Livongo's platform offering a way to keep patients engaged in between telehealth visits. Such examples show how new combinations can create value for customers by creating an

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

[12] See https://www.whatsonweibo.com/good-doctor-digital-hospitals-how-mobile-apps-are-alleviating-chinas-healthcare-problems/

[13] See Roland Berger, 2019, ibid.

integrated service offering where a "fixed core" provides the basis for partners to leverage each other's assets.

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, 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.[14]

Overall, platforms and ecosystems are making inroads into healthcare. The hope is that they will help patients and reduce waste—yet, as we will see, 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."[15] But if expectations are so high, why haven't we seen *more* activity?

What hasn't happened—and why healthcare is different

Let's cast a critical eye over the developments in healthcare. Right away, it's clear that they are concentrated in those areas where monetization is straightforward—that is, 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 help match-making between supply and demand. Here, profits are usually generated from commissions paid by professionals or hospitals for their listings—just like any other online directory. We also see that many of the winners already had a "core" that they wanted to expand, or a "captive audience" to whom they can provide an healthcare offering. And, true to the spirit of multi-product ecosystems, the aim

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[14] See e.g., Yoo, J, 2020, at https://a16z.com/2020/08/07/healthcare-technology-great-unlock/

[15] 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, 2019, ibid.

is to keep the customer locked in, using a platform (or a platform-plus-technology combination) as the key.

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 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 naïve attempts to disrupt this fiendishly complex industry have led to some very visible failures. Two examples were Microsoft HealthVault and Google Health: two competing propositions for providing individuals with the ability to 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 (EMR). 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.

Why healthcare is different

Intrinsic challenges holding digital healthcare platforms and ecosystems from scaling

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

So, what distinguishes these failures from the successes we 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 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 you have an in-house information trove that is easy for you to use internally, but hard for others to replicate externally. To that, we 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.

Looking beyond match-making, we can also see that healthcare platforms have tended to focus on certain relatively simple "B2C" activities—as opposed to the more consequential, but also idiosyncratic challenges that emerge from combining medical information to improve patient care. EMRs provide only a limited and partial view of a person's health, having originally been designed for the purpose of insurance reimbursement. Before EMR data can be meaningfully leveraged for health optimization, it must be complemented by other in-hospital and patient-generated data sources. In order to create value for users, both HealthVault and Google Health needed to engage with the healthcare community, including the doctors, hospitals, pharmacists and other stakeholders who ultimately hold the data. 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 the effort of actively managing a web-based medical record.

80% professionals have shared patient info electronically...

...but only **32%** outside own organization

Philips Future Health Index 2019. Survey of 15,000 individuals and more than 3,100 healthcare professionals in 15 countries.
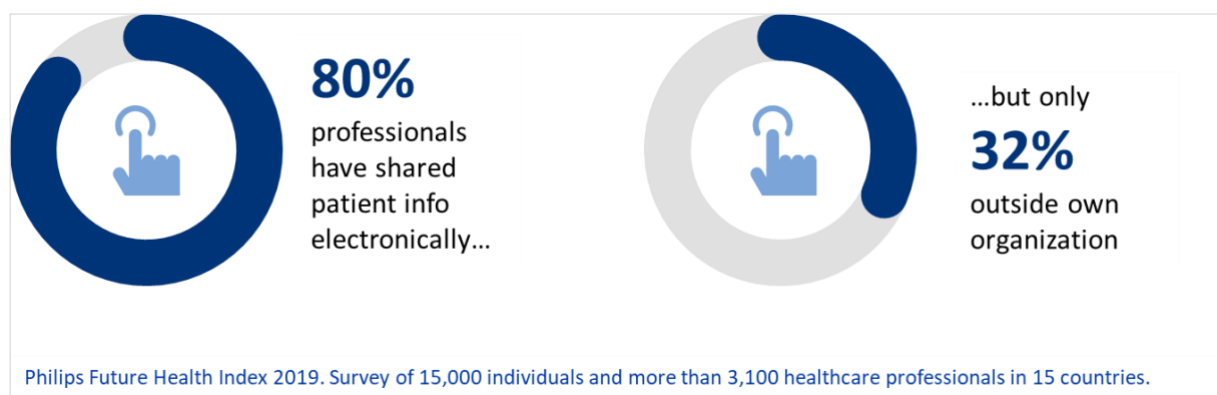
Healthcare's complex industry structure also played a part in the demise of HealthVault and Google Health. In other sectors, marketing professionals are used to interacting with consumers who have control or significant influence over a purchasing decision. But healthcare's multilayered decision-making process poses major challenges to scaling

consumer-centric business models in digital health. 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. This reality requires an aspiring digital healthcare platform to be able to reach deeply into the medical community. The failure of HealthVault and Google Health demonstrates the challenges of achieving scale, and the need to navigate multiple stakeholder communities and potentially conflicting incentive systems.

Overall, we shouldn't be surprised at the limited inroads made by cloud-based digital solutions in healthcare. 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 larger organizations like Kaiser Permanente and United Healthcare, and even in China, these innovations happen within the confines of mega-ecosystems who can manage patient data.

Sharing information outside the "walled garden" of an institution can be a challenge. According to research conducted by Philips,[16] 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.

Contrast that with China, where 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.[17] This is why China's giant e-commerce platforms—like Alibaba, Tencent, and Ping An—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 practice, however, they face a stricter regulatory

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

[17] 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).

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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 aims at leveraging technology to change patients' experience, lower costs, and improve outcomes. Another example is Apple's launch of health clinics (AC Wellness) dedicated to serving its employees in Santa Clara with technology-enabled high-quality care and experiences.[18] And, rather than focus on the core of healthcare, Big Tech firms like Google redeploy their analytics capabilities (through their spinoff Verily) working on the analytics of trial and drug development alongside with pharma giants such as Novartis and Pfizer.

As we have seen, the intrinsic nature of the healthcare sector has made achieving scale a significant challenge for digital platforms. However, these initiatives from Apple and Amazon suggest a new push to break through the scale barrier with a digital platform for providers that goes beyond the existing EMR offerings. The opportunities are there, even if the landscape is rugged. What may make a difference is the sense of urgency- such as COVID-19 has ushered in.

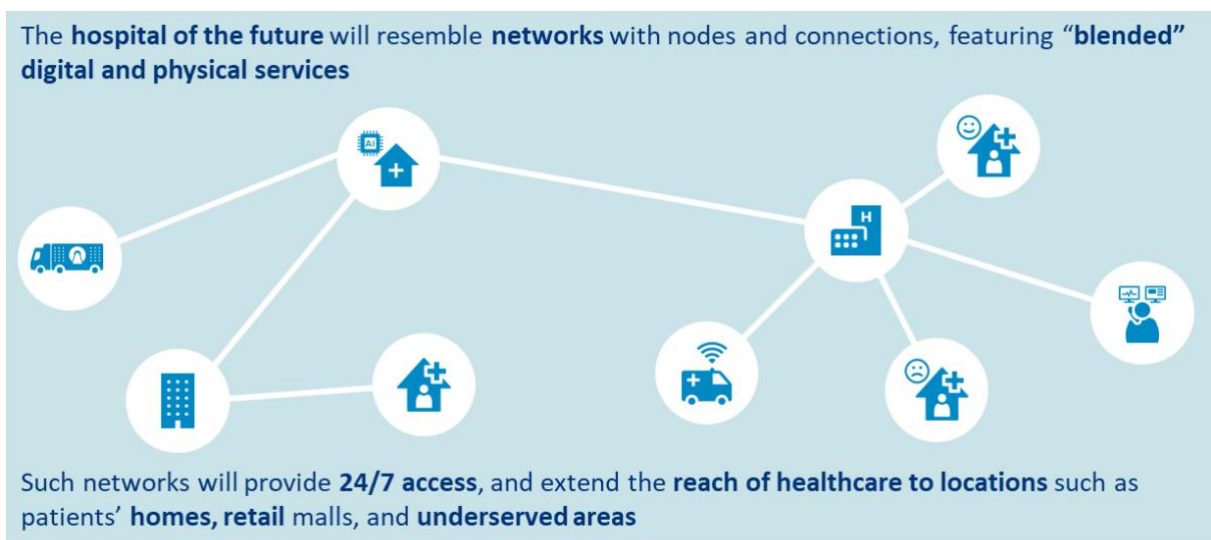# COVID-19 and the Hospital of the Future

The COVID-19 pandemic has undoubtedly become a catalyst for change, and a defining moment to reimagine healthcare the way it *should* be. In particular, the inefficiencies that arise 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, and protocols 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 other partners to support the dynamic referral flow of patients across different hospitals throughout the Netherlands, in order to optimize the use of intensive care units (ICUs).

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[18] Venture capital investment investments demonstrate the investors' concerns with the ability of tackling systemic issues, and as such focus on discrete aspects of the patient journey, rather than an integrated approach. VC investments in health tech have reached 14.7 billion in 2019. (Pitchbook 2019)

By building a national online portal 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.

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.

The **hospital of the future** will 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**

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.

Another pertinent example is Integrated Delivery Networks (IDNs) in the U.S. These holistic networks work with labs, clinics, primary care practices, and other providers to keep communities healthy and leverage the principles of value-based care to measure performance.

Kaiser Permanente, the largest nonprofit health system in the U.S., is often regarded as the gold standard for value-based care models because of its strong emphasis on prevention. This model is made possible by the tight ecosystem-like integration of its various clinical services (clinics, hospitals, laboratories, pharmacies etc), and the ability to track the success of its outcome-based business model by leveraging data and analytics end to end across partner organizations.

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.

Leveraging Platforms and Digital Ecosystems to Rethink Healthcare

Although digital technologies are making great strides, institutional factors limiting their ability to help improve patient outcomes. Clearly, then, we need some bold policy choices to unleash the latent potential of the healthcare sector. We cannot afford to wait: all stakeholders agree that global health systems are near breaking point. The ageing population and increasing incidence of chronic disease, alongside innovative technologies and powerful new drugs, have led to an unsustainable cost explosion. The COVID-19 pandemic has only made it even more urgent to redesign the healthcare delivery model to design a more patient-centric and productive healthcare system. In this journey, we must fulfill the potential of digital platforms and ecosystems, as we focus on the dual objective of better patient outcomes and better resource use.

Our guiding principle should be *value-based healthcare*, which focuses on outcomes versus cost to deliver.[19] 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, payers, suppliers, and society as a whole. This approach contrasts with the existing "fee for service" model, where the payment is based on the amount of care delivered, regardless of whether a diagnosis or procedure is successful. Furthermore, the "fee for service" model has not only led to benefits being unevenly distributed but has also created a legacy of highly complex administrative systems. Of the roughly 2,000 metrics that guide such systems, only 7% are related to outcomes and a mere 2% are patient-reported.[20]

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[19] See Porter M.E., Olmsted Teisberg, E, 2006. *Redefining Healthcare: Creating Value Based Competition on Results*, Boston: Harvard Business School Press.
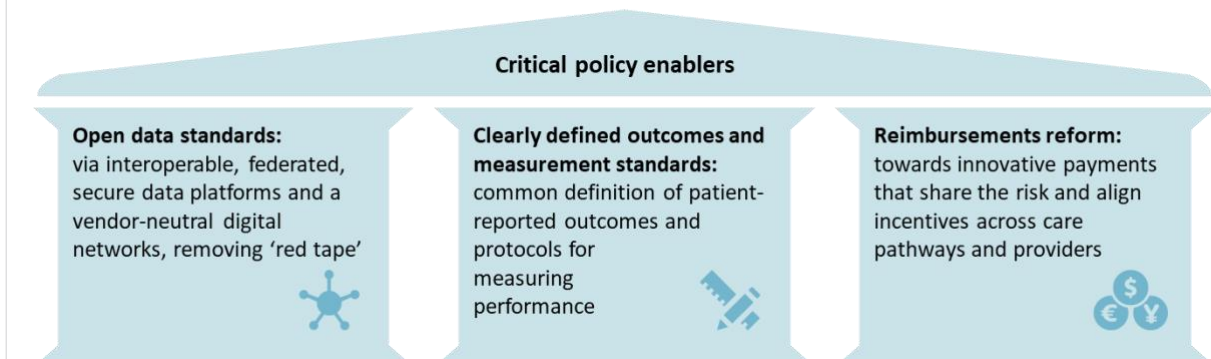
[20] World Economic Forum, 2017. *Value in Healthcare: Laying the Foundation for Health System Transformation* Insight Report (in collaboration with BCG), April.

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

Creating a responsive, flexible healthcare system based on value-based care, focusing on outcomes versus costs ...

...via **Ecosystems of federated multi-sided platform** enabling:
- Standardized, clearly defined measurements for outcomes
- The ability to capture and process data from multiple sources

Critical policy enablers

Open data standards: via interoperable, federated, secure data platforms and a vendor-neutral digital networks, removing 'red tape'

Clearly defined outcomes and measurement standards: common definition of patient-reported outcomes and protocols for measuring performance

Reimbursements reform: towards innovative payments that share the risk and align incentives across care pathways and providers

The "value" in value-based healthcare is derived from measuring health outcomes against the cost of delivering those outcomes. 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. 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 economies. It depends on 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. Core hospital systems such as Electronic Medical Records (EMR) are estimated to contain less than 40% of the patient's data, with specialized data formats such as images or lab information stored on dedicated systems. Equally, much healthcare data is often stored in unstructured forms, such as text-based doctor's notes, diagnostic reports and images, which limits its use in systems or digital workflows with advanced analytics. In order to support customer-focused and value-enhancing platforms and ecosystems, we must ensure that healthcare information becomes standardized, and is available irrespective of the provider.

Of course, we may 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 risks creating a world where large firms, building on their customer data or existing "walled gardens," will employ their own technologies to build closed, exclusive, or proprietary ecosystems. 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.

These arguments suggest that a lack of concerted action may not only delay patient health benefits (and societal cost savings); it 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.

Competition within and between ecosystems is becoming a hot topic.[21] In the healthcare arena, we should reflect on how to best create the information infrastructure that will enable inter- and intra-ecosystem competition, as well as patient outcomes. Our view is that value-based health delivery networks will need to rely on an ecosystem of federated platforms that can connect and exchange data in an interoperable way—rather than the "winner takes all" model typically associated with multi-sided platform. 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.[22] 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 resources. Hospitals have been forced to work together, sharing medical records and making beds available. In examples that range from the Netherlands to the state of New York, 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 platforms. 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 firms 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. 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) can be

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[21] See Stigler report, Scott Morton et al (2019), ibid for the US; Furman report (2019) for the UK, at Furman J, Coyle D, Fletcher A, McAuley D, Marsden P. 2019 Unlocking digital competition: Report of the digital competition expert panel. Report prepared for the Government of the United Kingdom, March; Cremer et al report (2019) for the EU at Crémer J, de Montjoye YA, Schweitzer H. 2019. Competition policy for the digital era. Report for the European Commission. April. Also, note the ongoing discussions around the Digital Services Act in the EU or the House Committee Report (2020) in the US.

[22] 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-regs-for-big-tech-data/

critical in enabling the growth of healthcare platforms and ecosystems. The goal we should aim for is 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 and shared infrastructure (secure, open data platforms). Regulators should also consider the risks of inaction, which will increase the inherent advantages of scale and scope and simply lead to greater exclusion and more wasted opportunities. 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 standards.* Interoperable, federated, and secure data platforms are the basis for 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. The challenge in healthcare is complex with a lack of interoperability, fragmented data models and ontologies. To overcome it, we will need a full-ecosystem approach to achieve an open and vendor-neutral approach to digital networks. Modern standards like FHIR (Fast Healthcare Interoperability Resources) can pave the way, but require full extendibility to achieve the semantical interoperability to create the necessary insights and collaboration.

Such an approach will build the foundation to collect, contextualize, cleanse, annotate, analyze, and exchange data and insights. This will empower consumers, patients, care providers, and payers 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, structured, and well-annotated datasets—but much healthcare data is still locked away in silos. 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. For example, the Gaia-X initiative in Europe suggests an interesting joint government/industry approach to this problem (focus on federated data, data portability, interoperability, semantic harmonization, etc).[23]

We will also need to work on *clearly defined outcomes and measurement standards*. We will need clear definitions for patient-reported outcomes and agree common protocols for measuring performance to identify and eliminate variance and enable shared 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". 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

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

flow from system-busting new platforms. As we saw, 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 payers 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. Health insurance providers and government payers have a major role to play in expanding value-based care from pilot projects into an operational model that can scale.

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 medical 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 the future of healthcare depends on it.

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