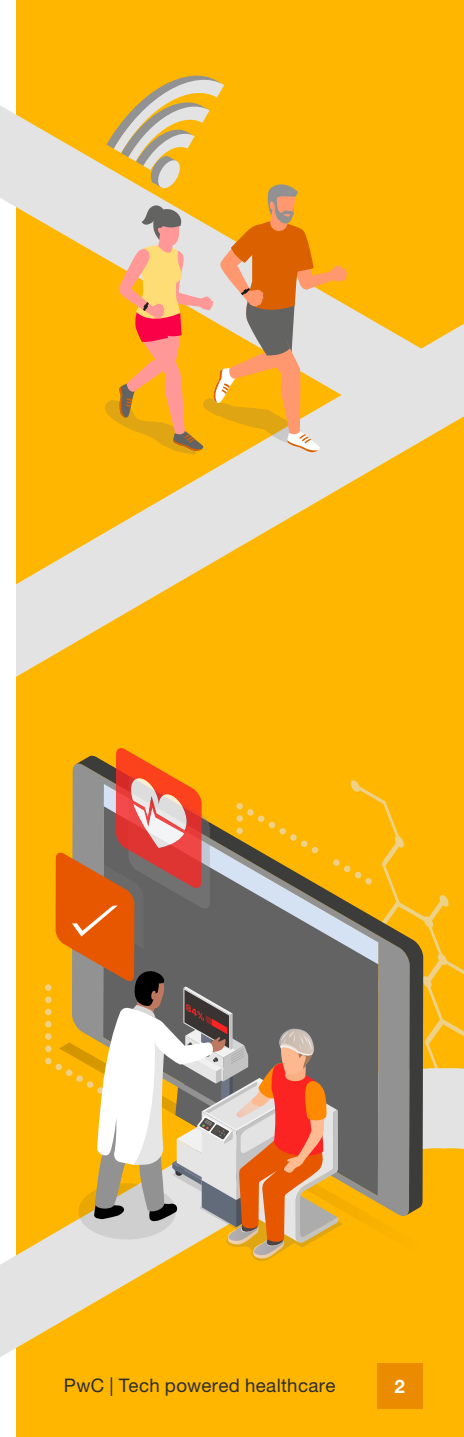# Tech powered healthcare

A strategic approach to implementing technology in health and care

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Foreword

Foreword

Rt Hon Alan Milburn

Technology has the power to drive a revolution in health and social care outcomes.

The COVID-19 pandemic has accelerated the pace of technological change but much more can be done to deliver truly innovative transformation. Patients are embracing new technology and increasingly expect care to be supported by it but they, along with staff, need to be further empowered and supported to change the way that they engage with and access care.

This report follows on from our previous thinking around the architecture of the NHS and the financial structures supporting it and is based on extensive research and partnerships with key NHS stakeholders and the private sector. We previously argued that place-based integrated care should be at the centre of the UK's health agenda, supported by appropriate funding flows and financial structures. We have since seen these recommendations come to life as the NHS has created integrated care systems and devolved funding flows. However, what we have not yet seen is the system-wide uptake of new technology and innovative solutions that could enable transformational change across the NHS.

For the last 12 months we have been conducting in-depth research into the future of technology in the NHS. We have been working closely with stakeholders from across the NHS, from junior doctors, to nurses and GPs, to CEOs, CIOs and NEDs as well as those in the private sector who are developing and delivering technology platforms. I'd like to thank all those who have engaged with this project – as well as the PwC research and writing team. Based on these conversations and, combined with our own experience supporting the sector, we have made recommendations that we believe are bold enough to evoke real change, and practical enough to ensure it's sustained.

The NHS is on the brink of a tech-led revolution. The advances the world is witnessing in big data, robotics, genomics, AI and a myriad of other changes, when they come together have the potential to transform what healthcare is and how it does it. In order to make sense of these potential changes we have concluded that there are four structural themes which need to be addressed: culture, partnerships, money and people.

Successful innovation requires cultural and behavioural change. However, openness to change means nothing unless you have implementable solutions to hand.

It is, therefore, imperative that we consider partnerships with technology and innovation companies to identify and build these solutions. This cannot be achieved without proper investment in technology and a rethink of complex funding routes. Once we have these solutions in place, we need to establish detailed training programmes across the patient journey to ensure every member of our healthcare system – including service users and carers – is primed to embrace new technology.

COVID-19 is an inflection point and as we enter our 'new normal' it's becoming clear that there is an opportunity for real sustained change. So, using these four themes, we have developed a series of recommendations aimed at capturing this opportunity. These recommendations form the basis of the following essay series, in which we will seek to capture the learnings from COVID, against a backdrop of the unstoppable advances in technology that are propelling healthcare into a new era. We hope this work can inform systems on how to embrace change and new ways of working, particularly in these challenging COVID times.

2

Introduction

Introduction

David Morris
Health Services
Sector Leader

We have spent 12 months researching in depth the future of technology in the NHS.

We assessed structural barriers and explored changes that would be needed to deliver on the opportunities technology presents for patients and the NHS workforce.

We polled 4,000 members of the public (before and after the pandemic), conducted a survey with 92 healthcare professionals, and had in depth conversations with 57 people in various roles in the health service and in industry through a series of interviews and roundtables. At the beginning of 2020, we were almost ready to publish, having distilled our findings into four main areas where change was most needed to capitalise on technological opportunities: **culture, money, skills, and partnerships.**

And then COVID-19 struck and transformed the landscape of health systems across the globe. We watched as the NHS rose up and responded to the crisis – yes, by building hospitals, reconfiguring existing sites and redeploying staff at eye-watering speed; but also by changing the way technology is used to care for patients – changes that had felt years away.

The pandemic's impact has been a catalyst for change in unexpected ways

COVID-19 has proved to be the biggest challenge that the NHS has faced in its history. Over the last seven months, the sector has shown a remarkable capacity for resilience and adaptation, in the midst of the pandemic. At the heart of this have been health and care workers – from front line clinicians, cleaners, porters, admin staff, managers, operational teams and many others – who have changed how they work and care for people. With face-to-face care no longer risk-free, GPs (accounting for 90% of patient contacts in the NHS) moved to online and telephone consultations – some making 85-95% of their contacts virtual in a matter of weeks, compared with around 10% previously. Surgeons conducted preoperative assessments by video call, and a national benchmark called for 60% of outpatient follow-ups to happen virtually. Hospital and Clinical Commissioning Group (CCG) back-office functions have been completely reformed, and the number of staff who have moved to flexible working – whether because they've been redeployed into flexible staff pools or because they're working from home – will likely drive forward a change in working practices in the NHS that will last well beyond the life cycle of COVID-19.

The impact of the virus has forced change, in ways which few fully anticipated. As the NHS takes stock as to what a future living with or recovering from COVID-19 looks like, there will be an opportunity for real sustained change. While no one would ever have wanted the NHS to be tested in this way, and while the scenes from hospitals, care homes and communities are deeply shocking, there have been some important developments. Blockers to technological change, which have existed for decades, fell away overnight. When we surveyed 92 digital healthcare stakeholders before the pandemic, including CEOs, CIOs, hospital consultants and researchers working for the NHS, 54% believed the major obstacle to a digital revolution was resistance to eHealth and dependence on traditional solutions. And yet plans to move outpatients towards a virtual model – which would have taken years – happened in weeks. In many places, communication channels opened between organisations: people were suddenly able to communicate as easily with colleagues in other organisations via video call or phone as with someone they used to share an office with. NHSX and NHS Digital struck a deal with Microsoft to provide the opportunity Microsoft 365 to as many as 1.2 million NHS staff to support digital communication and collaboration across platforms like Microsoft Teams, embedding these changing behaviours.

The impact of the virus has forced change, in ways which few fully anticipated. As the NHS takes stock as to what a future living with or recovering from COVID-19 looks like, there will be an opportunity for real sustained change.

These developments have been made possible by a set of circumstances that were propelled into existence by crisis.

Organisations with previously competing – and at times incompatible – drivers have been united by a single purpose.

This focus on a collective priority has allowed for data sharing, with rules on information governance relaxed or removed altogether. Organisations across our health and care system have seen what's possible when seemingly insurmountable barriers – whether actual or perceived – are lifted, and can use this experience to overcome future challenges and restrictions.

COVID-19 has accelerated the pace of change

Given the clinical nature of the challenges presented by COVID-19, clinicians became empowered to engage with digital solutions and lead on enacting change, whether that's through using barcodes and scanners to identify patients and equipment to track and monitor the use of non-invasive ventilators during the pandemic, virtual wards for those recovering from COVID-19, or the switch to digital general practice. And we have seen across many acute trusts and GP practices that if clinicians are driving the change, it's more likely to work and be widely embraced. The challenge for organisations will be to maintain the power and momentum of this clinical leadership, without sidelining the pragmatism and operational skill of managers.

Changes at a national level during this period also helped create conditions to accelerate the pace of digital and technological change across our health and care system. Working together, the Department of Health and Social Care and NHS England and Improvement embarked on a package of major reforms to the NHS financial system, including a monumental decision to write off £13.4bn of provider debt held by over 100 hospitals in April 2020, something we've long argued for.

Alongside this, a new funding model was introduced, including a simpler internal payment system to ensure the NHS could access necessary funding and support to respond to COVID-19.

This injection of funding was welcomed, and while clearly earmarked to support organisations to manage COVID-19, the additional funding which has been made available to the NHS may present the opportunity to lay the foundations for a truly digital future.

At the heart of the national response has been people's willingness to access care in new ways. These behavioural changes have been most visible in A&E, outpatients and primary care. A&E attendances dropped to their lowest recorded level in April 2020: the NHS saw 0.9 million attendances, down 57% from April 2019.

While this is partly due to lockdown (e.g. fewer traffic accidents), patients responded beyond expectations to the messaging to "Stay at Home, Protect the NHS. Save Lives" and this seems to have translated into an avoidance of A&E, instead using NHS 111 – which saw a 400% increase in calls in the first month of the pandemic. Most outpatient and GP appointments switched to a remote form overnight. Though much of this has been via telephone, around 6,000 video appointments were happening

per day at the height of the pandemic on the digital platform Attend Anywhere (rolled out across NHS organisations in March 2020). In the aftermath of COVID-19, there's an opportunity to encourage positive new population behaviours, for example only using A&E in emergencies, accessing virtual GP and outpatient care, and self-care.

Partnerships at national and local levels have been a source of both controversy and strength during the crisis. Solutions implemented in pressured circumstances are rarely going to be perfect and there has been a lot to celebrate alongside the lessons learned - but it's clear there still needs to be a national conversation as to how we lay the foundations of trust, transparency and consent that are crucial for public acceptance of national NHS technology partnerships.

At the heart of the national response has been people's willingness to access care in new ways. These behavioural changes have been most visible in A&E, outpatients and primary care.

400%
NHS 111 saw a 400% increase in calls in the first month of the pandemic.

Local partnerships have succeeded

As well as high profile, national partnerships, local partnerships between NHS and social care organisations and innovative companies have provided some real success stories throughout the pandemic. A proliferation of new software, changing pathways, new features and initiatives to support the health and care system have emerged across the country, with collaborative changes emerging across video consultations, virtual outpatients, population health management.

These are just a few examples of the extraordinary ways technology companies and NHS organisations are collaborating at pace to transform care delivery.

Local partnerships between NHS and social care organisations and innovative companies have been far more successful throughout the pandemic.

Localised technology partnerships still face challenges, but they have been less controversial and arguably more productive ventures.

Though there are some systems that it will be useful to procure nationally – such as tools to enable easier collaboration across all care settings – a tailored approach often seems to work best. There can be less complexity, risk, and publicity with small-scale innovations in healthcare than with high profile national collaborations – lowering the stakes provides more room for manoeuvre, and more tolerance of minor setbacks. Of course there is a place for national solutions (see the example of the shielding list – a remarkable example of data driven risk management at scale) but empowering local systems to make change should be a priority.

The challenge ahead

There is no appetite to revert back to the way things were prior to COVID-19, with face to face care as default. This period has been a remarkable experiment in behavioural change. But it hasn't been perfect. Solutions have been put in place hastily. Many digital changes are adapting existing pathways and models of care, and there is an opportunity to positively disrupt the patient journey. And some of the greatest barriers to digital care remain – lack of interoperability between systems, ageing and inadequate digital infrastructure, inconsistencies across digital platforms, and the lack of necessary skills. Despite the extraordinary progress, there is more to do to drive truly innovative transformation and these changes will need to happen in the context of a pandemic which is continuing for longer than many initially expected, rising waiting lists, and increasing health inequalities. Systems will need to develop new ways of thinking and use new technologies to disrupt the health ecosystem.

In response to this extraordinary crisis, and the possibilities and challenges that lie ahead for health and care organisations, we have decided to reshape our research into a series of short essays.

These essays will seek to capture the learning from COVID-19, against a backdrop of the unstoppable advances in technology that are propelling healthcare into a new era.

There is no appetite to revert back to the way things were prior to COVID-19, with face to face care as default. This period has been a remarkable experiment in behavioural change. But it hasn't been perfect. Solutions have been put in place hastily.

Our themes of **culture, money, skills,** and **partnerships** are as relevant as they were before the pandemic – if not more so. Through this series of essays, we will chart a course for health and care organisations to navigate the opportunities that the digital revolution presents while resetting systems in the aftermath of the crisis.

3

Getting the culture right

Getting the culture right

Culture makes a bigger difference than technology

Successful innovation requires cultural and behavioural change. To make transformation stick, staff must feel empowered to adopt and champion new ways of working. Supporting this change demands an understanding of the cultural values that underpin the NHS and its workers, and technology must reflect these values and meet the needs of the workforce.

"

I am absolutely of the view that culture is instrumental to any kind of transformation in the NHS, but particularly one that includes the adoption of technology."

NHS clinical entrepreneur

When we interviewed senior NHS stakeholders, they repeatedly reflected on the importance of using technology to enable efficiencies that give staff the time to focus on the patient-centric aspects of medicine. Patients too saw the value of technology in making improvements. They expect clinicians to share data between organisations involved in their care – 87% of people are happy with this (Opinium – Jan 2020).

54%

of those surveyed say that overcoming cultural resistance to innovation was a key challenge to adopting technology in the NHS.

Source: Survey carried out by HIMSS on behalf of PwC

Technology can create a culture that allows time to care

In the 1930s Maynard Keynes claimed that advances in technology would lead to widespread 'technological unemployment' and suggested a 15-hour week as jobs became increasingly automated. It's hard to imagine NHS staff working a 15-hour week anytime soon. However, technology does present an opportunity to shift the role of clinicians away from repetitive tasks and towards spending more time caring for patients. Productivity in the NHS has already increased dramatically since 2010/11, and significantly more quickly than in other sectors. While this is good news, much of the rise in productivity has been driven by wage stagnation and recruitment challenges. The result, in part, is a workforce which is tired and working at or beyond capacity.

Our research found 54% of those working in health industries felt overcoming cultural resistance to innovation was a key challenge to adopting technology in the NHS, and several recent surveys have found that staff morale is low. Policy makers and leaders must take the risk that good will is in limited supply seriously and act on the opportunities that technology presents to improve clinicians' working practices by thinking critically about what it means to improve productivity and outcomes.

The NHS must rethink what productivity means. By using technology to automate processes, staff time will, by many measures, become less productive. Both caring and health outcomes – if we consider them as commodities – are difficult to measure in throughput or cost per unit of time and, as such, more time spent caring and less time spent performing administrative or process heavy tasks could be misinterpreted as inefficient. The NHS needs to rethink how skilled, clinical time should be spent as technology relieves staff of certain duties – particularly in light of the growing backlogs that will be a legacy of COVID-19 for some time to come.

There is an opportunity to achieve this cultural shift. As we've stood on our doorsteps to "clap for carers", we have, as a nation, acknowledged that some of the lowest paid in our society offer something that we profoundly need and value – care. The NHS must rethink how we use technology to create space for people to be less "productive", and how it values time spent in human, compassionate, emotionally challenging tasks.

> " In the UK, the biggest challenge is the culture of shifting our focus from what we are doing right now to a redefined future and thinking differently is hard because people don't have the head room to do it ...ultimately, if we are really serious about adopting digital technology to transform healthcare, we need to change our entire approach to its delivery."

Healthcare scientist

We see two big areas where time can be diverted. The first is the human side of healthcare, which cannot (even as the field of "artificial empathy" grows) and should not be automated. The second is in innovating and scaling – which require stakeholder management, creativity and other human centric skills. Time for these things should be set out in job plans; consultants should have programmed activity (PAs) set aside for working on innovative projects and it should form part of their job description and appraisal. Organisations should have an expectation that staff are engaging in ways to improve care through technology and they should be paid to do it.

There is an additional advantage. How the NHS capitalises on this moment could build the will and trust to allow for future, more ambitious technology-enabled transformation programmes. COVID-19 will disrupt the health service in ways not seen since its founding, and there is the potential to use technology to bring about fast, seismic change in working patterns. GP video conferencing usage across the UK has sky-rocketed, with the average clinic in Scotland seeing a 1,000% increase in its use. The experience of patients and clinicians has been varied; a clinician operating largely through virtual clinics as part of the pandemic response told us "it's not exactly why I became a doctor, but I can't deny it's efficient." The evidence for efficiency is emerging and mixed (there is evidence to suggest that telephone consultations are more efficient when used appropriately), but COVID-19 has forced the hand of the NHS. There is a risk that technological change is occurring without the investment in cultural buy in, critical application to pathways and change management to sustain it and ensure that technological changes are made thinkingly and applied where evidence backs up their use (and if the evidence doesn't exist, then that robust monitoring is put in to develop and share it). If we can maintain efficiencies that allow clinicians to deal with simple, routine cases quickly and safely, it has the potential to enable them to do the things that are aligned with why they became part of the NHS – those which add value but need more time.

To develop a culture of innovation, the NHS needs to be serious about getting the basics right

From speaking to clinicians and service users, we know that plenty of people who interact frequently with the NHS have ideas on how technology could improve their day-to-day working.

"

I think the technological advancement that will impact the NHS most in the future will be something quite simple and basic, like secure communication systems, like interoperable electronic patient records. These are things that other sectors have as a standard."

NHS clinician

Henry Ford reputedly said if he'd asked people what they wanted, they'd have asked for faster horses. While there's room for revolution on the scale of the motor car (robotic surgery; genomics; AI diagnostics), if the only focus is on these, we lose sight of the fact that we still have a workforce using clunky, analogue solutions for everyday problems. Anecdotally, this is leading to widespread frustration and patient safety issues. Ultimately, getting the basics right will be essential for building a culture of trust in change – when your workforce is making do with donkeys, faster horses is not a bad starting point.

Asking a workforce to engage with and trust organisations and systems with the level of large-scale transformation which the NHS requires to achieve the type of revolution imagined by Henry Ford is unreasonable if the technology fails to meet the needs and expectations of the workforce using it.

Taking this further, the NHS has a huge asset in an intelligent, highly skilled, well-trained workforce – and not engaging with them on how technology can make their roles more efficient and effective would be a waste. Part of the solution will be to invest as much in technologies that simplify the systematic complexity of the health system (e.g. population health management or patient records and communication) as in complex innovations that solve specific challenges (e.g. robotic surgery; genomics).

Our polling showed how keen NHS staff are for improvement and basic standards: 42% of respondents felt that mandating technology standards was the highest priority change that could be made to the UK health and care system – second only to digitalising access. The latter has seen an extraordinary catalyst in the form of COVID-19 – but there's a clear lack of confidence that organisations can get the basics right without being forced into doing so.

42%

of those working in healthcare think that mandating technology standards should be held as highest priority for improving our health and social care system.

Source: Survey carried out by HIMSS on behalf of PwC

Research shows that innovation works best when the end-user is involved in solution design, delivery and implementation

How can the NHS create this culture of change? Innovative solutions developed from within services are more likely to be implemented and accepted than those created by external force. An example of rigorous application of this principle is the Veterans Health Administration (VHA), which launched the Diffusion of Excellence Initiative in 2015, aimed at replicating, scaling and spreading innovations developed with greatest potential for impact and positive outcomes.

After strict impact evaluation, these programmes are refined and rolled out. It sounds labour-intensive, but it works; frontline VHA staff have submitted more than 1,676 programmes, 47 of which have been replicated more than 412 times in Veterans Affairs hospitals across the USA. The impact is improved care for more than 100,000 veterans and approximately $22.6 million in savings for the VHA. With time and investment, this structure could be replicated in the UK. Here, Integrated Care Systems (ICSs) are better placed to champion and nurture local innovation than individual Clinical Commissioning Groups (CCGs) or individual providers. Working closely with local partners and resources – universities, Academic Health Science Networks (AHSNs), local technology companies – could further embed ideas as local, community-grown solutions and tackle challenges like Kate's (see Kate's story).

ICSs should identify, review and analyse grassroots changes across the country during the crisis and provide the support, resource and expertise to improve and scale – and they should be given funding to do this. The resources and expertise to innovate exist within the NHS and the higher education sector as a network of leading research organisations. The challenge is to make sure that researchers and clinicians are equipped with the skills to scale, and to recognise the skill set (entrepreneurship, patient involvement, stakeholder management, business case development) required to do this. There are some great examples in the UK: Greater Manchester is collaborating with the University of Manchester, which in 2019 announced its launch of the Christabel Pankhurst Institute for Health Technology. The institute will develop technologically enabled healthcare products and services. These will follow an accelerated pathway to clinical use through Greater Manchester's devolved health and social care system moving from bench to bedside in less than a year. ICSs should be encouraged to pursue similar routes, identifying, funding and scaling innovation locally.

Case study:

Kate's story

Kate is a community nurse working in a rural part of south east England. Kate sees about 12 patients in a day, and drives, on average around 90 miles a day to see them in their own homes.

Kate estimates that she spends 50% of her time on administrative tasks, journey mapping and travelling, and 50% on patient care. She worries that more technology will mean more time in front of a computer and less time seeing patients. She also wants to be able to make decisions about acuity and feels strongly that a 'computer can't feel if a patient needs more support'. As such, Kate thinks scheduling and route-mapping could be automated. She imagines a system that could map her journey between patients and tell them when she is about to arrive. However, she'd like to be trusted to override this system if she knew a patient needed prioritising. It would make Kate's day much more efficient, with less time planning and more time with patients and clinical tasks. However, she doesn't feel empowered to suggest these changes, or know the route to making it happen.

Leadership at board, organisational and ICS level needs to feel empowered to embrace technology and lead on innovating change through tech powered healthcare

Changing cultures within large, complex organisations is challenging and not something that can be centrally mandated. Leadership should be driving this cultural shift in the knowledge that there is an imperative for patients and staff to use technology that makes healthcare less process focused and more patient focused.

"

I wish that more technology meant less administration. I wish that it meant less red tape. In my experience, technology has created more red tape and more administration."

NHS clinician

The current NHS leadership needs to do more to ensure it has the right skills, structures and experience at board level to empower the clinical and research community to provoke change and innovation through technology. This view was echoed by several of the senior NHS stakeholders we spoke to. They felt that leadership was too insular and relied too heavily on 'born and bred' hires. With an industry as complex as health and care, there is value in hiring from within as it means people have a deep understanding of the sector. However, our interviews showed that the NHS needs to accept insight from outside to inform progression and modernisation.

"

I think the UK needs to say healthcare is a digital business. We need to mandate the level of digital leadership at boards and execs level. The 'old school' approach needs a complete change to drive a different view of the culture. That is not happening. No IT Director or CIO should be reporting to an accountant, a finance director."

Director, NHS commissioning support unit

At an organisational level, boards need to be better supported and incentivised to develop the capabilities needed to make good decisions about technology and digital services. This may involve challenging the makeup of boards in the NHS and questioning whether boards have the right mix of skills. Ultimately, as health and care services change, more needs to be done to attract relevant skills which may well sit outside the current system. Currently, only a handful of Global Digital Exemplar (GDE) trusts have anyone on their executive board with significant experience either outside of the health sector or in working with technology, which is celebrated on their websites. This suggests that either boards are only recruiting people with NHS experience – or that experience elsewhere is not seen as valuable enough to highlight.

NHS foundation trusts	Number of exec board members with tech or digital experience listed on trust website / total board members
Trust 1	2/12 (~17%)
Trust 2	1/17 (~6%)
Trust 3	1/13 (~8%)
Trust4	1/17 (~6%)
Trust 5	0/13
Trust 6	0/13
Trust 7	0/13
Trust 8	0/13

Source: We searched for significant technical or digital experience in the biographies of all listed board members in each trust's website.

Recommendations

1

ICSs and other NHS bodies should be responsible for and incentivised to create a local culture that solves problems using technology.

ICSs should be encouraged to develop a 'sandbox' approach to operational inefficiencies, which should be funded by central money that ICSs can apply to having piloted ideas. This would support the scale-up and the cost of working with AHSNs to independently assess the impact of solutions.

2

Boards should recruit people with the skills that allow them to lead on technological solutions and implementation plans.

The NHS does not have the skills, at scale, to lead on technology. It needs to look outside for the right skills to bring in, requiring a cultural shift to recognise the importance of these skills alongside more conventional board roles.

3

User experience should be at the heart of developing solutions.

User experience of technology solutions is consistently cited as poor, leading to frustrations and delays at best, and patient safety issues at worst. To get the most from technological advances – particularly where there is an intention to drive efficiencies – communities and practitioners should be as involved as possible in the design process.

4

Innovation should be part of the day job. People must be paid to innovate and to spread ideas.

People do not convert overnight. The average amount of time taken to spread from conception to widespread usage is seven years; this is time we do not have. For innovations identified as a priority, clinical time should be protected for training and advocacy to promote spread, and programme management time should be dedicated to scaling.
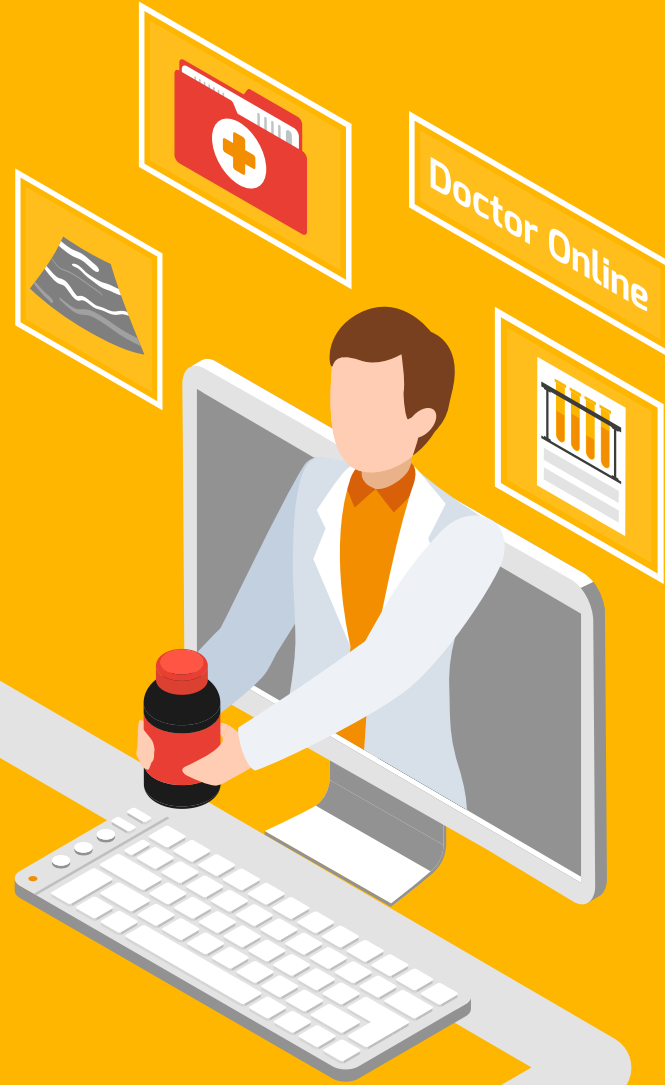
4

What does the polling show?

What the polling shows

We surveyed healthcare industry professionals and the public about their attitudes towards the adoption of technology in the NHS. Here's a snapshot of what they had to say:

Healthcare industry professionals

Source: Survey carried out by HIMSS on behalf of PwC

What are the priorities for transforming the health and social care system?:
(We asked respondents to rank their top three)

Digital access to NHS services
62%

Mandated technology standards
42%

(Remote) accessibility of patient records
33%

Ensure NHS systems and data are secure
31%

Decision support
30%

Artificial Intelligence (AI); intuitive tools to capture data
30%

What are the major challenges to adopting technology in the health and care system?:
(We asked respondents to rank their top three)

Cultural behaviours
54%

Outdated IT infrastructure
46%

Lack of funding
44%

Data silos in healthcare organisations
30%

Complex NHS procurement processes
27%

What most needs to change about the way technology and innovation are funded in the NHS?

Culture 33%
Funding for technology is risk averse

Investment 22%
Funding for technology is insufficient
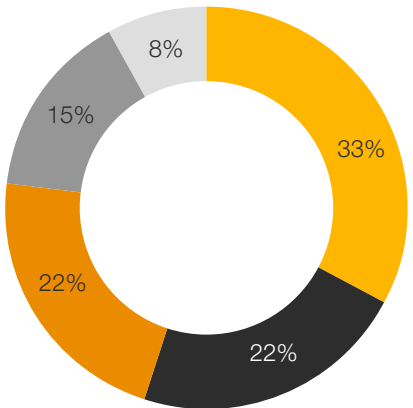
Incentives 22%
Funding for technology does not create incentives for sustained innovation

Process 15%
Funding processes are outdated

Pace 8%
Funding cycles are too slow

33%

22%

22%

15%

8%

The public

Source: Survey carried out by Opinium on behalf of PwC (August 2020)

We asked a nationally representative sample of the general public about the use of technology to access healthcare during the pandemic.

Which of the following medical services, if any, have you accessed during the coronavirus pandemic?

Phone consultation with GP or specialist
31%

Face to face consultation with GP or specialist
16%

NHS 111 phone line
11%

NHS 111 website
10%

Video consultation with GP or specialist
9%

I haven't accessed medical care during the coronavirus pandemic
49%

52%

feel a doctor needs to see them face-to-face to provide the care they need.

43%

found virtual appointments more difficult than face-to-face appointments.

Thinking about your own health, have you used technology or medical devices at home to monitor any of the following?

Weight
43%

Steps
36%

Heart rate
33%

Sleep
27%

Blood pressure
27%

Temperature
26%

Sugar level
17%

5 Patient stories

Technology has the potential to improve patient experiences and outcomes in fundamental ways throughout the health and care system, and there are many instances where this transformation is already taking place. Here we present some examples of patients reaping the benefits of tech powered healthcare in action.

Jill's story

Jill, 75, has early stage dementia. She's been just about managing in her own home for some time, but following the death of her husband, Roy, Jill and her family have decided that she needs the support of sheltered accommodation. However, while Jill can no longer cope on her own, it is important to her and her family that she maintains some independence.

The sheltered accommodation has a number of carers on site, but also has installed a "smart meter" in each apartment. The device can track Jill's everyday movements and flag any sudden changes in their day-to-day routine – or problems such as a hob being left on – to a resident carer, Sarah This gives Jill much wanted privacy, and her family confidence that she is safe.

Recently, the monitor has picked up on a disruption to Jill's routine – she drinks a lot of tea, and she is beginning to more frequently boil the kettle later in the evening. Sarah is notified of this change through an app on her phone, and checks in on Jill.

She notices Jill seems more confused than normal and suspects she might have a UTI. The carer helps Jill to use an AI kit which includes a urine collection cup, a standard dipstick, and a colour-board, all of which is connected to a mobile app. Her results are sent to her family and GP, who can together assess whether her urine is the likely cause of her increased confusion and discomfort and, if so, prescribe her the appropriate medicines or whether she requires an in-person assessment.

She continues to check Jill's routine to see if it has settled down to normal, or whether she needs to flag the data to her consultant to assess whether her dementia has got worse.

Ali's story

Ali, 60, has diabetes and has been struggling with his vision. He has been referred to Moorfields Eye Hospital by his optician for a retinal scan. The scan is interpreted automatically by AI-assisted technology, which allows the specialist to diagnose his condition with confidence, saving clinical time, and increasing accuracy.

Ali is diagnosed with a damaged retina. As the damage is severe, laser treatment is not an option and he has been advised to consider a different type of eye surgery to remove blood and scar tissue. Ali decides to have his surgery performed by a surgeon assisted by AI robotics. In this instance, the "robot" gears the tip of the surgical tool, as overseen by the surgeon, to allow more precision than is possible for a surgeon working unaided.

After receiving treatment for his eye condition, Ali fears he may have contracted a postoperative infection.

He checks his symptoms on an app which can understand natural-language statements such as "I have a headache", asks follow-up questions, and compares the data to people in a similar situation to Ali to identify a potential diagnosis for the user's symptoms.

The app uses machine learning to improve its accuracy over time. Ali is reassured his symptoms are normal, and knows he can follow up with his consultant over a video call if he is still worried.

Jordan's story

Jordan, 15, has recently been diagnosed with type 1 diabetes. Jordan's mother was at first worried about how having type 1 diabetes would affect his day-to-day life. However, his doctors have prescribed him Continuous Glucose Monitoring (CGM) System through the NHS.

The CGM system is about the size of a £2 coin and automatically measures and continuously stores glucose readings day and night, which are linked to an app. This system frees Jordan from the hassle of constant finger-prick tests and alerts him when his blood sugar is too high or too low.

As he gets older, it is decided that an intravenous insulin pump would best suit his care as he is unable to control his sugar through single use of the CGM system. Jordan starts using an insulin pump that employs an algorithm to accurately mimic the actions of the pancreas. More specifically, the technology tracks and predicts blood glucose fluctuations in the user and automatically delivers the exact dose of insulin they require.
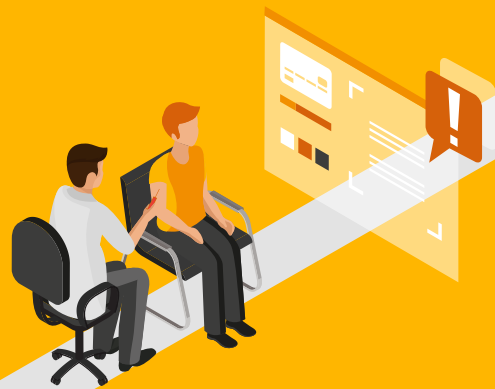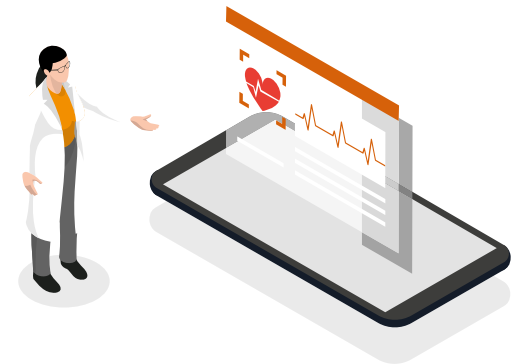
Dr Karim's story

Dr. Karim is an A&E consultant in London. In the past three winters she has had to regularly divert ambulance crews away from her department when it reached maximum capacity and was unable to cope with any additional demand.

To combat these issues, a team of doctors have come together from across the hospital to challenge issues with patient flow. In particular, they wanted to test the most efficient patient flows from A&E into other departments to ease capacity. The team are making use of a simulation model, which can simulate different scenarios to work out which combination will help patients flow through the hospital most effectively, so that there isn't backlog for patients coming into A&E. To do so, the model uses historical data and simulation modelling to identify bottlenecks in patient flow and improve movement through the system.

Using this model, the teams were able to re-imagine patient flow through the system, simulate the changes, and put them into action to reduce the amount of time people spend in hospital.

Impressed by the outcomes of this model, Dr Karim decided to employ more innovative solutions in her A&E department. She began using a decision-making tool, supported by machine learning technology, to help her and her staff identify patients more prone to cardiac arrest and hence require emergency procedures. This tool worked as a decision-making aid for doctors to help with their judgements as based on historical patient data, and proved most useful to younger, less experienced A&E doctors.

It's not about the technology.

While Jill, Ali, Jordan and Dr Karim's stories might seem futuristic, they are all using technologies that exist. They're not, however, real people. The technologies that are available aren't being rolled-out at pace within the health and care service, even where these technologies have the potential to dramatically improve outcomes, improve experience, or reduce costs.

What is holding us back? For Jill, some of the issue is a fragmented system which struggles to share data between different parts of the care system. **Data flows** within NHS organisations are challenging enough, and building **information governance and data sharing agreements** between the NHS and private providers is more challenging still. There are **privacy concerns** surrounding being monitored, particularly if we are unsure as to how, where and why that data is being processed, and safeguards need to be in place to prevent vulnerable people like Jill being exploited. As for her AI dipstick test and virtual lab, the **funding flows aren't aligned** to allow this to happen easily. Currently the privately run care home would likely pay for the test, but the saving would be seen by the NHS as an admission is avoided.

Ali's experience is maybe closer to becoming a reality. Robotic surgery is becoming more common, but **it doesn't always offer better outcomes** than surgery performed more conventionally at a lower cost due to taking longer to set up, even if costs are dropping and outcomes are improving. If it is to continue to improve, a decision must be made as to whether to

fund more expensive treatments in the short term in order to create improvements in the long term. Virtual appointments too are becoming more common, but **a lack of consideration of their impact on traditional care models has damaged trust** in how sustainable they can be. The opportunity to use big data to support decision making and to compare best practice outcomes is an exciting one, but getting **consent to use data** for this purpose can be arduous, and using 'opt out' principles isn't universal.

Jordan's management of his life long condition has the potential to be changed by technology. As the use of this technology has increased in popularity, the **risk to cybersecurity grows**. Cybersecurity firms have warned NHS trusts that cybercriminals could hack medical devices that would enable them to disable intravenous pumps or change doses.

Finally, Dr Karim's using data to change how her hospital cares for patients, opening the possibility to improve the care of a vast number of individuals. The idea of prototyping to problem-solve has been used since Apollo 13's oxygen tank exploded in space, and NASA used a

model of the spaceship which was safely on the ground in Houston to test ideas and ultimately to instruct the astronauts how to build a makeshift air purifier. However, using historical patient data to create these prototypes raises challenges around **data accuracy and depth,** and the challenges of trying to quickly instil change in an environment that prides itself on being evidence based, and holding the randomised control trial as the gold standard of evidence. Developing a culture where it is possible to **try something out and to fail fast** is hugely difficult, especially when doing it in real life could cause genuine harm.

Technology has the potential to transform care. But the challenges the health and care system needs to work through in order to realise the potential isn't one of wires, algorithms, or even robots. In some ways, the technology is the easy bit. Transforming the culture of the health service into one which can adopt and spread innovation quickly will require serious investment of money, time, and creativity.

6

Getting the money right

Getting the money right

The NHS needs sustained investment to provide the foundation for a technologically enabled system

We repeatedly heard calls for the NHS to become a technologically enabled sector. In order to do this it must make investment in the same way as any organisation looking to make technology a differentiator – by making the funds available to create significant, strategically driven change. While there have been several welcomed announcements in technology investment in the last few years, as well as high profile spending commitments in specific AI programmes, there must be investment in the basics that organisations need to make the most of it. Current capital processes force trusts to choose between clearing backlog maintenance and upgrading computer systems – there needs to be room for both.

When the NHS has set substantial sums aside for digital transformation, reports are often of widespread underspending on technology and of funds being redirected to offset pressures. Following a government announcement of £4.2bn of technology funding in 2016, £250m remained unspent in the first year. Why is this happening? Complex processes surrounding large scale investment can be a barrier, and business case development and due diligence can slow spending down.

When the country moves towards something representing stability or recovery, the government must resist the temptation to divert technology funding to meet other demands and instead see bringing technology up to standard as part of the solution. Being able to articulate the clear role that technology plays in resolving the COVID-19 backlog and in developing the efficiencies required to move forward will be essential.

COVID-19 has provided an incredible example of the speed of change that can happen with a more permissive approach – and the obvious and immediate challenge of tackling a global pandemic forces immediate problem solving. It has also shown us that, in some cases, the infrastructure to do significantly more with technology exists but wasn't being used well enough – there's more that can be done to use assets that are already in place and to make gains without huge investment. When choosing where to invest in future, policy makers, system leaders and organisational leads need to keep focus on the challenges that COVID-19 has highlighted, while keeping in mind that the public appetite for a wholly digital NHS is limited – 43% of those we surveyed felt that virtual appointments were more difficult than face-to-face ones. This figure, surprisingly, was highest among 18-34-year-olds (reminding us that assumptions about how people wish to access care aren't always accurate or simple).

We would suggest caution against financial penalties which focus entirely on acute trusts getting activity back up to pre-COVID-19 levels. This approach lacks risks penalising trusts who are using COVID-19 as a catalyst to think in a genuinely creative way about delivery of care, and risks driving systems towards short term, piecemeal solutions which could in the longer term prove inefficient. Of those we surveyed working in the health service, 33% felt that a risk-averse approach to investment in technology was preventing innovation – and in the rush to recover there is a big risk that trusts ignore the huge opportunity to capitalise on the innovations that the pandemic has made necessary. Where systems can demonstrate that they are using technology to reduce the need for referrals and to increase the amount of care delivered in a community setting with specialist (virtual) input, this should be welcomed. There is an enormous opportunity to invest to build an NHS for the future and it is crucial that the financial regime doesn't deter organisations and systems from taking advantage of this.

33%

felt that a risk-averse approach to investment in technology was preventing innovation.

Survey carried out by HIMSS on behalf of PwC

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In order to adopt new technology, we need some head room. We need the ability to re-designate some of that resource, so we can spend it on other things. Now the challenge we have is the amount of expenditure on digital and technology currently in the NHS is between 1.5 and 2% at the upper limit, and in a more effective health system, we would be expecting that balance to be somewhere closer to 10%."
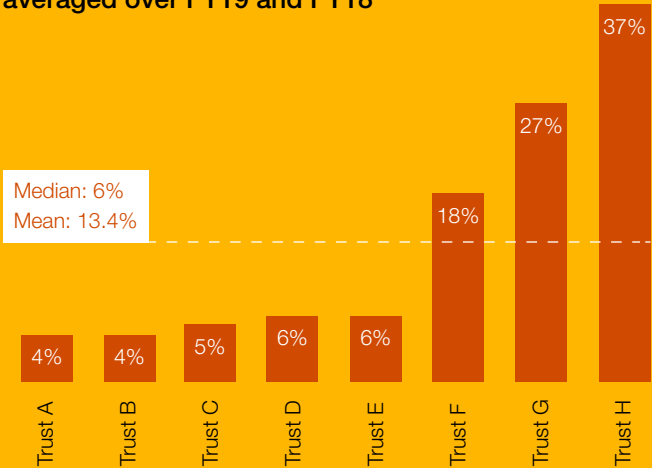
Director, NHSE/I

Good technology is expensive, but not as expensive as bad technology

We asked junior doctors what technology they saw making the biggest difference to how they cared for patients, and the answer was unanimous: they wanted to see electronic patient records, and electronic prescribing. One asked for a computer which reliably turned on. These are not complex asks – there's no R&D required here. These are junior doctors, passionate about driving change in their organisations. Several were trying to push change at a grassroots level, but their ambition around technological advances was limited by the fact that they spent so much time being frustrated by the basics not being in place.

It highlights the fact that technology in the NHS has been systematically underfunded in a capitally constrained system, despite the evidence that there is a significant return on investing in R&D. We looked at the annual reports for several GDE trusts to understand how they were spending their money – both in terms of capital expenditure (capex) and revenue. The median IT capex spend was 6%, and the median revenue spend just 0.45%.
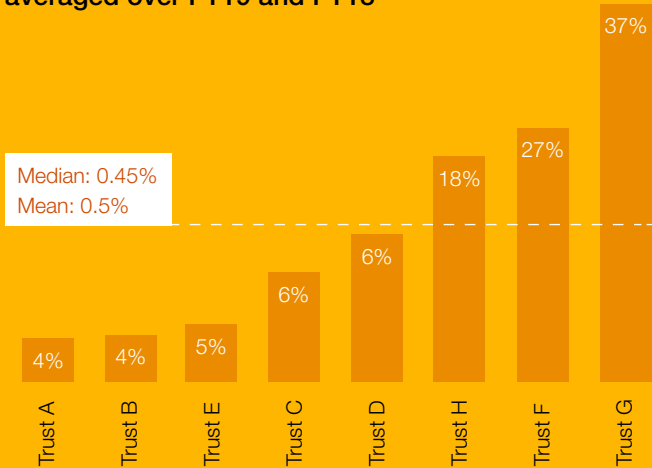
These figures are remarkably low for organisations which are, according to the NHSE description, "internationally recognised NHS provider[s] delivering improvements in the quality of care, through the world-class use of digital technologies and information". And we're starting on a back foot – according to OECD data the UK has significantly fewer CT scanners and MRI scanners per million population than other OECD countries (for the last year there is data for the UK – 2014 – there were an estimated 9.46 CT scanners in the UK per million population against an OECD average of 25.25).
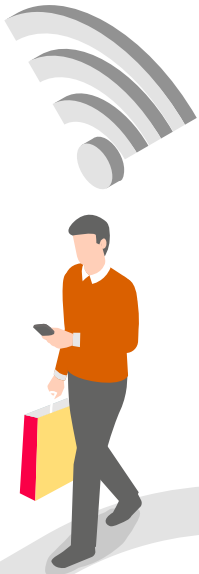
If we take an example of an organisation which is often cited as world-class in how it delivers care through technology, Kaiser Permanente, we find a different view on technology investment. Spending on technology at Kaiser is as critical as another hospital or medical office building: around 25% of its capital spending each year goes on technology. Kaiser views technology as integral to integrating care; by focusing investment on 'changing the centre of gravity of healthcare' it aims to create multiple access points to care, making it more convenient and more affordable.

> " There is this constant push for investment in technology to be capital funding but most of the agile innovative systems are offered as a service requiring revenue. This needs urgent review."

Director, healthcare industry

IT spend as % of capex averaged over FY19 and FY18

Median: 6%
Mean: 13.4%

Trust A	Trust B	Trust C	Trust D	Trust E	Trust F	Trust G	Trust H
4%	4%	5%	6%	6%	18%	27%	37%

IT spend as % of total revenue averaged over FY19 and FY18

Median: 0.45%
Mean: 0.5%

Trust A	Trust B	Trust E	Trust C	Trust D	Trust H	Trust F	Trust G
4%	4%	5%	6%	6%	18%	27%	37%

Source: review of NHS annual reports

Current spending on technology across local and national NHS organisations is around 2.7% of the total NHS budget. In 2017/18 this amounted to £3.5bn against a total budget of £130bn. The Government has pledged investment into NHS technology – the £40m set aside in January 2020 for improving computer login times is just one of many recent instances of this – the amounts are often relatively small and directed at a single challenge. These injections of cash are much needed and welcome but the system would benefit from a systematic approach to technology investment.

In interviews, we repeatedly heard that it was difficult to commit to investing in technology at an organisational level, due to limited sustainable funding mechanisms, a complex capital regime, and a barrage of more immediately pressing concerns. One way of supporting systems and organisations to make the right decisions about investment would be to create a centrally held fund which organisations could bid to borrow from, to invest in technologies that would help them make back office efficiencies. Organisations or systems would then pay back the loan – with a gain share arrangement – over the period set out in their business case, starting at the point where they planned for efficiencies to be realised.

Such a fund would need to be flexible enough to cover both capital and revenue investments (cloud-based solutions, for instance, are generally accounted for as revenue), or a mixture of the two. Business plans should be submitted at an ICS level, rather than an organisational level, to avoid piecemeal, duplicative solutions and to encourage interoperability at system level. And risk should sit with the organisation – overly inflated business plans would be discouraged as the organisations will have to pay back the loan at the rate their believed efficiencies could be made.

Don't digitise your current organisation: build the digital organisation the system needs in the future

Our research showed there was public appetite for increased spending on technology – 59% of respondents felt it important for people using the NHS to have access to new technologies, and 40% would be happy to see tax rises to pay for this. However, our research also showed that people really value the human aspect of care – while 43% of those we surveyed felt that accessing care remotely was more convenient, over half of respondents felt they needed to speak to someone face-to-face to get quality care.

The NHS should be investing heavily in areas where technology can support decision-making or automate repeatable processes, freeing up time for parts of the service where human interaction is far more significant. Authentic human connections are at the heart of caring, and for the human element of care to work well there are some minimum capabilities that need to be in place. Clinicians must be able to make diagnoses, to recommend treatments, and to have informed, sensitive conversations with patients. They must be able to find information when they need it. Tests must happen in a timely way. The technologies that enable care, for instance technology used in surgery or diagnosis, should be up-to-date, evidence-based and reliable.

Natural language processing that takes clinical notes, checks prescribing, and informs research, should be available to support clinicians. Communication tools which allow someone to undergo complex, ongoing treatment with minimal impact on their everyday life should be commonplace. We should be used to technology being part of our healthcare journey.

Technology has its limitations. While people might be comfortable with AI being involved in diagnosis, a machine cannot talk them through the options for treatment, engage with them about the impact on their family and finances, or physically and compassionately care for them through invasive treatments. The human aspect of healthcare cannot and should not be undervalued or underinvested in. But not all organisations that make up our health system are involved in direct patient care. In Clinical Commissioning Groups (CCGs) up and down the country, decisions are being made about service provision.

These decisions span everything from how many hospital beds will be needed for an ageing population, to the best contractual levers to drive improvements. They include how to identify and understand the segment of the population at risk of developing expensive, long-term conditions in the future – and should include identifying the moments when it's possible for that individual to make a change. The purpose of the NHS remains about people – however, decisions made with and about people can be enhanced by using exceptional, secure, clean data.

In this context, parts of the NHS become more like a data-driven business whose function is to support planning and decision-making to ensure people can access the right services at the right time. As the role of CCGs changes and develops into something more like a data-driven organisation (we use CCG here to describe the planning function of an ICS in future), the level of investment in infrastructure and individuals with the right skills should be increased proportionately. This will, undoubtedly, take investment.

Recommendations

1

The recovery from COVID-19 will be expensive, but technology should be seen as a crucial part of this solution.

While recognising that there will be economically challenging times to come, investment in technology must remain a priority and any temptation to see it as discretionary spend should be resisted.
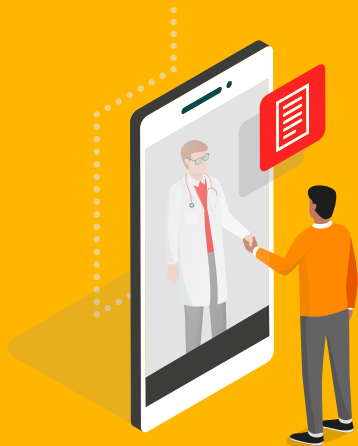
2

While eye-catching investments in new technologies are important, there should be significant, sustained, ring-fenced investment in upgrading current systems and infrastructure within organisations.

Trusts spend around 2% of expenditure on technology. This is not sufficient when the basics are so often not being achieved.

3

There should be innovation funding for systems to make efficiencies through technological solutions.

The experience of COVID-19 has demonstrated that infrastructure must be in place to allow for seamless communication, video consultations and sharing of large data sets. This money should be bid for at system level, with a view to paying back the loan as efficiencies are realised.
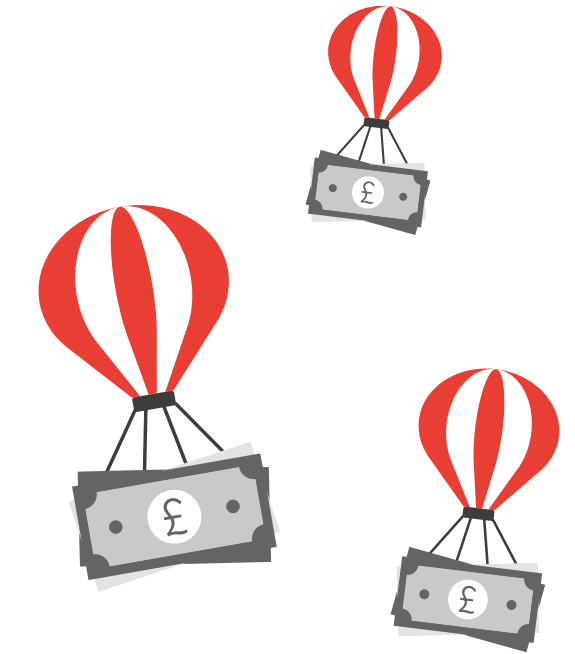
7

Getting the
skills right

Getting the skills right

The NHS needs to urgently invest in large-scale digital skills-building to support the health system to embrace tech powered healthcare

Technology is already changing what it means to deliver care, and the pace of change is increasing as the healthcare system grapples with COVID-19. Staff, patients and carers will all need new skills to ensure everyone involved in the patient journey can get the most out of new technology.

The NHS needs to urgently invest in a large-scale digital skills-building programme to build on the positive steps that have already been made, such as the creation of programmes like the Technology Enabled Care Services (TECS) Resource for Commissioners and the positive proposals within the Topol Review. Continuing to invest in these types of resources and training programmes in the NHS will be integral to realising the full benefits of tech powered healthcare.

It is not overstating the case to say that the convergence of technologies – in the form of digital advances, AI, genomics, robotics – is set to revolutionise healthcare. For patients, it will mean having access to more of their own health data and therefore a more patient-led model of healthcare, but it will bring new risks, particularly around data security and accuracy.

It is now vital that staff and patients understand the technology and all its implications – and new roles are introduced where necessary – so they can make informed choices about these solutions.

Technology will be an essential component of care for all: engagement and training will be needed for a truly patient-centric model of care

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In a 20-30 year period, we will probably be at the point where we can see the redefinition of healthcare become real to the point where it is no longer clinician and profession dominated, but it has at that point transitioned to being citizen centric."

Director, NHSE/I

Technology has already triggered a seismic shift in traditional healthcare roles. Healthcare will rapidly move towards a situation where patients frequently have more data about their health to hand than their doctor, which will drive a shift in care delivery away from the current paternalistic model of medicine to a patient-led model. Already, we have seen huge progress in the field of personal medicine and medical devices to support this transformation.

As care becomes more patient-centric, patients will need the skills to understand all the health data available to them and how it could be used to manage their conditions. While a good user interface goes some way to provide this insight, patients still need support and training. An example of this kind of training is the Widening Digital Participation Programme, which worked to reduce health inequalities among older people and disabled people by training them to use online health resources.

So far, more than 140,000 people have been trained, of whom 34% have fewer GP visits and 64% improved their diet. This type of training should not be limited to patients, but extended to their carers, as technology has the potential to hugely improve their quality of life by providing opportunities for both increased standards of care and more respite.

"

We are still focused on the tech as opposed to the outcome, which is that the patient is in control… but that is going to require us to change the behaviour of the workforce and try to re-educate the population."

Director, NHSE/I

This training should form part of a wider system plan, and the NHS will need to ensure that clinicians and health care professionals can adapt to their new role in this patient-driven system. Then training opportunities should be designed which bring long-term conditions management out of a medicalised setting. For example, digital training to improve health literacy could take place in libraries or leisure centres, instead of NHS estate, or training on how to make use of data about diet could happen in a supermarket cafe. Using the entire community and public estate reinforces the message that health choices should form a consistent part of life, rather than something addressed once a month in the GP's office.

The future will require roles that do not yet exist in the NHS – bold workforce planning is critical

As system-wide training encourages the broader uptake of technologies, we will see a shift in the variety of roles required by the NHS. New technology will make some roles redundant, while others are created in their place. To prepare for this, the NHS needs a detailed workforce plan that caters to the needs of the future NHS. This will detail how the NHS can identify the future capabilities required of their workforce and outline how these can be recruited or built.

First, this plan should look to capture a detailed overview of the current skills mix in the workforce. In 2017, NHS Digital released the Fit for 2020 Digital Capability Report, which laid out a plan to improve its digital capabilities in readiness for 2020. This plan was prefaced by a capability review, which identified clear capabilities gaps and strengths. Using this review, NHS Digital developed a detailed workforce strategy, which aimed to review its recruitment approach and develop targeted role profiles, use incoming recruits to uplift capability mix, and create clear training plans and career paths to strengthen their profile of technical roles.

The broader NHS could learn from this approach, which is touched on in the current People Plan of the NHS Long Term Plan, but which focuses on recruitment and retention and places minimal emphasis on technology capability building, which is only mentioned within the context of the medical workforce (excluding allied health professionals, pharmacists, and dentists).

The NHS now needs to be bolder and move faster to capitalise on the momentum from COVID-19. The role of Clinical Commissioning Groups (CCGs) needs to fundamentally change; as Integrated Care Systems (ICSs) and system working become more formalised a significant portion of their workforce should be dedicated to system-wide data analytics. In short, the NHS will need a data and analytics engine unlike anything in the current system. Workforce planning will, therefore, be critical, and will likely be uncomfortable for some as traditional roles evolve or disappear, other opportunities develop, and the skill mix would dramatically change. We reviewed job adverts in July 2020 to see which CCGs, ICSs and STPs were looking to employ data scientists, analysts and coders. Out of 128 jobs advertised nationwide, we found 14 which listed data, analytics or business intelligence as a major part of the job description. That's only 11% of new staff being brought in by these organisations. Compare this to organisations in the US focussed on care planning: in the same period, 20% of advertised non-clinical jobs at Centene were in technology or data (increasing to 25% when sales and marketing are removed). At Kaiser Permanente, 30% of advertised non-clinical roles were technology or data driven (take out sales and it jumps to 35%). We're falling behind for a modern health system.

The NHS needs to create systems and structures that bolster and celebrate the successes of emerging digital talent

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The workforce crisis will not be solved by recruitment and retention. Boards must have innovators that can change their approach to leverage new AI and robotics being launched to deliver care."

Director, NHS commissioning support unit

With the described workforce plan, we expect to see an increase in the number of technical roles in the NHS, including data scientists, bioinformaticians, and coders. To successfully modernise the NHS, it's vital that this community of technical staff is properly represented, trained and valued as an essential part of the workforce. This requires both a cultural and structural solution (see 'Getting the culture right'). New technological roles within medicine – including geneticists, coders, engineers, data translators – who choose to specialise in healthcare should be supported by a dedicated faculty that represents, supports and advocates for them so that others understand their roles and is given the same level of prestige as clinical Royal Colleges and Faculties. The Academy for Healthcare Science (which holds a professional register of around 1,500 of the estimated 50,000 healthcare scientists working in the NHS) and the Academy of Medical Science go some way to providing aspects of this, but there is more to be done to increase the prominence of their work.

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We're not producing a workforce equipped for the 21st century. Clinicians are trained to have clinical understanding, however, this skill set is not built out to support the development of a broader skill base that encompasses wider, inter-linked problems, including multi-disciplinary working and technology."

Director, NHSE/I

To support these structures, the incoming clinical workforce needs to be trained to understand how these roles operate and where they can be used to support healthcare delivery. When we interviewed junior doctors about their current training schedules,

they told us they did not feel equipped to work closely with advanced technology, nor with the people who would be using these tools.

This must change rapidly so that any student leaving medical school can ask the right questions about big data, AI and informatics; they should recognise the health opportunities in bioinformatics and population health management; they should have as good a foundational understanding of genomics as they do anatomy. Intercalation in health science based degrees should be strongly encouraged and trainee healthcare professionals should also be equipped with the skills to conduct innovation and research projects.

This sentiment is echoed in the 'The Topol Review: Preparing the healthcare workforce to deliver the digital future' and has since been put into practice by Health Education England's 'Future Doctor' programme which outlines the incorporation of 'digital and technological solutions' into training and education as one of the central tenets to creating a workforce that is fit for the future, and on a small scale through Topol digital fellowships. Taking this further, the NHS should develop detailed planning for integrating and embedding these technology programmes into medical, nurse and allied health professional training programmes, as well as setting national targets for this type of training.

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My training at the moment hasn't really touched upon the development of technology in the NHS. I think this topic is one that I look into on my own accord after having frustrations with the current systems."

NHS clinician

Recommendations

1

The NHS needs to urgently embark on a massive upskilling programme for patients, their carers and the broader medical community.

This programme should focus on supporting these stakeholders in adapting to the everyday use of technology in healthcare.

2

Detailed workforce planning is required to prepare for the future. Here, CCGs and ICSs should review their workforce to ensure they are recruiting people with the right skills.

As ICSs become more formalised they should become a data-driven system integrator. This body should look to recruit people who are highly trained in using big data to create and drive population health management, and to understand system demand and capacity.

3

Technological roles should be actively supported as crucial to the NHS.

Essential roles such as coders, geneticists, engineers, data translators should be bolstered and celebrated by structures and systems.

4

Medical education needs to evolve to create a future fit workforce.

In collaboration with HEE and the Royal College of Medical Schools, medical schools need to adapt their curriculums to support the creation of a future workforce with the technological and digital literacy to work as part of a modern NHS.

8

Getting the partnerships right

Getting partnerships right

The NHS and industry must work together to create successful partnerships.

Partnerships with technology and innovation companies will define digital transformation across healthcare. We believe that the NHS can no more transform to become a technology driven organisation alone than it could manufacture all its own scanning equipment, or build hospitals using only NHS staff.

In a world built increasingly on collaboration, on connections that reach across the globe and into every sphere of our lives, our healthcare institutions should also be connected – with each other and with patients – so that they can share learning, innovation and information. Some of the UK's greatest strengths are the diversity of our economy, the vigour of our academic institutions, and the prevalence of innovation across sectors. And while we continue to see world class research and innovation happening in the UK, our health service too often falls behind in implementing and scaling this innovation.

We need to embrace our national assets and invest in creating dynamic, responsive partnerships to address the biggest healthcare challenges of our generation and spearhead a digital revolution.

Our research – conducted with healthcare leaders across the NHS and social care, government, and industry, and members of the public – suggests that most people agree. The majority of healthcare and government leaders think the NHS should co-produce solutions with industry; though software and technology leaders are more likely to suggest an off-the-shelf approach. This is telling: industry and healthcare organisations need to be better aligned in their approach and thinking to overcome differences that can hinder the success of digital implementations. However, our interviews and surveys suggest that the NHS currently lacks the commercial skills and mindset to partner in a way which brings the best value.

Why partner?

The value of partnership working – not only between health and care organisations, but across sector boundaries – has become acutely evident during the COVID-19 pandemic. Strong partnership working was the architect of the sweeping, overnight changes across the healthcare system. The challenge now will be to maintain the unique conditions that the response to COVID-19 has engendered – united purpose, agility, pragmatic risk assessments, pace – that could support a transition to partnerships where all involved genuinely collaborate to deliver better results for all.

Partnership is important. An off-the-shelf technology solution might have benefits – improving care, making services easier and more convenient, and improving efficiency – but we see three main reasons to partner over a build or buy approach:

> "Partnerships between the NHS and the wider healthcare community have been critical to advances in patient care. These partnerships have helped the UK to both sustain our world-renowned NHS and become a global leader in life sciences, with 25 of the world's 100 most used medicines discovered or developed here"

Sir John Bell
Writing for The Times (2019)

Few people we surveyed felt that off-the-shelf solutions were the right model for the NHS (interestingly, we also found an ambivalence towards entirely homegrown solutions) – and even if they were, technologies cannot be lifted and planted in an organisation without a lot of work to shape implementation to the organisation's social context. Thinking about partnership as solely one between the NHS and a technology provider is an unhelpful model; even a simplified illustration of those involved would need to include a dynamic relationship between universities, government, the NHS, industry, patients, and carers.
An important additional benefit of fostering technology partnerships is the economic growth it stimulates: in 2018-19, Academic Health Science Networks (AHSNs) and the NHS Innovation Accelerator invested £152m in innovation and technology companies, and created around 700 jobs.
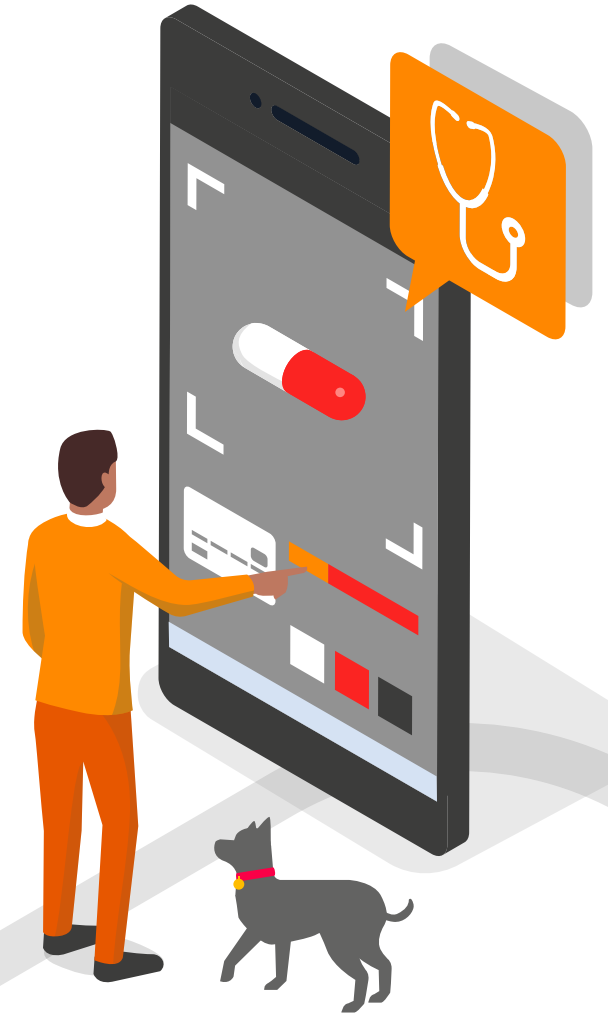
There is a web of support in partnering with the NHS and its complexity forms a barrier to entry

There is a long list of mechanisms for driving partnerships and technological change in the NHS: Global Digital Exemplar (GDE) programme, Research Councils, Collaborations for Leadership in Applied Health Research and Care (CLAHRCs), Academic Health Science Centres (AHSNs), NHS Innovation Accelerator, NHS partnership with techUK, Innovation and Technology Payment Programme, Digital Innovation Hubs, Digital Health Technology Catalyst, Accelerated Access Collaborative, and myriad funding bodies. They operate in different ways and are targeted at different organisations, but all these programmes and initiatives aim to advance digital transformation through financing or supporting technology partnerships in some form.

However, despite some examples of improvement and successful transformation, this many pronged approach isn't always working. Digital transformation in the health and care system remains a huge challenge, and ambitious targets can be missed. One example is the 'Paperless 2020' ambition set in 2015 – in 2019, only 12% of NHS trusts were fully digitised.

Though the intention behind all these programmes – to fund and support digital transformation and the companies that can deliver it – is the right one, the NHS and the Government need to rethink their approach.

Consider the GDE programme: only 27 (of a total of 200) digitally mature NHS providers have been awarded GDE status, and the accompanying funding, since the programme's inception in 2016. Scaling the GDE programme would be an opportunity to tackle digital inequalities and service variation.

There's no shortage of principles, approaches and targets. The UK has a proliferation of national technology standards, frameworks, and strategies to match its array of partnership programmes. Since 2014, NHS organisations and the UK government have set out at least five digital transformation strategies and frameworks. NHS Digital, NHS England, the National Institute for Health and Care Excellence (NICE), and the Department of Health and Social Care have all recently released technology standards.

What is arguably lacking is a coherent way to navigate the system for potential partners, and guidance on how business and the NHS can work together to partner effectively.

Rather than shaking up the landscape further, there is a need for simplification: NHSX should take responsibility for providing real clarity about the function and purpose of the dizzying array of organisations, frameworks and standards, and simplifying wherever possible. We were repeatedly told during our

research that technology companies see the NHS as challenging to do business with on many levels – we heard that it's over complicated; procurement is clunky; there's a closed shop mindset and a suspicion and rejection of ideas from outside. It is NHSX's responsibility to start reducing barriers to entry that exist simply due to complexity.

COVID-19 has shown how a simple solution can work effectively. Several people commented that ambiguity and equivocal guidance around information governance had previously left the NHS and business unconfident about what was permissible. Clear, explicit and bold guidance issued during the pandemic left trusts in no doubt that more was allowed than they had thought – and more progress was made in weeks around data sharing and remote consultations than had been made in years previously. The clear guidance was only one factor in the rapid change, but several people we spoke to pointed to it as an example of a blocker which simply fell away.

> "
> We already have more frameworks than we need – the NHS has a lot of buying power but is one of the most difficult businesses to do business with."

Head of healthcare, international technology company

Getting the partnerships right

Encouraging hyper-collaboration could further drive innovation

There are benefits of partnerships to patients, the NHS and to the wider economy. But, to get the most from partnerships, the NHS needs to start engaging in hyper-collaboration – accept that many of the problems it faces will have already been solved by external companies and research organisations – and build meaningful partnerships with a whole ecosystem of players who are prepared to collaborate on mutual terms.

To support local partnerships, a tested and agreed framework should be in place from the centre that sets out core terms, and a streamlined route for healthcare organisations and technology companies to begin building mutually beneficial arrangements. The terms in this framework should be strategic and values-based – a set of minimum quality and value principles to guide how organisations engage with innovation partners. Part of this should stipulate that established players looking to partner with the NHS should be prepared to contract on the basis of patient outcomes, rather than specific process measures. This would ensure that private companies collect the data that allows them to improve their offer in a way which impacts outcomes. This will give the public confidence that solutions meet core expectations (e.g. of delivering improvements and being financially transparent), while still meeting specific local population needs, which may vary across the country.

A significant advantage of hyper-collaboration would be to bring together the ideas of start-ups, experienced players, clinicians and research organisations, to improve products and ultimately outcomes. Partners should be financially incentivised to collaborate over the long term where this can improve outcomes for the population. At an ICS level, there should be regular opportunities for those involved in partnerships to come together and work to solve local challenges. Traditional market engagement events could be replaced by co-design sessions to develop ideas, build relationships and – ultimately – commission partners with the right skills, values and approach to help improve patient outcomes and create value.

"

Innovative technology is difficult to implement because the basics aren't in place – there needs to be investment in getting the fundamentals and foundations right."

Head of healthcare, international technology company

"Whoever owns the data owns the customer"

Our polling prior to the pandemic showed that 65% of the public are willing to share their data with technology companies if it benefits the NHS – and this data sharing will be the bedrock of partnerships across the healthcare system. People's willingness to put their data forward (appropriately anonymised) for the greater good of the NHS reveals that the UK has a strong foundation on which to build public trust in technology partnerships.

Public conversations around data ownership are prominent and important and this is clearly in the mind of NHS organisations and their partners. On the FAQs of one large teaching Trusts in London which has a high profile partnership with an international technology company, 7 of the 18 questions are about data protection and consent, while another dedicates half of the webpage detailing its partnership to data protection. While it's right that data protection is taken seriously, it is important that this conversation doesn't drown out discussions around value, outcomes, and other risks and benefits.

COVID-19 has lubricated the conversation around data sharing and helped prompt clear guidance on what is permissible from a data governance perspective. The guidance is unequivocal, going as far as issuing the explicit statement "In the current circumstances it could be more harmful not to share health and care information than to share it. The Information Commissioner has assured NHSX that she cannot envisage a situation where she would take action against a health and care professional clearly trying to deliver care."

65%
of the public were happy for the NHS to share their anonymous data with a large technology company if it improves efficiency of service (e.g. the NHS making a profit to pay doctors and nurses).

60%
were happy if the technology company uses the data to create treatments for a specific disease.

62%
were happy if profit goes into general NHS budget.

Source: Survey carried out by Opinium on behalf of PwC (January 2020)

For a partnership with the NHS to be meaningful and long lasting, a clear understanding of the value that both sides get from that data is essential. From an NHS perspective some of that value is clear – access to rigorous R&D and disruptive technologies; access to a disruptive working environment and culture (perhaps most famously demonstrated through Virginia Mason's enthusiastic adoption of the Toyota Production System); and access to capabilities and talent. For technology companies, partnership with the NHS provides a gateway to the overwhelming majority of the UK population who use its services, access to a market of £20bn worth of business and a sales pitch to use elsewhere in the world.

The patient's role in providing the raw material for this value should not be underestimated. NHS bodies should use this asset wisely by treading a fine line – avoiding guarding it so closely that it's impossible to release its value (the data equivalent of keeping a windfall under the mattress rather than investing it), but equally by being transparent about the value – financial and in terms of health outcomes – that comes from it. ICSs should be working with their local population to understand what a good return on their data looks like, and reporting back on how they've achieved this. There should be an expectation that patients withdraw consent for data to be shared with private companies if value isn't achieved. We found that people expect the NHS to get a return on their data – but that the majority are open minded about the nature of that return: whether the value comes back financially to be reinvested into the health service; as part of research into treatments; or to improve efficiency. Whatever form value takes, co-designing value with the public and partners will be essential to building and maintaining trust.

Recommendations

1

Private sector companies partnering with the NHS should do so on a risk and gains share basis.

There should be an assumption that established players partnering with the NHS are prepared to take on financial responsibility for outcomes.

2

At a local level, the NHS should explore hyper-collaboration and create an ecosystem of a diverse range of partners who can bring value.

To facilitate this, trusts should be incentivised to work closely with start-ups in various ways, including providing 'innovation hubs' on-site, where ideas can be exchanged; providing shorter term contracts to allow smaller players to enter the market; and working to evaluate solutions and share evidence. At an ICS level more should be made of local partnerships. ICSs should work closely with local universities, AHSNs and R&D organisations who can provide innovation and entrepreneurial ideas and should set out a clear approach for how they can mutually engage as part of wider local economic planning.

3

At a national level, NHSX should continue to take responsibility for supporting technology companies to navigate how to partner with the NHS.

To make the most of technological advances, and for hyper-collaboration to work, more support and guidance should be given to companies who have valuable solutions and who want to work with the NHS. The work done by NHSX during COVID-19 to simplify and provide guidance to technology companies on issues such as information governance, CE marking, funding streams, outcome measurements and partnership approaches, in order to ensure that both sides can benefit, should continue.

4

The NHS should work with the public to ensure they are comfortable with how their data is being used.

The public is prepared to share data – but the NHS needs to be aware that this rich asset is on loan and report explicitly on the return it gets from sharing this data. The public are essentially shareholders in the NHS, although the 'shares' they contribute are their sensitive personal data. Trusts and ICSs should be mandated to publish an annual report on the value they get from sharing this data with technology companies.

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Authors

Authors

David Morris

david.x.morris@pwc.com

Dr Luke Solon

luke.solon@pwc.com

Jude Simpson

jude.f.simpson@pwc.com

Olivia Read

olivia.read@pwc.com

Jess Abel

jessica.abel@pwc.com

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How we
can help

How we can help

At PwC, we're helping to lay the technology foundations for healthcare. And we're working with the industry to create the innovations that will transform healthcare for the future.

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www.pwc.co.uk/tech-powered-healthcare

Contact

David Morris

Health Services Sector Leader, PwC

david.x.morris@pwc.com
+44 (0)7841 784180

Quentin Cole

Leader of Industry for Government and Health Industries, PwC

quentin.r.cole@pwc.com
+44 (0)7770 303846

Thank you

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