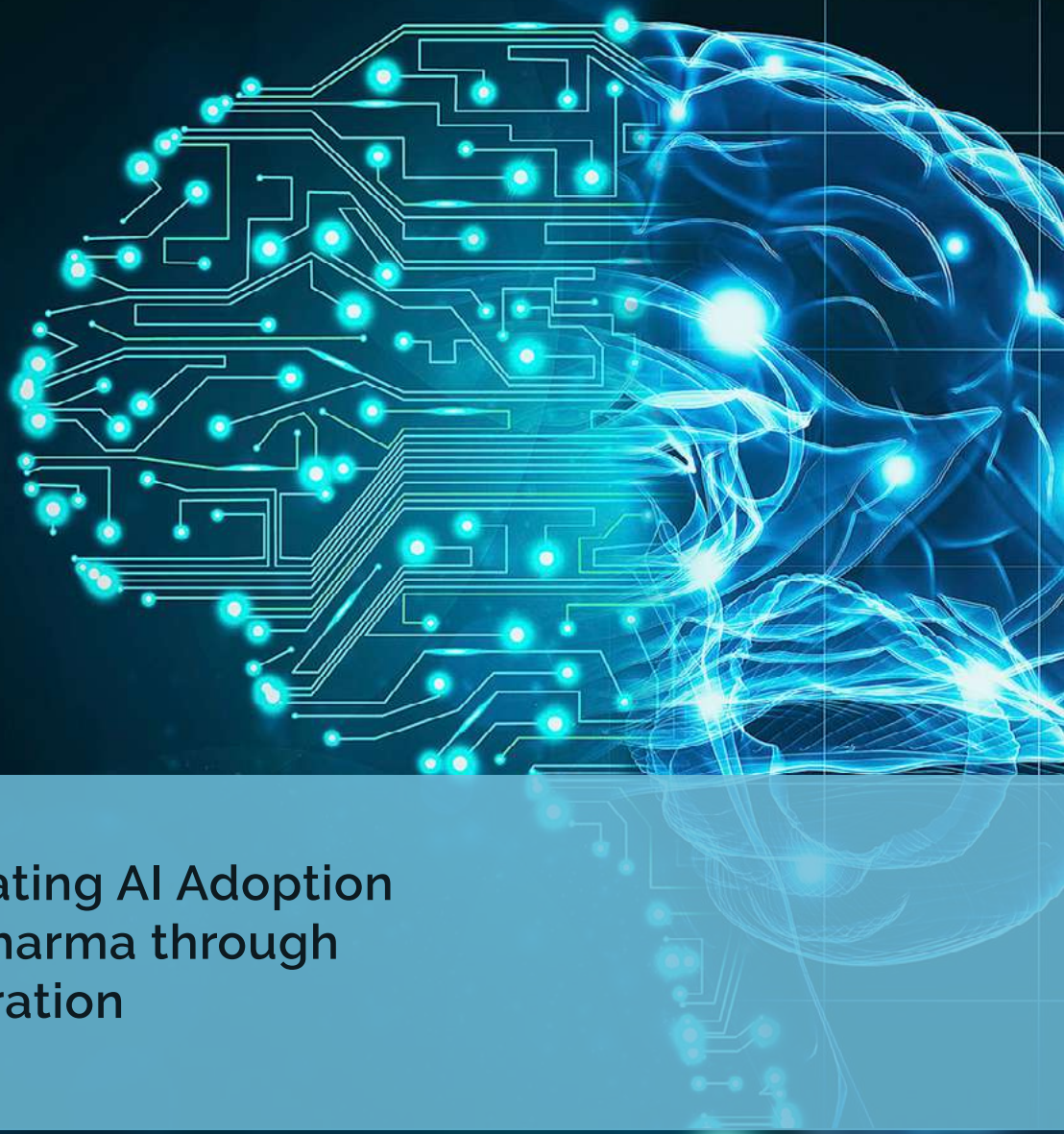


White Paper



Accelerating AI Adoption
in Bio-Pharma through
Collaboration

WHITE PAPER: Accelerating AI adoption in bio-pharma through collaboration

AUTHORS

Chengyi Lin, PhD

Affiliate Professor of Strategy, INSEAD

Jean-Michel Moslonka

CEO, Agalio

Bertille Le Bihan

Senior Associate - Healthtech Lead, Early Metrics

Anaïs Masetti

Senior Communications Officer, Early Metrics

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ABOUT THE CO-AUTHORS



Chengyi Lin, PhD

Chengyi Lin is Affiliate Professor of Strategy at INSEAD and a leading expert on digital transformation. His research and teaching primarily focus on digital transformation and innovations, strategic impacts of technologies, and drivers for successful digital execution. Professor Lin serves as board member and consultant for many multi-nationals, and mentors for startups. He is also the youngest standing member of the European Executive Council.

His past experiences include management consulting at Bain & Company, where he served as an expert advisor in the healthcare practice and led the development of thought leadership for corporate and R&D strategy in the pharmaceutical and biotech industries.

To learn more about Professor Lin [visit his Faculty Profile](#) or reach out at: chengyi.lin@insead.edu



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ABOUT THE CO-AUTHORS



Early Metrics is an international leader in startup ratings and emerging technology research, empowering decision-makers from funds and corporates to succeed in their innovation initiatives.

For further information,
head to earlymetrics.com



Or reach out to Pierre-Louis Martinie,
VP Sales & Marketing:
pierre-louis@earlymetrics.com



Agalio is a team of experienced marketing, sales and strategy consultants with strong backgrounds in the Pharmaceutical, FMCG and B2B industry sectors.

For further information,
head to agalio.com



Or reach out to Jean-Michel Moslonka,
Founding Partner and CEO:
jm.moslonka@agalio.com

EXECUTIVE SUMMARY

Beyond being the “flavour of the year”, Artificial Intelligence (AI) has started to generate real impact in the healthcare system in the past years. We see efforts in exploration and experimentation on multiple use cases of AI in health, ranging from machine learning (ML) aided compound screening and modification, to ML-based patient identification in clinical trials, from image recognition in diagnostics, to gene-sequencing based personalised treatment, from AI-enabled financial budgeting, to “recommender” for field medical representatives, and many more.

Equally excitingly, we see the participation of various players in the ecosystem including medical research institutions, pharmaceutical and biotech companies, medical device manufacturers, hospitals, insurance providers, digital health startups and public entities. Beyond the healthcare ecosystem, we also observe increasing interest from technology giants such as Microsoft, Google, and Amazon.

In this white paper, we aimed at developing a deeper understanding of AI adoption in healthcare, particularly in the European context. More specifically, we are interested in four main topics:

1. **How are the speed and scale of AI adoption in healthcare compared to other industries?** Are the speed and scale similar across major economies such as the US, China and Europe? And more importantly, what are the reasons behind the differences?
2. **At the company level, what are the areas of focus for AI use cases in pharmaceutical companies?** How do companies approach AI exploration and experimentation? What are the opportunities and challenges for businesses to further accelerate AI adoption?
3. **Strategically, how do pharma businesses consider building internal AI capabilities versus partnering with startups?** What are the best practices for collaboration and what are the main challenges?
4. **Finally, beyond pharma, how do various players in the healthcare ecosystem view the adoption of AI?** What could be their roles in the future of AI adoption?

To answer these questions, we conducted in-depth interviews with European executives from ten major pharmaceutical companies as well as four startup founders. The results of the interviews were used in two ways to develop this white paper. First, we synthesised the various points of view and presented the consensus and major trends. We also highlighted where they differ. Second, we directly used examples from the companies and quotes from the executives to illustrate our findings.

These interviews are very informative and insightful in helping us formulate the following main findings. Many also offered actionable recommendations to accelerate AI adoption in the future.

- Though without consensus, **the majority of European executives agreed that AI adoption in health is slower than other sectors.** In addition, European healthcare consumers, businesses and entities are also more cautious when it comes to digital transformation including AI, compared to their counterparts in the US and China.
- **Data privacy and security concerns may be the most openly quoted reasons for slow and cautious AI adoption.** Further analysis reviewed that the deeper reasons lie in the availability, quality and accessibility of data in the ecosystem and in the openness to share and use data.
- AI is an additional tool to bio-pharma businesses. However, **leveraging AI and building the right capabilities could present a strategic opportunity for a new competitive advantage.** Companies therefore pursue a mixed mode to AI exploration and experimentation. Collaborating with AI or digital health startups will provide speed and technology know-how, but some AI startups may lack sufficient knowledge about the healthcare industry and others may face challenges when scaling up. Partnering with technology giants is a viable alternative, however it could be expensive and less differentiated. Then, building internal data analytics and AI capabilities could be beneficial in the long-term yet challenging to jump-start in the short-term. The last option is to acquire startups, while the challenge of integration needs to be considered carefully. We observe companies use a combination of these methods to balance the short-term needs to experiment and the long-term goal to build strategic capabilities.
- **To accelerate AI adoption, the key is to unlock data.** Both pharmaceutical executives and entrepreneurs agreed that we need to encourage better collaborations in the ecosystem to unlock the potential of healthcare data. For public entities, regulatory frameworks need to be in place to govern the collection and usage of data. For pharmaceutical companies, a more experimental mindset and simplified processes could help explore new use cases for AI and uncover the benefits for patients. For healthcare providers, collecting high-quality data and sharing that data in a secured and responsible fashion could help build a more comprehensive resource for the entire ecosystem. And for startups, developing a deep understanding of the healthcare sector, acquiring

patient capital and working collaboratively with the various players would be key to their success. Altogether, AI cannot be done by the will and power of a single player. It will require an open and sharing approach, a more collaborative way of working, breaking the silos and reorienting towards the ultimate goal of improving patient outcome.

- Finally, **AI adoption may be but one aspect of a bigger and broader digital transformation coming to healthcare.** COVID-19 exposed many challenges that the healthcare system is facing. The solutions to these challenges may require some re-thinking about new technologies and more importantly new business models.

Throughout our research for this white paper, we continue to be inspired by a common trait of the interviewees across bio-pharma executives and health startups: **driven by purpose**. We are also encouraged by their thoughtfulness, open-mindedness and data-driven approach.

Combining the laser focus on serving patients and improving health outcomes, with the huge potential AI and other new technologies could provide, we are confident that stakeholders of the healthcare space will join forces and pave a new path forward into a technology-powered future of health!

Introduction: The potential behind the buzzword

Artificial intelligence (AI) might be the buzzword of the moment, but it is not a new topic. Since the 1950's, computer scientists have set up an ambitious goal to make a "thinking machine" that can see, hear and think like a human mind. AI has been an intriguing topic in and out of public eyes, passing through booms and winters of interest in the past five decades.

Recent advancements put AI back under the spotlight: Google's DeepMind AlphaGO beat the world champion Lee Se-dol, a new deep learning algorithm was able to recognise cats in videos, and consumers started to "chat" with Siri and other virtual assistants. Abundance of digital data, both structured and unstructured, combined with powerful and accessible computing capacity fuelled the advancement and democratisation of AI. From this emerged a series of exciting AI applications in business settings, including stock performance forecasting, commodity pricing prediction, insurance underwriting, social media analytics, predictive maintenance, and many more.

Among these fields of application, the use of this technology in health and pharmaceuticals undeniably holds great promise. AI-enabled medical image recognition, for instance, has progressed in leaps and bounds. Indeed, large pharma companies, tech giants and young startups have jumped on this new opportunity to develop machine learning (ML) algorithms able to diagnose various disease types, such as solid tumour and brain lesion. These algorithms can rely on various image sources including radiology, histology and functional magnetic resonance imaging (fMRI).

Very quickly, initial scepticism turned into optimism as they generated encouraging results. For example, IBEX Medical Analytics, an Israeli HealthTech startup, achieves high accuracy in certain cancer diagnostics. As a result, the company is moving its AI-powered digital diagnostics from second to first-line.

Increasingly, new ML systems are developed and new applications experimented. In fact, many R&D teams are exploring the use of ML for early target selection, patient identification, and clinical trial redesign. Beyond this, ML technology is starting to be tested in a wide variety of settings: in medical and commercial, in regulation and compliance as well as in preventative health and wellness.

Encouragingly, we now see from both healthcare incumbents and digital startups joining the development effort. Many large groups have ramped up their digital innovation initiatives, with Novartis appointing a Global Head of Data Sciences and AI just under two years ago, for instance. Meanwhile, digital health incubators have been set up to help foster the growth of new players in the space, such as EIT Health, Plug And Play European Healthcare accelerator and Tech Care Paris. The European health startup ecosystem is booming, scoring over \$3.6 billion in VC investment in 2019 so six times what was raised in 2015 (Atomico, 2019). Early Metrics data confirm a steady growth of technology startups focusing on health, with digital health now being the third most represented sector in its database of over 3000 startups.

“Digital disruption has not shaken the core of healthcare yet.”



Martin Dubuc
General Manager,
Biogen France

AI adoption: slow but steady?

As exciting as these developments in digital and AI for healthcare are, we couldn't help but wonder how the speed of AI adoption in healthcare compares to other industries such as FMCG, media, and financial services.

Responses from executives in the healthcare system consistently rated digital and AI adoption in healthcare as slow or slower than aforementioned other industries. Our interviewees couldn't reach consensus on how slow the adoption rate is in their field. Depending on the role of the interviewee, assessments vary from “much too slow” to “slow but acceptable”.

When compared to the pioneer sectors of digital transformation of FMCG and media, healthcare seems much slower from both external and internal perspectives. Digital transformation has significantly changed how consumers interact with business in both the FMCG and media sectors through mobile apps, social media and online transactions. To enable these customer-centric transformations, companies have shifted their business model, internal processes, ways of working and even their company culture.

The emergence of e-commerce and digital platforms such as Amazon, Uber, Facebook, Instagram, among others, are testimony to the speed and success of digitalisation in these fields. By contrast, healthcare's own digital transformation may be described as “painfully slow”. Despite the fast growth of its startup ecosystem, Europe has only birthed a handful of healthtech unicorns (startups worth over \$1 billion) of the likes of Benevolent AI and Doctolib.

Healthcare is therefore at least 5 years behind the FMCG sector. Some argue that these two industries are hardly comparable,

especially on the regulatory side as health companies are much more heavily regulated. Moreover, healthtech development requires much more advanced technical and medical expertise. Those are but a few differences between FMCG and the healthcare industries that explain the gap in digital transformation between them.

Therefore, we thought it would make for a fairer comparison to look at the healthcare and the financial services sectors side by side. Both industries are heavily regulated, driven by industry-specific expertise and deal with highly sensitive private data.

We delved deeper into our study and found some interesting results.

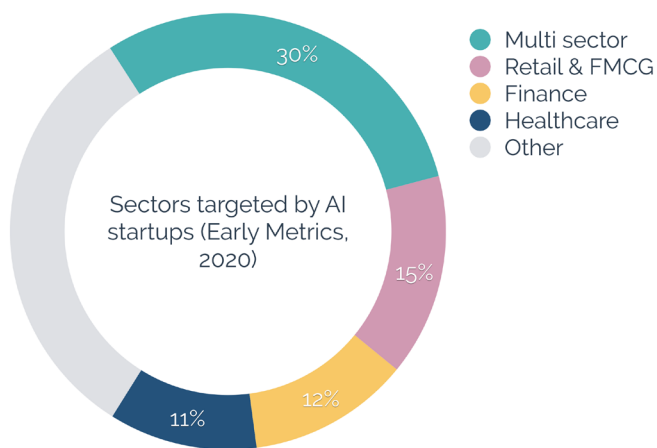


Startups: growing or fleeing?

Startups are a key motor of technological development and change in all industries. Hence, we decided to analyse how well innovative businesses fair in the healthcare space and what hurdles they face in bringing AI to this market.

When we analysed the European startup landscape, we observed that AI businesses had different market targeting strategies. Naturally we found that some of them were created with a single focus on health and kept this strategic position in the mid to long-term. This is the case with Owkin, created in 2016, whose CEO and Founder Thomas Clozel is an hemato-oncologist by training.

Owkin has been very successful in the French and American pharmaceutical and healthcare markets, conducting projects for some of the largest industry players. For instance, the startup led an initiative which allowed to pool several clinical trial data sets originating from ten pharmaceutical companies including Janssen (Johnson & Johnson), AstraZeneca and GSK. By using blockchain systems, Owkin was able to leverage this data while remaining compliant with patient data protection and confidentiality policies.



On the other hand, some AI startups decided from the get-go to operate in multiple sectors at once. For example, we interviewed Quantmetry, established in 2011, which services the healthcare sector but also banking, insurance, manufacturing, energy, services and the public sector.

Early Metrics' research highlights that AI is a fairly prevalent technology among healthcare startups. In a sample of 354 rated healthtech startups, 19.45% of them use some form of artificial intelligence. But when we look at the overall sample of 538 AI startups, we find that only 11% solely focus on healthcare while 30% address multiple sectors, including healthcare.

“To ensure the survival of our company, we had no choice but to focus on the banking and insurance industry, where we found a growing support from investors and clients.”



Nicolas Méric
CEO, Dreamquark

We also uncovered a third case scenario that is perhaps more surprising and concerning: **several innovative newcomers that initially wanted to address the healthcare market, had to pivot and target other industries to survive.** That is what happened to Dreamquark founded by Nicolas Méric, PhD in Particle Physics, in 2014. His initial vision was that Dreamquark would solve the issue of A&E overcrowding thanks to AI, but sadly he didn't receive enough support to realise that vision. So the startup expanded its target audience to include financial firms.

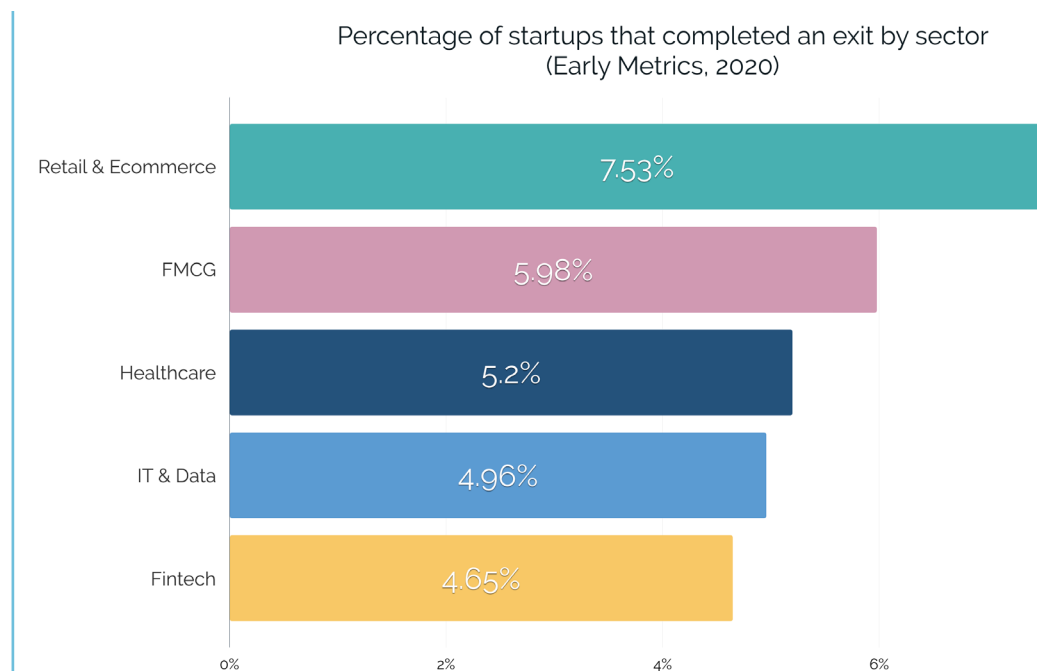
Méric explained: “While we have continued to sell our AI engine to healthcare companies, I have seen a greater willingness to pay in insurance and banking while investors were looking for repeatable and steady streams of revenues to fund our company.” By pivoting away from healthcare and towards finance, the startup was able to succeed in securing funds and in scaling.

Growth experienced by startups in the three-year period following their rating by Early Metrics (2020)

Pillars	Team growth	Revenue growth	Real funding secured vs. Targeted sum
Healthtech	31%	229%	88%
Average	69%	214%	121%
Difference	-56%	8%	-28%

Early Metrics' data confirms that **access to funding is indeed a generalised** issue encountered by healthcare-focused startups. On average, early stage healthtech startups analysed by the agency raised 88% of their target sum when completing a funding round, while startups in other sectors raised 121% of their fundraising goal.

Nonetheless, the data also shows that healthtech startups have a slightly higher chance of completing an exit than the average. In the three-year period following their rating by Early Metrics, 5.20% of startups in the health space exited, compared to 4.96% of IT and data ventures and 4.65% of fintechs.



In 2016, Nicolas Méric with two of the initial employees of Dreamquark, Ekaterina Besse (ex-COO at Dreamquark) and Axel Orgogozo (ex-CTO at Dreamquark), both of them PhD's in theoretical physics, decided to create a spin-off, DreamUp Vision. The project aimed to develop image-recognition AI applications in ophthalmology, and was supported by Dreamquark after a successful hackathon organised by Novartis.

Again, the same fate hit this innovative venture: **insufficient support from investors, a very complex regulatory environment to navigate for healthcare data management in France, and difficulties in monetizing this data forced them to shift to a financial services focus.** As a result, DreamUp Vision was closed in 2017.

Then in 2019, Besse and Ogorgozo launched QuantsUnited, an AI solution provider for asset managers and hedge funds to create sophisticated mathematical models, integrating both structured and unstructured data streams. Thanks to machine learning and advanced algorithms, the startup enables financial players to connect financial data, social trackers and images to generate Alpha.

Of their pivot away from health, Besse said: "We did have a good concept for healthcare, but we simply could not monetize it fast enough." She continued: "We had to turn to another industry – asset management and hedge funds - where we could use similar AI models. But we still like healthcare, it does feel good when you can improve patients' lives."

Looking at the qualitative metrics measured by Early Metrics' model, we observed that healthtech startup managers **scored lower in their business administration and marketing skills** than the average mainly because they are often doctors or academic researchers with little experience in leading business. On the other hand, within the healthtech cluster, AI startups had an even lower score than average in the management pillar primarily due to their lack of expertise in the specific therapeutic areas they were addressing.

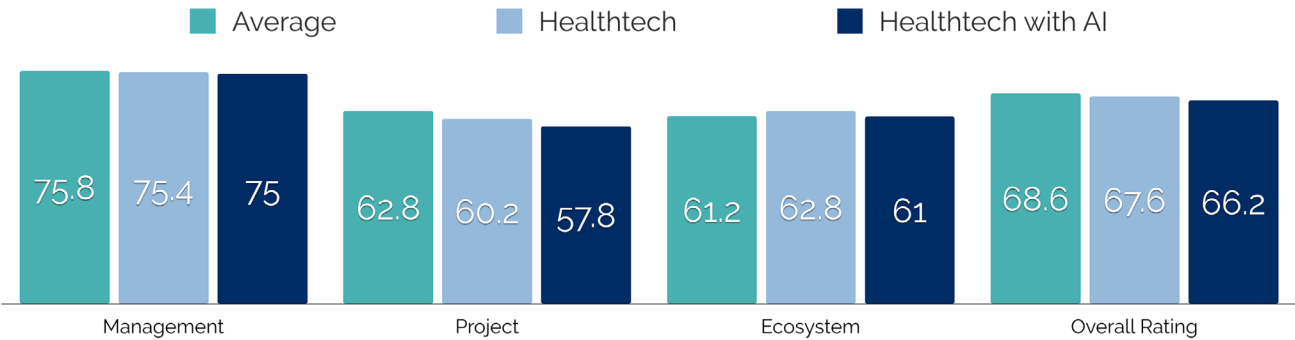
When it comes to the growth potential of their projects, the ratings showed that AI startups in healthcare also scored lower than the average for their technico-commercial stage of development, often appearing behind startups of similar maturity in other sectors. We can therefore infer that these elements, coupled with the regulatory and technical complexity of the healthcare market, can easily discourage AI startups from remaining in the health and pharma space.

“ We did have a good concept for healthcare, but we simply could not monetize it fast enough.”



Ekaterina Besse
Co-Founder & Chief Product Officer, QuantsUnited

Rating out of 100 achieved in each key pillar by general healthtech startups and AI startups in healthcare compared to the average rating of the whole database (Early Metrics, 2020)



These difficulties faced by startups in healthcare are also echoed by recent strategic shifts taken by tech giants such as IBM, which [announced in April 2019](#) it would stop the development and sales of its Watson AI software for drug discovery due to poor financial performance.

From these observations we can highlight four important findings for our research:

1. Healthcare, pharma, banking and insurance have **very similar AI problematics**, with respect to personal data protection, high level of regulation, and applicable AI algorithms or mathematical models.
2. The slower speed of AI-adoption in pharma and healthcare might be **correlated to a lack of venture capital appetite in this sector**, especially compared to fintech or insurtech.
3. Startups, particularly early stage ones, **struggle to monetize AI concepts in healthcare** in part due to highly complex and stringent data-protection legal frameworks.
4. The recent success of Owkin may signal that the tide is turning, and that **AI for healthcare might become the next "gold rush"** for startups.

These same startup stories leave us with an important question: is there a potential for pharmaceutical and financial companies to run cross-sector collaborations, alongside tech players, for the "common good"?

Together, they could potentially tackle issues such as the protection of data anonymity in AI applications, the growing need for a higher level of "AI-proof" cybersecurity, and the management of global crises such as the COVID-19 pandemic.







Reasons behind slow AI adoption

Why did digital come to healthcare in such a slow and incremental way? Is it because the technology is less relevant to the industry? Is it because the healthcare system rejects the technology? Are there some structural challenges for AI adoption? Or is it because the integration of AI requires a true transformation in mindset and culture?

The answer is yes.

1 First, the core of the healthcare industry remains science-driven. The pre-clinical research process relies heavily on development in biosciences and biotechnology. The application of digital technology including AI can shorten the research cycle in terms of increased throughput, computational design and simulation, among others. It is unlikely that AI will fundamentally change how bioscience research is done. However, new biotechnologies could have a profound impact on the industry. CRISPR technology is one important example of discovery that is deeply transforming how we think about medicine.

2 Second, a robust yet rigid clinical trial process cannot be replaced by a streamlined digital one. At least not in the short term. While clinical trials remain the most lengthy and costly process for bio-pharmaceutical companies, they are also their key competitive advantage. As a result, a combined effort has to be put forth by technology giants, startups and pharmaceutical companies to integrate AI and achieve industry-wide efficiency gains. This includes AI-assisted trial design, target patient identification, and clinical trial data analysis. These use cases may seem obvious but their execution is far from being simple.

“AI is a long-term economic growth factor: essential to improve the real-life data generation and collection which allows us to maximize the value of our innovations. Now we have to manage the regulatory and legal complexity as well as the sensitivity of access to health data.”



Emmanuelle Quiles
CEO, Janssen France

3 The third major hurdle to AI adoption lies in the fact that medical practice is centred around doctors, many of whom are slow at adopting new technology. Medical education, habit of practice, pressure for patient throughput and risk aversion, among other factors, may contribute to the slow uptake of new digital technologies by medical professionals. Some may even go as far as prohibiting the use of AI in their practice. In fact, one of the executives interviewed for this study said to have recently received a letter from a French specialists' association, addressed to its community, stating that the practice would uphold its standard practice and not allow AI application for at least 5 years.

It is worth noting that there seems to be a generational gap between doctors. Younger medical practitioners express their openness and interest in leveraging digital technologies including AI. Millennials and the generations that have followed have grown up using digital solutions, hence the nickname “digital natives”, which explains why they are less resistant to technological transformation. As these new generations entered the workforce, including medicine, they started to challenge the existing process and system. They are more open to new digital technologies and have been asking for better ways of practicing medicine. And their voices are also impossible to ignore: in the UK, the age group with the highest number of registered doctors is that of 30 to 39-years olds with over 90 thousand doctors (Statista, 2019).

Their expectations for new practices may range from digital booking systems, patient databases, digital back-office, online resources and connected systems with laboratories. They recognise that these technologies could help them drive better efficiency and performance. For example, a digital back-office could help them streamline their administrative processes and save time that can be spent by their patients' side.

Digital patient databases can speed up the process of locating patient files, recall visit histories and keep more accurate records. Digital resources could also help them in keeping up to date with medical research. More specifically, AI could potentially allow them to access the right information at the right time, automating some of the administrative work and facilitating the diagnostics process.

4 Fourth, the slower pace of digital tech adoption stems partly from the fact that it has not yet challenged the existing business models in healthcare to the extent that it has in many other sectors. For example, the sharing economy challenged the ownership model of many consumer industries such as automotive, hotels and taxi. E-commerce challenged the supply chain structure of the existing retail business. The business model of medicine still revolves around products and services provided by medical professionals, such as consultations, pharmaceuticals, surgeries and laboratory services. Most digital health innovations remain at the periphery, such as digital appointment booking, online insurance claims, online payment, etc. These digital "add-ons" have yet to disrupt the core model of conducting business in the bio-pharmaceutical space.

However, many executives we interviewed noted that this may change soon. We are starting to see a growing adoption of new technology in multiple areas including:

- Consumer wearables allowing research, such as the use of the Apple Watch for the Stanford Apple Heart Study
- Personalised medicine, such as gene sequencing-based diagnostics and treatment in cancer
- Ongoing health management, such as women's health tracking enabled by connected devices and mobile apps.

Moreover, our interview with Frédéric Collet, President at Novartis France and Chairman of Leem, revealed that AI applied to marketing is already being implemented in large pharma groups.

"AI allows us to sharpen the marketing and sales process, from segmentation to targeting, sales force sizing and call allocation," stated Collet. "Through marketing automation, we can deliver the right message, to the right doctor, at the right time."

It remains unclear whether, when and how much these new digital innovations could revolutionise the current business model of healthcare. Still, evidence from other industries would suggest it unwise to be unprepared for their potential disruptive power.

“ We need to get rid of the risk aversion that is in the big pharma DNA. Collaborating with startups can help us create a new culture.”

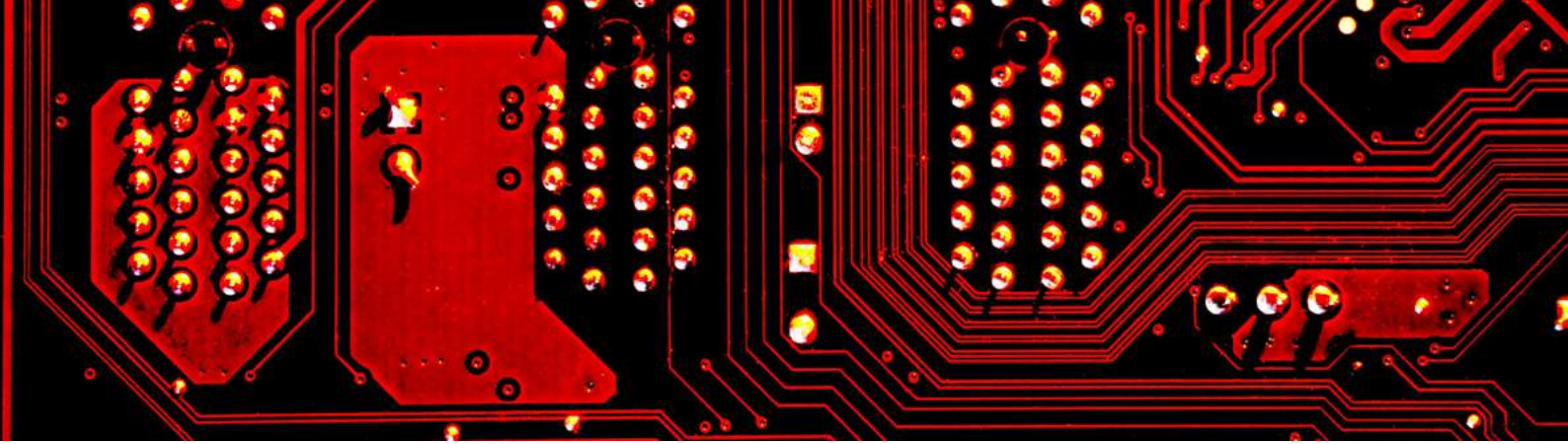


Frédéric Collet
President, Novartis France
& Chairman, Leem

5 Fifth, shifting culture and mindset takes time. Beyond the complexity of evolving the current healthcare infrastructures into digital ones, it seems to be even more challenging to change how stakeholders in the healthcare system think, behave and interact with each other. **“Because healthcare deals with people's life, the system and everyone in it are very risk averse.”** More than one of our interviewees shared a similar comment, including pharmaceutical executives and healthtech entrepreneurs.

This mindset may create a “chicken and egg” problem for AI adoption. Stakeholders in the system need to see scientific or at least statistically sound evidence before sharing data with AI algorithms. However, these algorithms need to access past cases and other data to be developed and trained in order to demonstrate their effectiveness. Hence, risk aversion could delay the initiation of an AI pilot by months or even kill it at its idea stage. While the FCA and other financial regulatory bodies have created “sandboxes” for new fintech solutions to be tested in controlled and safe environments, this has yet to happen in the bio-pharmaceutical world.

Other reasons may also contribute to the slow adoption of AI by the healthcare sector. Together, these factors build structural, procedural and cultural barriers to a rapid AI adoption. As they haven't shaken the foundations of healthcare, digital technologies including AI are restricted to side-projects while business continues to operate as usual.



Data security: real blocker or scapegoat?

“The human body is one of the most prolific creator of data. So AI in health can create huge social and economic value.”



Karl Neuberger
Partner, Quantmetry

Data security is a major concern underlining the overall risk aversion in the health sector. Naturally all medical and health professionals are committed to upholding the protection of their patients' privacy. As a result, data protection and cybersecurity are the first questions to be raised when a digital wave comes to shore. A prerequisite for any digital project including AI is to comply with regulations and demonstrate a superior capability in handling data in a secure and responsible manner.

It is easy to anticipate that data privacy and security would be the two main reasons cited for a slow AI adoption in healthcare. This is exactly what was confirmed by our study. Nearly all executive interviewees immediately gave those two as the reasons for “cautious exploration” of AI. While these are valid concerns, we thought it would be important to challenge this perception and understand whether it is justified. Indeed, there are existing regulatory frameworks, technologies, industrial best practices, as well as products and services that can meet healthcare requirements. So we wondered, has data security become the scapegoat for not accelerating AI adoptions in health?

Our interviews with AI startups and executives who are more advanced in AI adoption shed some light on these questions.

First, data privacy and security could be real concerns for some AI startups. Some pharma executives commented on the variation in AI startup qualities. "They have different knowledge and understanding of the healthcare industry. Some of them do not have the necessary understanding of healthcare regulation on patient data...This makes it difficult for us to work with them," one of the mid-sized pharma executives shared on her experience working with AI startups.

AI startups should be aware that regulations pertaining to data management apply differently in healthcare than in other sectors such as finance and consumer goods. They should therefore study the healthcare regulations, adapt their practices to healthcare compliance and demonstrate their capabilities to meet the specificities this sector requires. These additional steps may also help them rethink how they could adapt their core digital technologies accordingly. For example, Owkin has adopted its fully "cloud-based" approach to an "on-premise" one, in which they only have access to patient data locally in each hospital while the trained AI algorithm sits in the cloud.

Then, data privacy and security concerns are real "mental blocks" or "procedural blocks" for some pharmaceutical companies, especially within procurement functions. Medical data sets are some of the most sensitive and private kinds of data there is. In most countries, medical data strictly belong to individuals. Usage of a patient's data could expose businesses and organisations to multiple high risks of a legal, financial and reputational nature. When considering using patient data in new technologies such as AI, companies tend to take extra caution especially before new regulations and legal frameworks become well-established.

The risks associated with mismanagement of data in AI pilots could be significant for pharmaceutical companies. They could directly impact business performance, brand and company reputation. Moreover, they could harm public perception and negatively impact AI adoption as a whole.

In practice, these concerns are reflected in procurement procedures. Both pharma executives and entrepreneurs commented on current procurement procedures being very conservative and lengthy. Sometimes, it may set up "impossible standards" for startups to demonstrate their track record. An unintended consequence of such practice is that these procedures may shut the door for AI startups to work with pharma companies.

Finally, data privacy and security serve as acceptable "official statements". Because of the privacy concerns around healthcare data, taking a cautious position on AI is generally viewed by the general public as responsible. These statements certainly help to maintain public trust and calm down key stakeholders such as doctors. Unfortunately, an unintended consequence is that these statements may reinforce the slow adoption of AI and distract businesses from focusing on the real challenge – data quality and access.



Key challenge: data quality and access

The challenge of adopting AI in healthcare is indeed data. In addition to the concerns on data privacy and security, larger challenges in practice are data quality and access. In order for an AI algorithm to work its “magic”, it needs to be trained and be fed data to analyse. After the training, it needs to undergo a quality control process by processing an additional testing data set. The training and testing phases therefore require large amounts of high-quality data. Surprisingly, this is where the healthcare system meets its data challenges.

As discussed previously, science remains the core of healthcare. And science is based on data. To file for drug approvals, pharmaceutical companies used to move truckloads of results filled with data to health authorities. So how could healthcare systems possibly lack data?

When we discussed this issue with AI entrepreneurs, we found that indeed healthcare has a lot of data but unfortunately, the amount and quality of that data are generally not high enough for AI algorithms. So in many cases, startups have to help their clients build new data sets that meet the AI's requirements.

IBM developed the **4V framework** for big data: volume, velocity, variety, and veracity. According to this framework, to train a good AI algorithm your data needs to be:

In large quantity

*For example,
over 8000 unique samples*

In high quality or high definition

*For example, patient profiles need to capture detailed
demographic information*

Accurate and dynamic

*For example, treatments and results need to be
followed and documented*

Linked across domains

*For example, different doctor visits of the same patient
need to be linked*

These requirements seem easy to meet but are difficult to achieve in practice. In many European countries, the national healthcare system tracks certain information for individuals such as doctor visits and payments. However, diagnosis and treatment information may be stored locally in laboratories and hospitals over various systems. For large pharmaceutical companies, they may own the results of their clinical trials.

Raw trial data, on the other hand, may be owned by and sit separately in individual clinical sites. These scattered data sets could be very difficult to aggregate, link and update.

To make matters worse, this scattered data that is stored in each physician's practice, laboratory and hospital, may also vary in formats. Some archival data are still held only in paper or in old system formats. Even new data may not be logged completely or accurately in digital systems. These factors compromise the quality of healthcare data and make them difficult to access. Indeed, it's not the amount of data that is lacking but the amount of digitally accessible and exploitable data that is.

These challenges have practical implications for AI adoption. First, it may take time to locate the data. Startups shared in their interviews that it can take between 3-6 months to find the data they need. Second, it may take time and efforts to re-organise and clean that data. Even with the best efforts, the data may not be good enough to use. For example, Owkin shared that they started with 5000 unique data points in one project, only to find that 2000 of them were incomplete.

Third, lack of data may lead to lengthy new collection. If existing data is not sufficient, companies need to invest in the collection of new usable information. This obviously entails the employment of additional costs, time and resources.

Underneath the concerns on data privacy and security, the true challenges lie in the quality and availability of data. An interview with one of the tech giants confirmed that this is a reality not only for startups but for all innovators in the health space.

The ecosystem, beyond pharma

The data challenges we explored in the previous section pertain to the complexity of the overall healthcare system. The system lacks a common standard for data format, quality, ownership, usage rights, collection and validation processes. This decentralised system has become a maze for AI pioneers to navigate.

Many pharmaceutical companies recognize the huge potential of AI in healthcare and have put in place AI strategies from the top. Headquarters-driven innovation around AI is being put into action at increasing pace. Partnerships with tech giants such as Microsoft, Google and IBM have been announced. Pilot projects with AI startups have been launched. However, the engagement and participation of each market vary significantly across companies. Indeed, variations in market context make it difficult to have a standard approach across geographies and sub-sectors.

An individual market's response to AI depends on multiple factors: regulatory environment especially on technology and data, patient digital readiness, openness of the medical community, maturity of the online insurance industry, digital infrastructure such as national digital health record systems, and the list goes on. Each of these factors could constitute a hurdle to AI adoption and create a chained effect on the pace of innovation and its applications.

One entrepreneur we interviewed shared their experience of this complexity. The large pharmaceutical company his startup worked with was very bold on AI and committed significant resources. The startup quickly built the algorithm and started to look for data. They immediately realised that the data owned by the pharmaceutical company was far from enough, both in volume and quality.

“Innovation can take place very rapidly, but it will take a long time for the healthcare system to adapt.”



Corinne Blachier-Poisson
General Manager,
Amgen France

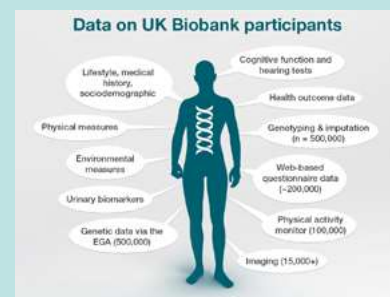
To obtain the data, they leveraged the pharma company's network and reached out to a few hospitals. After several rounds of negotiations, those hospitals only granted on-premise access to their medical data. The startup team had then to build hardware and deploy resources on-site at the hospitals.

This anecdote gives a glimpse of how interwoven the different areas of the healthcare ecosystem are: **once you start a partnership with one player in healthcare, you are partnering with everyone to get the data needed for AI**. This need for cooperation certainly lengthens development and deployment processes, and sadly many startups don't have the luxury to wait several months to receive the fruits of one collaboration if they want to survive.

The question then is: can healthcare simplify the data sharing mechanism?

There are some encouraging developments around the world. Although most of the initiatives are still in their infancy, they could offer valuable lessons and new possibilities for AI. For example, **Australia started the nation-wide initiative "My Health Record"** in 2018. Every Australian will have a digital health record unless they opt out. As of February 2020, over 5,000 general practices, 1,000 community pharmacies and 500 public hospitals and health services have used the My Health Record system. This initiative could provide a centralised database for all medical records and in so doing improve the quality and speed of data sharing with AI providers.

Smaller experiments are currently conducted in the UK as well. **UK BioBank**, for instance, follows the health and well-being of 500,000 volunteer participants. The data collected through this initiative has already benefitted international scientific and clinical researches. Moreover, the longitudinal data from this initiative could have significant impact in the future.



In China, an even more profound transformation is unfolding. Consumer digitalisation has accelerated the digitalisation in healthcare. Digital health apps started to collect large amounts of dynamic patient data that can directly feed into AI algorithms. **The PingAn Good Doctor initiative**, AliHealth and many others also started to connect wellbeing with consumer behaviours outside of the healthcare industry.

Similarly, in the US the participation of **technology giants such as Amazon, Apple and Google in the healthcare space** could deeply and rapidly transform how we think about healthcare data. We can in fact note that many European healthtech startups were able to raise funds and grow thanks to the support of large American tech groups. As European governments (such as France) seek to decrease our dependence on American tech tools and resources, it will be interesting to see if local tech groups and large healthcare players from the Old continent will be able to still support innovative newcomers.



Working the three-way partnership: Private, Public, Startup

How can we better manage AI adoption in healthcare? As mentioned earlier, the answer will vary depending on the context of each region. For Europe, our interviews unanimously pointed to the importance of partnerships in the healthcare system.

“Most importantly, we need to better manage the business – startup – public sector relationship. What are the needs for each stakeholder and how can AI deliver the benefits?”



Martin Dubuc
General Manager, Biogen France

Ultimately, the disruptive power of a new technology is linked to value creation. The more value it creates and the more unique it is in creating that value, the more disruptive the technology can be. Technology adoption, on the other hand, will be driven by the end user (be it a business or an individual) and their ability to capture value. The more a player can recognise value, the more willing it will be to adopt the technology and disrupt the industry.

We have seen these dynamics play out in the media sector, financial services and consumer goods and services. Take ridesharing for example, the new digital business model was enabled by mobile apps, cloud, real-time tracking, geolocation and other digital technologies. The new business model created huge value for consumers, driving vast and fast consumer adoption. Ridesharing startups claimed a fair portion of the opportunities created by this disruptive technology, which drove them to compete fiercely via venture capital (VC) backed mega-rounds and large Initial Public Offerings (IPOs).

Even though the long-term sustainability of the ride-sharing business model is debatable, the initial value creation for consumers and highly anticipated value capture for ridesharing startups drove the rapid adoption of these new digital technologies and business models at a global scale.

To speed up the adoption of AI in healthcare, we may need to go through a similar process. Our interviews made it apparent that **every pharmaceutical company and executive understands the potential power of AI in creating value**. This may include driving higher efficiency, improving accuracy and efficacy, providing better patient outcomes, reducing bottlenecks, enabling personalised medicine, and more.

At the same time, there is still a need for further exploration and iteration on how companies could effectively capture value through AI. Moreover, AI requires non-trivial investment to fund data collection, additional resources and new capabilities. These investments could be riskier compared to other innovations to which bio-pharmaceutical incumbents are already accustomed to (such as telemedicine). All these factors hinder the adoption of AI, especially at the regional level.

Logically, there are two ways to jump start AI adoption: **reduce investment costs and risk, and improve the value articulation to each player in the ecosystem**. How can these be achieved? Our interviewees called for more meaningful collaborations within the healthcare ecosystem. First, no single player in the healthcare system can unlock the value of AI alone.

Value creation comes from coordination and collaboration across key stakeholders.

"There is definitely a trend for pharmaceutical companies to collaborate more with the broader health ecosystem, which includes Academics but also health startups," said **Olivier Delannoy, Global Head of Digital - Cardiovascular Renal & Metabolic diseases at AstraZeneca**.

He explained: "Once exploited, we used to keep clinical trials datasets in our closets, both for successful and unsuccessful trials, without

recognizing their intrinsic value. But thanks to the emergence of new technologies and continuous digital data generation, research and data infrastructure are now being more and more federated and collaborative, which opens new opportunities for AI-powered data analysis."

So pharmaceutical companies could invest in AI technologies and pool resources behind AI development,

while the government and public sector could accelerate the digitisation process and promote standardisation of data systems.

On top of this, hospitals and physicians could participate by ensuring quality data is recorded and updated. Technology companies and startups could also bring expertise and new ideas to the ecosystem and facilitate experimentation.

Last but not least, patients and advocacy groups could continue to safeguard data privacy and security while being more open minded in sharing data to enable AI development.

No single player in the healthcare system can unlock the value of AI alone.

“By federating relevant data into opened and secured data exchange environments, and without compromising individual contribution or intellectual properties, we can collectively produce more value and address unmet patient needs”



Olivier Delannoy

Global Head of Digital - Cardiovascular Renal
& Metabolic diseases, AstraZeneca

Each stakeholder has a role to play in creating value through AI. Only when all stakeholders join forces could we see a true acceleration of AI adoption in the healthcare system.

It's safe to say Europe has a solid foundation in healthcare. Many countries including France and Germany have hybrid health systems and those usually cover the entire population. If we could accelerate the digitisation process, **the wealth of data in those systems could fuel great advancements in AI** and other new health technologies. As a result, they could unlock new value that benefit the entire ecosystem.

Second, we need to **cultivate an experimentation mindset**. Because AI is a brand new technology, an exploration process is necessary to identify valuable applications. This requires a new mindset, a new way of working and even a new culture. Many companies have recognised this requirement by setting an autonomous team aside to experiment with AI. These AI or digital innovation teams may be allowed different criteria of investment returns, separate P&L, dedicated resources and a longer-term horizon. These mechanisms could help protect these projects during in their early days. At the same time, the continuous connection with the "mothership" can allow resource sharing, idea flows between departments, project matching and scaling up.

Finally, it's vital that all actors in the ecosystem pursue an ongoing search for novel value propositions. **Prospective innovation** can indeed increase the ecosystem's readiness to adapt and survive to sudden change, such as the COVID-19 crisis.

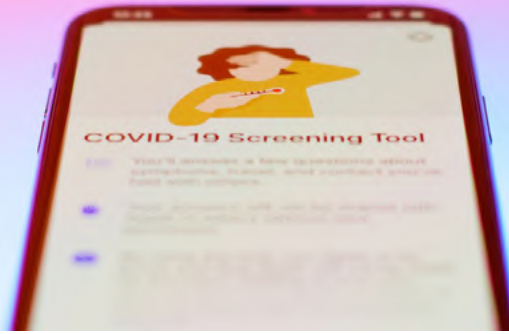
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Lessons from the COVID-19 pandemic

“A digital revolution does not happen thanks to one technology's brilliance. It has to happen because the ecosystem is under such pressure that it has no other way out.”



Patrick Errard

Innovation Commission
President, MEDEF
& General Manager,
Astellas France

Now an unprecedented crisis has shaken the global healthcare system and beyond. During this crisis, we have witnessed the courage, solidarity and conviction of every member of the healthcare ecosystem. At the same time, the crisis exposed many weaknesses in the different configurations of health systems around the world.

In these trying times, we have seen many examples of digital technology and innovation filling in the gap. Among these, telemedicine and chatbots have been very helpful for first-line triage and early-stage diagnosis. China's AliHealth and JD Health both expanded their telemedicine services for distant consultation and preliminary diagnostics with physicians to prevent the spread of the virus. They also launched different versions of their chatbots (a basic form of AI) to disseminate COVID-19 related medical information, health recommendations as well as Q&As.

In the US, the CDC used Microsoft's healthcare chatbot service to create a coronavirus symptom checker and Whatsapp (owned by Facebook) launched the WHO Health Alert to share critical information to millions of users worldwide. In India, Facebook also used its helpdesk bot to share news and answer user questions relating to the pandemic.

Closer to home, it was encouraging to see smaller European startups launch similar initiatives, such as the French startup Clevy which is among Early Metrics' highly rated companies and has created Covid-bot.fr.

These speedy developments in response to the pandemic were a testament to the real value brought by these technologies and to the reactivity of young innovative companies. We hope they will inspire future considerations for public healthcare systems to welcome innovation from both tech giants and emerging innovators.

Another silver lining of this crisis has been the increase in collaboration among various stakeholders. Pharmaceutical companies have partnered with startups and with each other to develop vaccines and push existing drugs through approval for new indications. Notably, AstraZeneca France collaborated with three startups, Qare, Libheros and Cureety to develop a new telemedicine solution aiming to help cancer patients receive remote care from their doctors while avoiding getting contaminated by the novel coronavirus.

Pharma groups also partnered with hospitals to provide medicine and equipment to personnel on the frontline. Meanwhile, technology companies have collaborated with manufacturers and logistics companies to secure medical supplies. Public sector entities partnered with the private sector such as technology companies and startups to provide public health support, accelerate vaccine development, monitor population health data and manage patient flow.

For example, in France the startup Nouveal E-santé adapted its telemedicine solution with the collaboration of the AP-HP (the largest hospital system in Europe) and the Agence Régionale de Santé Ile-de-France to create Covidom, a platform for remote tracking of confirmed and suspected COVID-19 positive individuals.

Moreover, we can cite the DataCovid project, initiated in March 2020 by a group of scientists and civil servants, and in which the Authors are involved as a core team member (Jean-Michel Moslonka), scientific committee member (Chengyi Lin) and project partner (Early Metrics), which confirms this trend towards increased collaboration.

We did notice a strong willingness from the organisations supporting DataCovid.org, including pharmaceutical companies and companies from other sectors such as transportation, insurance and asset management, to share insights across industries and in collaboration with startups. Their discussion topics included how and to what extent the COVID-19 crisis will reshape patient, consumer and citizen behaviour as well as shake up the established business models.

In our view, this collaborative mindset, that reaches even across competitive boundaries, has the ability to not only accelerate the business model transformation in the pharmaceutical and healthcare industries, but also lead to greater adoption of new technologies in healthcare.



Moving forward: Recommendations for the ecosystem

In this paper, we aimed to bring to light the key pain points keeping artificial intelligence (AI) solutions from being applied in the bio-pharma space. Through our interviews and data analysis, we were also able to identify practices that could speed up the adoption of AI in health. One important idea was brought up in all our interviews, be it with big pharma directors or startup leaders: **collaboration across the whole healthcare ecosystem is key.**

Only through a concerted effort from bio-pharma groups, big and small tech players, and public bodies, will we be able to leverage this new type of technology to its full potential and bring real impact to patients' lives.

In order to build successful collaborations, these different healthcare players have to adapt and take steps to prevent common pitfalls. Below we share some of the recommendations and best practices that could help healthcare startups, corporates and public sector institutions better collaborate.

FOR THE STARTUPS

Our interviews pointed to three main areas of recommendations for startups.

First, demonstrate your understanding of the healthcare sector and willingness to co-develop technology solutions and capabilities. For example, startups need to prove they understand the healthcare regulations on compliance, the business processes of pharmaceutical companies, and the needs of the various stakeholders. Based on this knowledge, startups can work with internal champions to educate various stakeholders about cutting-edge technologies, collaborate to explore new use cases and identify new values.

To illustrate further, we'd also like to highlight a common point of resistance met by startups: data privacy and security. It is expected by the pharmaceutical companies that entrepreneurs do their homework as to the regulations on patient data that bio-pharma corporates or medical research bodies have to comply with. Large pharma groups will also expect the startup to have a clear regulatory roadmap showcasing the KPIs and certifications it aims to reach and the timeframe in which it hopes to do so. In practice, startups need to take extra precautions with this sensitive data. When approaching potential partners, they need to be able to demonstrate that all data processed by their algorithms would be safe. Owkin can serve as an example: by using blockchain ledgers to process clinical trial data, the startup was able to apply its AI predictive models while ensuring a high level of security.

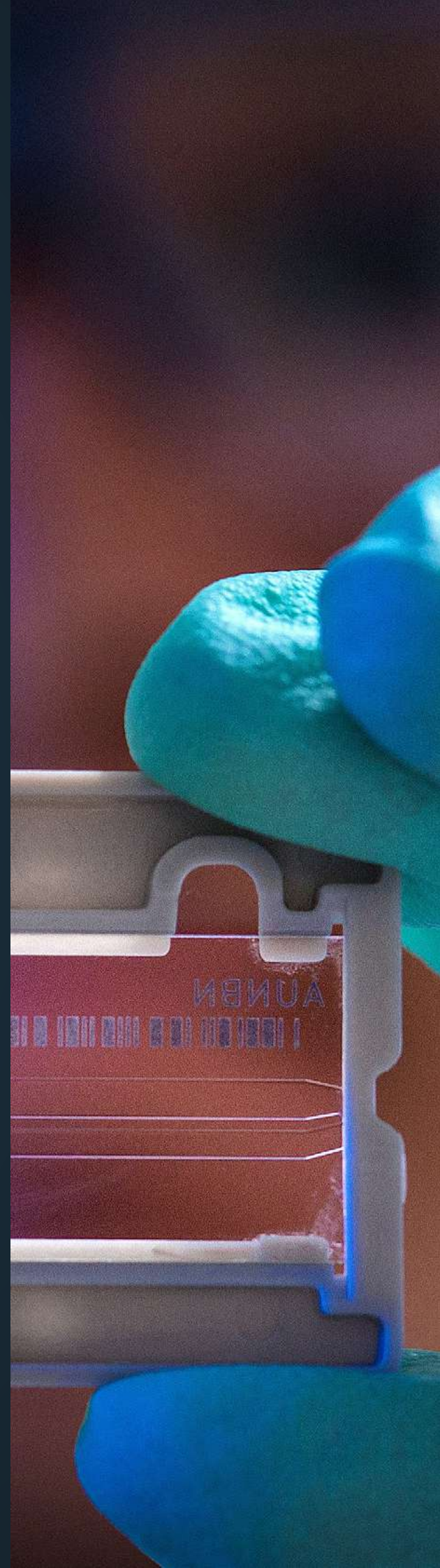
Second, budget sufficient time and resources to collect and process data. Access to data in high quality and quantity arose as a major hurdle from our interviews with AI startup founders. As we explained earlier, some large pharmaceutical groups might be willing and motivated to implement AI but often underestimate the amount of data that is required for such type of algorithm to deliver on its promises. It is therefore essential for AI startups to get the clearest picture from the start of the amount and format of data that their clients can provide so that they can accurately estimate the time and cost that potential extra data collection processes might entail. Educating the client as to the requirement of their technology (such as the 4V framework) and helping the client build internal data capabilities can allow for more efficient and transparent collaborations as well.

Furthermore, it is worth noting that some patient data is more difficult and expensive to acquire than other. On top of this, clinical trial data sets will always be limited in size. So, AI startups need to be strategic in the niche they choose to address and in pooling data from several sources in a way that preserves the intellectual properties of each data contributor.

Our third recommendation pertains to the lack of business administration, marketing skills and market expertise that was observed among the AI startups in health rated by Early Metrics. Before diving into their entrepreneurial project, aspiring founders

should invest in skilling up in these areas, especially if they primarily have a medical or academic background. Alternatively, they should look for co-founders that already have the skills to complement theirs and relevant experience in contributing to the successful market entry of a business in the healthcare industry. Venture capitalists are spoilt for choice and healthcare corporate investors are generally very risk averse, so finding a solid business model that can highly facilitate the search for funding, which so many healthcare startups struggle to secure.

In particular, R&D can take a long time in this sector, so finding quick wins with “lower-tech” (e.g. a telemedicine app) to complement the “high-tech” AI products can be a viable path to faster revenue generation. On the other hand, co-development alongside academic bodies or private healthcare companies can also allow to pool resources and achieve faster time-to-market.



FOR THE BIO-PHARMA GROUPS

“My advice to pharma companies: regroup and own your data, be open to collaboration, and nurture a “sustainable data” mindset, setting very high standards for patient information and patient privacy protection.”



Thomas Clozel
CEO & Co-Founder,
Owkin

From Early Metrics' data on AI startup growth, we observed lack of support and funding from healthcare companies were major hurdles for innovative startups. Anecdotally, several startups pivoted away from healthcare towards finance and other industries. These could be opportunities lost for the healthcare ecosystem, either discouraging further participation of technology startups or missing out on potentially life-changing solutions.

To turn the situation around, we could offer a few thoughts from our interviews.

First, clarify the strategic objectives of AI initiatives and manage them carefully. Considering AI, data analytics and other digital initiatives at a strategic level may be a critical first step away from “buying a new piece of technology from a startup”. Positioning the relationship with a startup as collaboration instead of procurement may be a subtle but important way to avoid the “set up to fail” syndrome. To identify and select the right startup partner, startup ratings and valuation methods tailored to early-stage newcomers, such as the ones offered by Early Metrics, could ease this shift in strategy.

Setting strategic objectives may also include setting the right expectations upfront in terms of time investment, resource commitment, return on invested capitals and time horizon. For example, private healthcare companies need to change their attitude to investment to support initiatives with startups. As Frédéric Collet, President at Novartis France and Chairman of LEEM, pointed out in our interview, traditional pharma has been about investing a lot of money, for a very long time, at the lowest possible risk. This approach is in exact opposition to the startup world and has to evolve to allow for greater collaboration. Inviting startups to co-create realistic expectations and understanding their needs may be a good starting point for the partnership.

Once strategic objectives are clear, AI initiatives need to be paid equal attention to as other strategic projects. This may include engaging with the right stakeholders internally and externally in the healthcare ecosystem, identifying quick-wins and communicating business results. These could further attract internal interest and enhance engagement across businesses and functions.

Second, cultivate a new mindset of learning, experimenting and exploring. Innovative startups often hold the technical know-how, new ways of working and fresh approaches to problem-solving. Many of these identified as challenges to work with can often be the most important learnings for bio-pharma incumbents. As a new and potentially disruptive technology, AI usually requires an agile approach to ideate, experiment, test and maybe pivot to uncover its full business potential. Habits and change inertia in addition to legacy systems can greatly hinder a large company's ability to develop cutting-edge technology in-house, while young businesses provide alternative inspiration to traditional ways of conducting business. As we stated previously, AI can not only give a competitive edge in terms of offering new solutions to the doctors and patients served by pharma companies, but also could help shift its operational processes, digital capabilities, business models, and even organisational culture.

If healthcare companies seek inspiration, they don't need to look further than the financial services industry. The two share

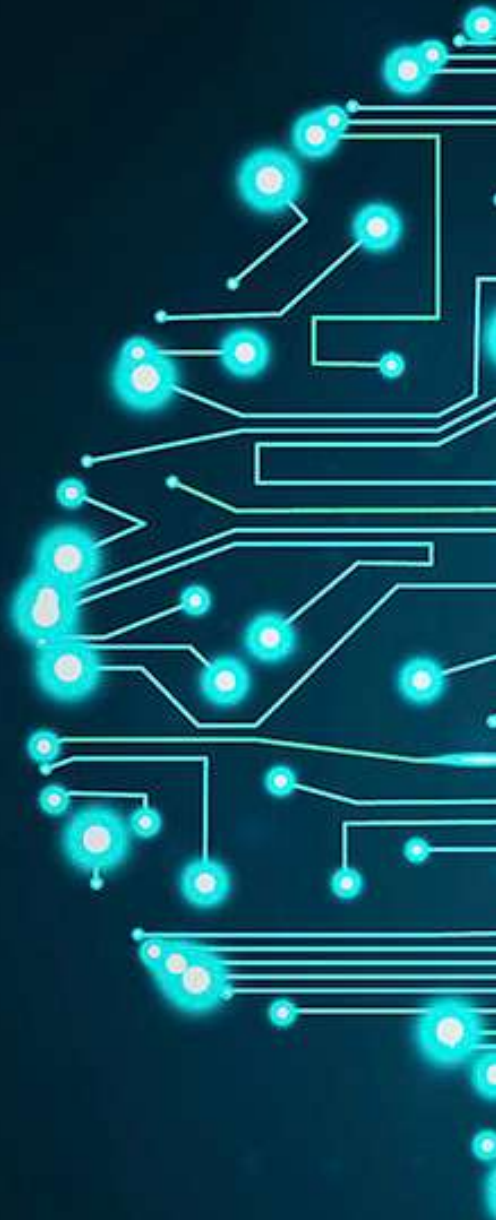
many similarities from the complexity of the regulatory environment to the sensitivity of the data managed. It took an existential shock for the banks and insurers to take digital startups seriously. Now many banks have set up accelerators and partnerships with startups to get access to new technologies such as blockchain (including cryptocurrencies) and AI, and more importantly accelerate their adoption.

Thanks to the nature of the healthcare industry, bio-pharma groups among other stakeholders have yet to experience a major disruption. But crises such as the COVID-19 pandemic could serve as a wake-up call for the ecosystem to re-evaluate the current practices, business models and our collective attitude towards new technology adoption.

Third but equally important, engage other stakeholders and create a collaborative environment in the healthcare ecosystem. AI can create new values for the healthcare sector and data is key to unlock these new values. However, any single player's ability to do this alone is very limited. At the same time, getting comfortable with collaborations with various stakeholders requires a shared understanding, a common practice and an agreed-upon framework to share data and distribute the new value created. As we are only at the beginning of the AI era, we can offer no further recommendation than starting dialogues involving multiple stakeholders in the ecosystem to work on all these critical issues such as data governance and value distribution.

For example, some pharma executives we interviewed suggested setting up consortiums for clinical trial data sharing between pharma competitors, public sector entities and startups. Such data consortiums could help solve the issue of lack of accessible data in high quality and quantity that AI players have been faced with. A practice that has also been implemented in the financial services and retail industries. Similarly, working committees on data governance could also provide an efficient path to accelerate the development and adoption of AI for the benefit of the entire healthcare ecosystem and beyond.

This leads us to bring our additional recommendations to the public entities, which play a critical role in the three-way partnership between private businesses, startup and the public sector.





FOR THE PUBLIC ENTITIES

First, take a collaborative approach to accelerate the development of regulatory framework on AI and data. Different from Facebook, Amazon and their alike, healthcare businesses tend to be more cautious and wait for dedicated frameworks to adopt new technologies. Therefore, it is important for public bodies to create meaningful regulation, legislation and policy frameworks to guide these actions. These frameworks could serve multiple purposes: provide directional guidance, safeguard businesses and consumers, and promote new technologies and accelerate their adoption, to name a few.

Europe has done this in the past through a collaborative approach. Although far from perfect, GDPR offered an important signal as to where Europe stands on data and created certain boundaries for business practices. Similarly, the OECD Principles on AI is a good starting point. But important questions remain: How can policies and regulations be developed based on these principles? How can these principles be applied in the healthcare sector? How can these frameworks be adapted to the healthcare context and to the specificities of individual countries across Europe?

The public exchanges between Facebook and the US congress and EU commissions were vivid examples of the limitations of traditional approaches.

Because AI is new, the development of these frameworks needs early inputs from digital startups, technology giants and private

businesses. Collaborations between these players could help public entities better understand the impact of technology both on business and society in order to put effective regulations, legislations and policies in place.

Second, enable and facilitate a system-wide transformation. These transformation efforts may include but not limited to upgrading digital infrastructure (e.g. digital medical records), harmonising digital systems (e.g. data entry formats), facilitating data sharing, benchmarking the best practices, and moderating negotiation on value distribution within the ecosystem. These efforts are fundamental to the creation of new values through AI and other digital technologies. We have illustrated examples of such initiatives in the UK and Australia. These public sector experimentations could shed light on how to accelerate these transformations.

Obviously, public entities could not do this alone due to limited budget, human resources and time. To build these foundations, public entity needs to play an orchestration role and bring various entities to the table. For example, bio-pharma businesses, technology giants and startups dialoguing with hospitals, medical associations, insurers, patients and advocacy groups around a concrete disease use case for AI. The key conversation could be around what each entity could contribute to the development and how new value created can be shared as a result of the transformation. These dialogues could broaden the one-to-one negotiations and accelerate the speed of development.

Third, beyond protection, public entities have to inform, educate and guide the general public about new technologies. Recent development in both political and business environments showed that public awareness and knowledge is critical to the rightful usage of technology. The general public is not only the consumer of technology but the contributor in terms of data (both behaviour data and digital content) as well as revenue. There is an implicit trade-off for consumers - patients in the case of healthcare - between benefits and costs. Neither fear nor blind optimism is good for making this trade-off. The better informed general public is, the better they can take decisions.

To do this, we also need partnerships between public entities and businesses to inform the general public about the demonstrated benefits and costs. For medical professionals, such could include cost efficiency, speed to market, efficacy based on patient identification, and more. Such costs could cover sharing medical data, transiting to a digital medical record system, and exposing to security and privacy risks, among others. Concrete data needs to be provided to the consumers, similar to the likelihood of survival for cancer treatments, in order to allow consumers to make informed choices. As you could see, only collaboration could generate these meaningful data through experimentation.

“Government initiatives should provide a tremendous boost in terms of innovation for the entire ecosystem when they become effective in France. Clearly, health data challenges must be addressed collectively. We are convinced that the way forward is through public-private collaborations and partnerships”



Emmanuelle Quiles
CEO, Janssen France

CLOSING REMARKS

As we conclude our white paper, we would like to take a look at a bigger picture. AI adoption in health is at its early stage. Moreover, it is only one part of an important digital transformation coming to the healthcare industry. The executives and entrepreneurs we interviewed unequivocally pointed to the huge potential of AI and the new value it could bring to the healthcare ecosystem. Because we are at the cusp of this transformation, we need to pave our own way forward.

Challenges lie ahead on the path to AI adoption. Three truths about healthcare gave us hope.

- **First, devotion to this purpose: keep improving patient outcomes.** This shared sense of purpose could serve as a starting point for the much-needed collaborations across various stakeholders.
- **Second, data speaks: always take a scientific approach to problem solving.** Once we start experimentations and pilots on AI, the data collected could convince various stakeholders to come onboard.
- **Third, responsible and trustworthy behaviour: license to operate and caution on actions.** This mindset will be critical in AI application because the technology keeps evolving with data and because we will become increasingly reliant on the human stewardship behind the technologies and their responsible actions.

Considering all these important factors, we are reasonably optimistic about the future AI adoption in the healthcare ecosystem through a collective, collaborative and creative approach.



METHODOLOGY

The findings and data reported in this white paper were gathered through a series of interviews with industry experts and startup leaders, conducted between January and April 2020.

Early Metrics also provided data from its database of over 3000 startups rated between September 2014 and February 2020. Early Metrics' ratings are based on a scientific methodology that assesses qualitative and quantitative metrics in three pillars: a startup's management team, project and market.

Additional data was collected via the platforms Crunchbase and Statista.

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