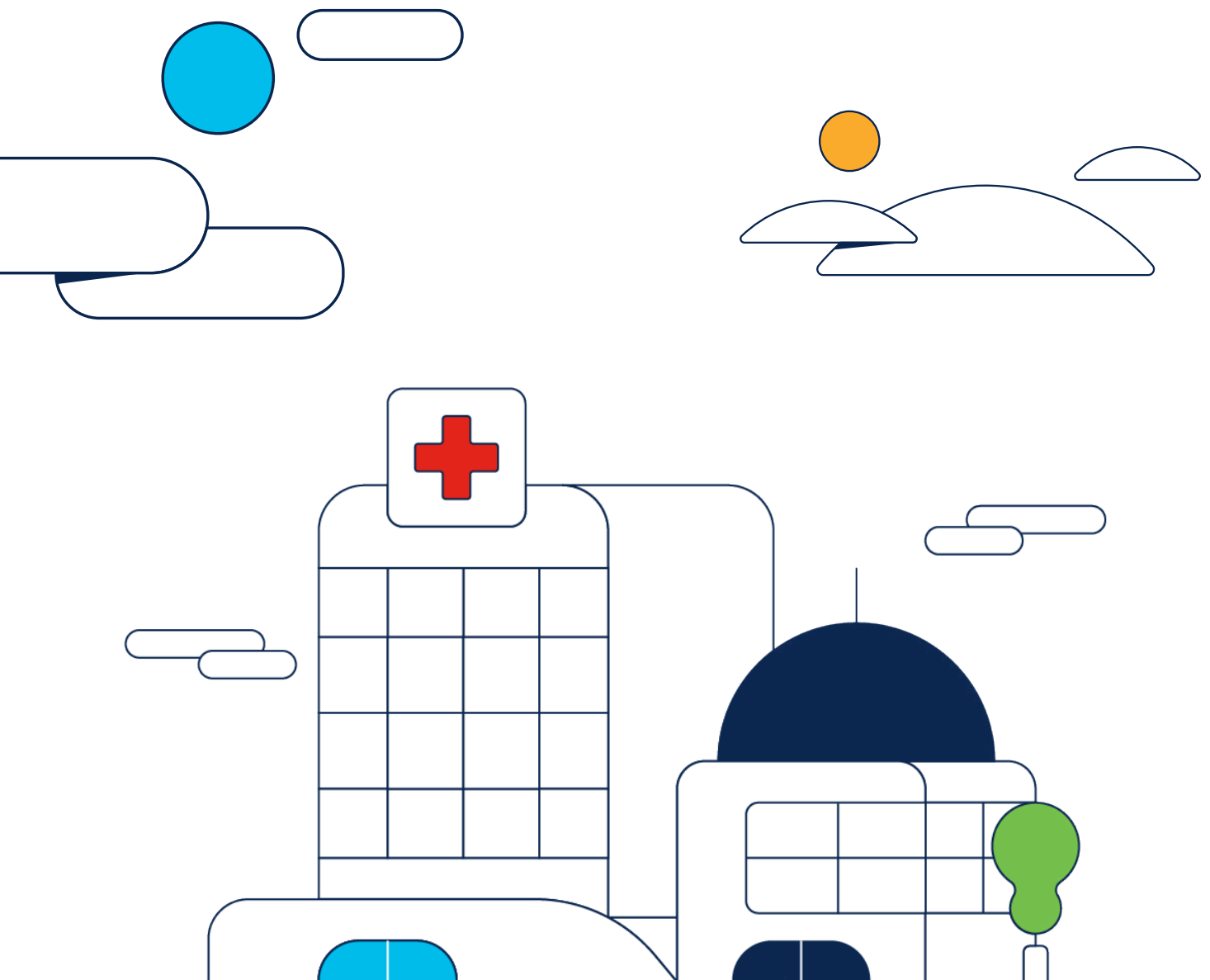




The Lister
Alliance



The Case for Smart, Sustainable & Productive Healthcare Facilities



Introduction

The NHS estate is vast, if you were to put all the floor space together in one place, it would cover the same area as the city of Worcester. However, many of the buildings are antiquated and in need of replacement or major refurbishment.

The scale of this challenge is huge, with the current maintenance backlog estimated to be more than £11b¹.

This situation is further compounded by a reported £37b shortfall in general capital expenditure since 2010. To address the most dilapidated sites or those built from Reinforced Autoclaved Aerated Concrete (RAAC), the previous government set aside £20b² of investment. For those organisations embarking on a build programme, there is a unique opportunity to redefine how technology can be harnessed to improve the safety, efficiency and sustainability of healthcare facilities, as well as creating buildings that will adapt to the changing healthcare priorities set out by the new Government³. This white paper presents Cisco's viewpoint on the building blocks of a smarter, more sustainable healthcare system.

To shape our perspective, Cisco has worked with Trusts and frontline staff through The Lister Alliance to create a network of living labs across the country, developing solutions and evaluating technologies in different care settings. Although still in its infancy, the Alliance is starting to shape and influence how technology is integrated into the building fabric and how digital teams can engage stakeholders to actively shape both the building design stages and the digital transformation process.

A digitally enabled healthcare service has the potential to address its growing productivity problem, whilst also removing the day-to-day obstacles that frontline staff face⁴. For the majority of the first 75 years of the NHS, the hospital was considered the safest and most appropriate place for a person, with health-related issues, to be treated.

As we look to the future, government policy, consumer habits and emerging technologies are increasingly shifting perceptions about where a person is best treated. With care closer to, or in the home, becoming a more viable proposition for an increasing number of health interventions. This shift, along with a concerted effort to move the NHS towards disease prevention and anticipatory care, will change the requirements and design of all future hospital facilities.

In commissioning this White Paper, Cisco has sought to combine its qualitative understanding of the technology landscape in hospitals, with a quantitative assessment from frontline staff. To achieve this, in-depth interviews were conducted with a variety of healthcare professionals (HCPs) and former senior NHS executives. Those insights were further enhanced, with a survey of 70 hospital-based HCPs in England. This research has complimented the understanding Cisco has developed through its ongoing partnership with NHS Trusts, academia and industry, within the Lister Alliance.

At its core, we believe a smarter healthcare facility is best understood by combining four functional tenets, these are flow, experience, adaptiveness and infrastructure. Together these tenets will support healthcare providers to deliver safer care, be more productive, improve service resilience and empower both patients and staff to deliver better outcomes.

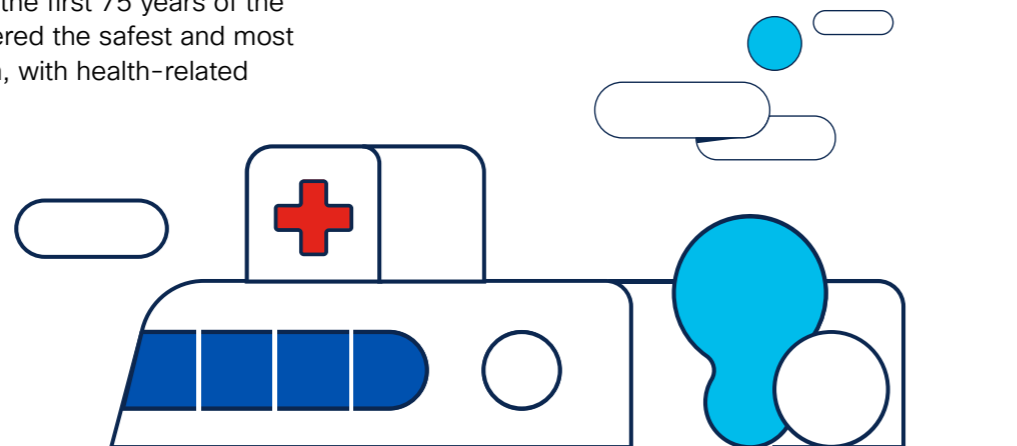
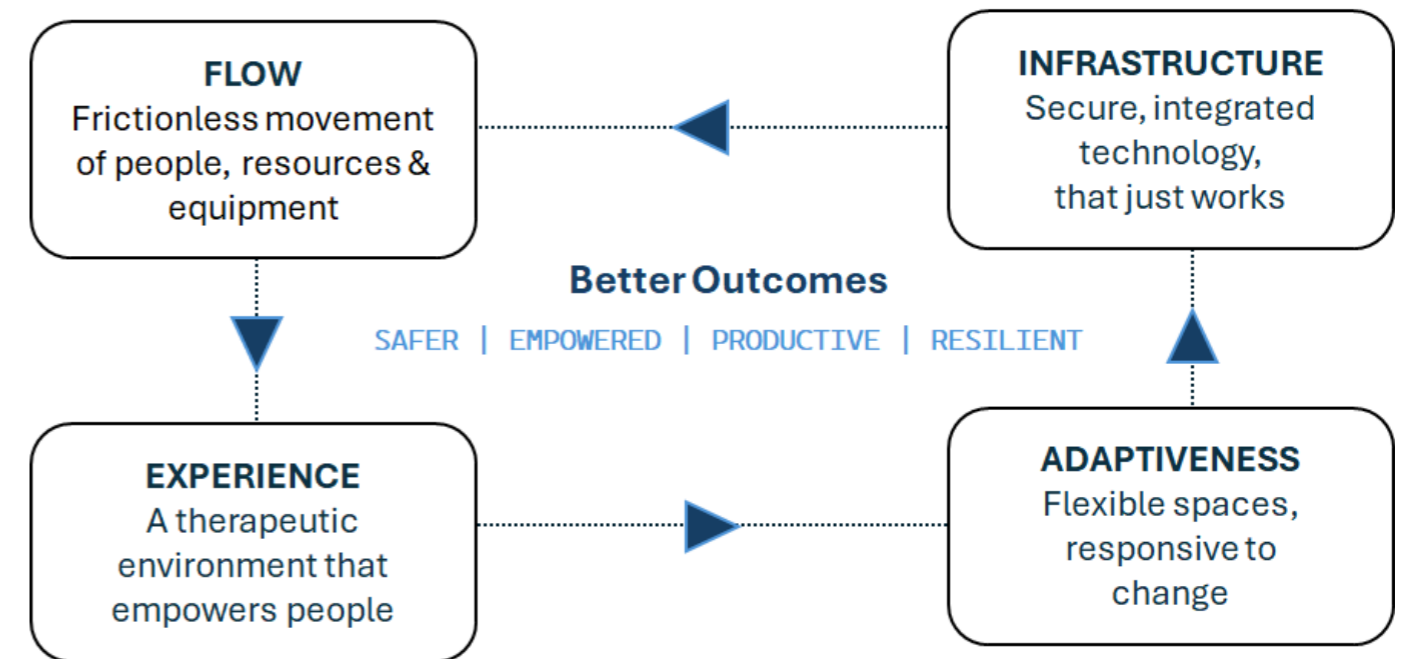


Diagram 1: Four tenets of a smarter healthcare facility



FLOW

A fit-for-purpose hospital facility should be designed to support patient flow – from arrival and admittance, through to treatment and recovery, and finally on to discharge. Unfortunately, the situation today is that many patients experience delays at all stages of their journey, including the point of discharge. A large proportion of delayed discharges are attributed to issues organising follow-up social care. This situation is neither good for the patient or the hospital, with up to 13% of all NHS bed capacity being used by patients, who find themselves in the wrong care setting⁵. For patients not requiring bed-based care, there are potential digital solutions (virtual care and wards) that could negate the need for admission, through to solutions that can support patients to be successfully discharged earlier and prevent unnecessary re-admission.

Whilst in the hospital, there are many flow challenges, as patients navigate wards, diagnostics, rehabilitation, and other departments. Delays occur throughout, as complex inter-department workflow and scheduling is compromised by over-stretched staff and a lack of suitable operational support tools and systems. In our survey 64% of staff said that poor scheduling was either a high or very high factor in operational inefficiency, and 57% said this had a high or very high negative impact on patient care and outcomes.

Aspects of scheduling and bed management can be enhanced with Wi-Fi enabled real-time tracking and location services. Combining this with a digital prescription could help improve inpatient flows.

Within many ward environments, flow is compromised due to poor availability of equipment compounding difficulties accessing clinical systems. Even those organisations who have implemented electronic patient records have highlighted issues related to Wi-Fi connectivity. In many parts of the NHS, healthcare professionals are bound to static hardware and must relocate high risk patients closer to the nurses' station to monitor them safely. Over 50% of our respondents said accessing systems and equipment at the patient's bedside had a high or very high impact on operational efficiency, and 47% said this had a high or very high impact on patient care and outcome.

Secure, fast wireless connectivity is essential to enabling digital solutions that can enhance the supervision of patients through sensing and monitoring, as well as enabling staff with handheld devices to deliver and record care by the bedside.

Our feedback from the frontline, highlights the interdependencies between achieving improvements in operational productivity and having secure, ubiquitous connectivity, which is also a pre-requisite for a smarter hospital. Furthermore, learnings from the Lister Alliance, has demonstrated the importance of seamlessly integrating digital solutions, rather than adopting a piece-meal approach. Staff in our survey identified with this, 91% said that optimised scheduling and patient flow technology is a priority for them, yet only 29% have such technology in place in their care setting. 98% think asset tracking should be a priority, but only 54% have access to such technology in their hospital.

Tracking technology needs to be ubiquitous and integrated with other ward systems, to help frontline staff focus their time on patient's recovery and discharge.

EXPERIENCE

Coming into hospital for treatment can be unsettling. A strange environment, uncertainty about what will happen, can all lead to anxiety for the patient, carers and the family. In a busy ward environment, it can be difficult for staff to find the time to keep everyone informed about treatment plans and the proposed date and time of discharge – to say nothing of the milestones they need to hit in their recovery. Information needs to flow both ways, patients and family need to be able to raise concerns and ask questions throughout the hospital stay. In part, this is being addressed by Martha's Rule⁶, which came into effect in April 2024. However, our survey found there is still considerable ground to cover, with 40% of respondents reporting difficulties communicating with patients, their families and carers, which had a high or very high impact on operational efficiency; a further 44% felt this had a high or very high impact on patient care and outcomes.

Adopting a unified, omni-channel communications strategy can help hospitals to engage patients, family and friends in all aspects of a patient's journey. Integrating those communications into digital systems, can automate and contextualise messaging, enhancing the patient's experience.

The hospital environment affects care in many ways. Unfamiliar surroundings and crowded spaces, insufficient privacy, or exposure to adverse environmental factors can hinder a patient's recovery. Older healthcare buildings were generally designed to aid treatment, but with little thought to wellbeing – and so control over the environment (lighting, heating, noise, personal space) is typically not in the hands of patients. 34% of respondents said that limited environmental controls had a high or very high impact on operational efficiency, and 37% said it had a high or very high impact on patient care and outcomes.

Integrating building technology with digital solutions can enable patients to control their environment, encourage (post-procedure) independence and promote recovery.

For the staff working in the hospital, the same lack of environmental control can also have a detrimental effect on their wellbeing and ultimately, their productivity. The physical nature of healthcare, combined with a typically warm environment, excessive noise and the impact of bright, fluorescent strip lighting can all contribute to staff fatigue. With the latter, being one of the main reasons for proposing the switch to smart LED lighting at Westmorland Hospital. Having the ability to control heating, cooling and other aspects of the workplace, featured highly in our survey, with 93% saying it would be a technology priority for them, yet only 39% of survey respondents said they have environmental monitoring in the workplace.

Smart controls that allow both patients and staff to modify their environment, can improve wellbeing, reduce utility costs and help meet sustainability targets.

Finding equipment is a perennial problem in the NHS. Back in 2009, the Nursing Times⁷ reported that the average nurse spends an hour per shift looking for things. Our research, suggests the situation today, has not changed. Beyond the obvious inefficiencies, this inability to find things in a timely manner can impact

patient care and lead to a hoarding mentality on the wards, meaning that specialised (and expensive) equipment is not being utilised effectively, is often easily lost and consequently, over supplied. One digital solution for this conundrum, is to implement wayfinding in conjunction with real-time asset tracking that will allow staff to quickly locate essential equipment. As an added benefit, the solution also allows new (or rotational) staff, patients and visitors to navigate their way across the hospital campus. One important factor to consider when implementing tracking and wayfinding, is wireless connectivity. Older tracking solutions tended to rely on an additional overlay network, increasing both costs and complexity. Solutions being implemented today should aim to leverage Bluetooth, Wi-Fi and Ultra-wide band radio technologies incorporated into a single modern wireless network access point. Only 29% of our respondents had some form of digital wayfinding to aid the patient experience, yet 92% highlighted it as a technology priority.

Implementing digital wayfinding combined with real-time asset tracking can enable staff to quickly locate equipment and help people navigate within the hospital campus.

LISTER ALLIANCE LIVING LAB: WESTMORLAND GENERAL HOSPITAL

Survey responses from staff working at the Outpatients Department in Westmorland General Hospital revealed that 38% of staff suffered from 'physical symptoms related to the work environment e.g. headaches or coughing' When asked 'Do you feel that the environment in this department impacts negatively on staff productivity and efficiency?' 43% responded 'yes'. As part of a proof of value, The Lister Alliance has installed power monitoring solutions to baseline the current energy utilisation across the department. Environmental sensors and smart, responsive power over ethernet (PoE) lighting has been installed to pilot and de-risk the potential of these technology solutions in clinical areas. This will demonstrate the potential energy saving digital interventions can offer the NHS as well as improving staff working conditions and patient experience.



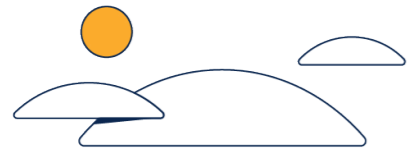
ADAPTIVENESS

Technology innovation is exponential in nature and very different to the timeline of a building. Hospitals tend to have a lifespan of 50-100 years, whereas technology tends to change every five years or so. Therefore, it is essential that the building fabric is designed to accommodate these rapid changes. A fit-for-purpose hospital environment should have the intelligence to support changing clinical practices that are integrated with new digital innovations. Whilst it may be difficult to envisage what these technologies might look like in the decades to come, it is possible to extrapolate out some of the design characteristics, from current trends. For example, the convergence of building and IT solutions, the proliferation of medical devices and the emergence of artificial intelligence and robotics are likely to require, enhanced security, low latency, high bandwidth wireless networks. Alongside this, the fabric of the building needs to be ready for emerging technologies with early design consideration given to cable containment, power distribution, sustainability and resilience.

Both new build and refurbishment schemes should be designed with rapidly evolving technology cycles in mind.

Whilst technology is unlikely to replace the care and compassion offered by clinical staff. It is possible, that we will see digital solutions emerging over the next 10 years that will augment clinical practice and help bridge some of the workforce gaps associated with an aging demographic. It is therefore critical that hospitals explore every available option to create an adaptive environment that reduces friction and increases productivity for staff in the delivery of care. In our survey, 81% of respondents identified labour shortages as having a high or very high impact on operational efficiency, with 76% saying it had a high or very high impact on patient care and outcomes.

Focusing digital transformation capacity towards the design and development of smarter buildings can help to address workforce gaps and general productivity.



LISTER ALLIANCE LIVING LAB: LINDEN LODGE NEURO-REHABILITATION UNIT

Linden Lodge is a neuro-rehabilitation unit which has been developed into a Lister Alliance Living Lab at Nottingham City Hospital. The Lab was set up to inform digital procurement decisions for the New Hospital Programme (NHP) Cohort 2 newbuild, the National Rehabilitation Centre. Through iterative rounds of testing and feedback with clinical staff, solutions have been refined to meet specific NHS needs. Solutions implemented at Linden Lodge include asset tracking, smart cameras and vision analytics, space utilisation and resource management. Smart booking and resource 'bundling' supports staff with clinics and specialised patient sessions. Though development and implementation at the Lab is ongoing, there have already been significant learnings around how to build capacity for innovation and enable collaboration between industry and the NHS.

[Watch the case study video here.](#)



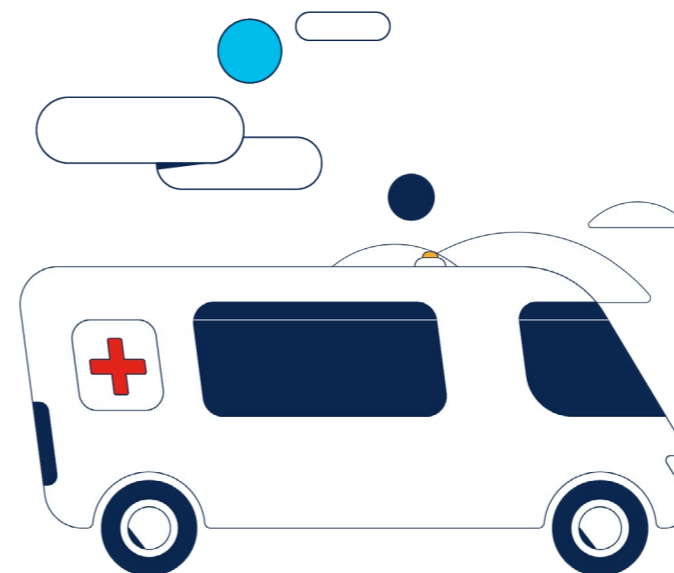
INFRASTRUCTURE

Whether you are building a new hospital, a new wing or just refurbishing part of your existing estate, the IT Infrastructure, the convergence of operational technologies⁸ and the sustainability agenda all need to be considered, from the outset of your design journey. Ideally, aligned to the organisation's digital roadmap, with the aim to create a secure digital infrastructure that 'just works' – by this we mean digital solutions that are easy to access, simple to use and most importantly, save time for frontline staff. Whilst this may be something that many people take for granted in their own homes, it is not a common experience for NHS hospital staff or their patients. An example of this is inconsistent and slow Wi-Fi across different healthcare settings. Cisco found that 54% of survey participants felt that poor Wi-Fi either had a high or very high impact on operational efficiency, with 44% saying that it had a high or very high negative impact on patient care and outcomes.

“Even the simplest thing for example we have an app-based system that shows people inhaler technique in Airways disease. And so often the Wi-Fi is so bad in clinic room that I can't show them on my phone” (Consultant)

Systems that cannot be accessed, devices that do not work, and poorly designed tools that create more work, all contribute to a less productive workforce. In our survey 56% of respondents said that difficulty accessing clinical and non-clinical systems had a high or very high impact on operational efficiency, while 50% said it had a high or very high impact on patient care and outcomes. Furthermore, 50% said poor access to devices (computers, laptops, handheld devices) exacerbated the situation.

Adopting a holistic, cross-architectural perspective to your IT infrastructure can help to reduce complexity, simplifying the management of digital systems and improving the end-user's experience.



With the expected growth of medical IOT⁹ and the general proliferation of connected devices in a hospital environment, security is a growing concern for both clinical and non-clinical professionals alike. In our survey, 37% of respondents felt that poor cybersecurity had a high or very high impact on operational efficiency, and 41% said it had an impact on patient care and outcomes – this finding is interesting given that cybersecurity is not generally perceived to be high on the list of concerns from frontline staff. However, given the growing reliance on clinical systems and the government's mission to shift from analogue to digital¹⁰, it is no surprise that perceptions are changing.

When designing for the future, security needs to be baked into the network, formulated to incorporate medical IOT and policy driven, based around intent.

How hospitals enable staff to communicate, interact and respond to patient needs is the cornerstone of a productive hospital. Given that telephones are ubiquitous in most hospitals today, it is concerning that 56% of respondents to our survey, reported that limited ways to communicate with other hospital staff had a high or very high impact on operational efficiency, and 54% said this had a high or very high impact on patient care and outcomes. As the NHS accelerates its journey towards digital, the methods by which people communicate will adapt and change. A smarter building will interact with its human occupants, through connected environmental sensors, intelligent vision systems and passive monitoring solutions that seamlessly integrate with the hospital's communications systems (and digital signage) to alert operational teams to incidents and autonomously adapt to changing circumstances.

An intelligent building will integrate its telemetry into a hospitals command and control centre, augmenting clinical flow data to maximise productivity and safety.

CISCO CASE STUDY: BARTS HEALTH NHS TRUST

Spread across five sites Barts Health NHS Trust has one centralised network where clinical information is shared between healthcare professionals wherever they are and whatever they are doing. This concept of an always on system connecting everyone and everything means data is more readily available and clinicians can interact in a more informed way. Removing physical barriers and shifting towards remote delivery with technology as a fundamental enabler provides a system that is resilient, reliable and operational 24/7, 365 days a year. The Trust have more than doubled the number of both medical and non-medical devices and recognised the need to adapt their infrastructure in line with that increase. This globally recognised, scalable network means less need for laborious data collection and more time spent making decisions and informing improvements.

[Watch the case study video here.](#)

Creating the right environment for digital transformation

Despite a perceived lack of progress in digitisation within the NHS and the numerous, well documented, IT failures, the appetite for digital transformation still exists on the frontline and with policy makers.

In our survey, 99% of the clinicians interviewed said they would like their organisation to do more to implement technologies to improve patient outcomes and operational efficiency.

The often-piecemeal approach to technology investment, creates areas of haves and have-nots; areas of service and areas of none. A strategic approach is needed that recognises the physical and digital hospital environments are symbiotic and intrinsic to patient care. Through our work with the Lister Alliance and the insights from our survey, a clear picture emerges of what a smarter hospital would look like, that genuinely supports staff, enabling them to be more productive and improve patient outcomes.

While blueprints and organisational strategies are clearly needed, the journey of translation and transformation, moving from current to future states, presents a critical opportunity to shape both solutions and stakeholder opinions. Learning from the Lister Alliance Living Labs, we have seen that implementing a siloed approach to technical capabilities is just as likely to create a barrier or burden to the workforce, rather than driving up its productivity. Adopting a combinatorial, cross-architecture approach, using co-creation techniques, rapid iterative cycles, creating capacity and safe spaces to innovate, are among the

For the NHS to rapidly accelerate its journey from analogue to digital, hospitals will need to invest more into their technology transformation. Expanding their foundational capabilities to include ubiquitous Wi-Fi coverage, comprehensive asset tagging, digital wayfinding, integrated building management and medical device solutions, new sensor platforms and digital twins - all intrinsically linked to the patient and operational systems that are in use.

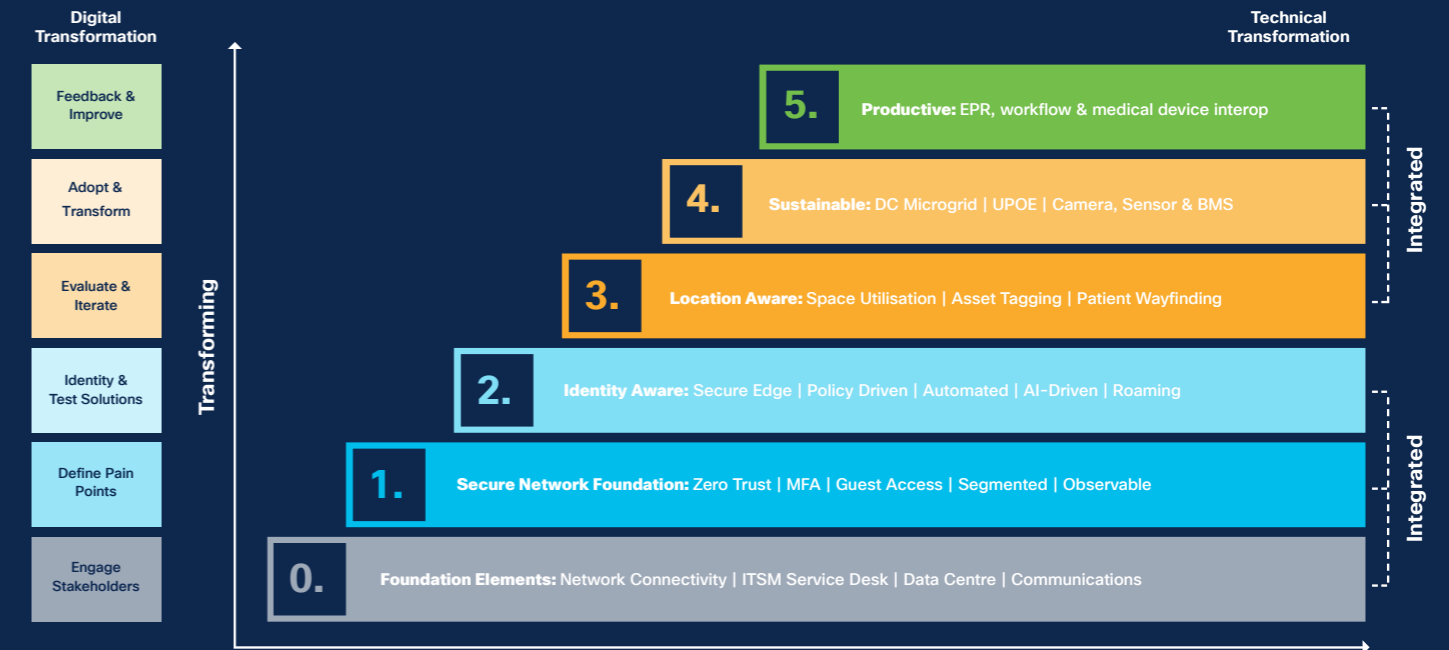
key factors for success. Accordingly, Cisco's approach advocates that technological transformation and digital transformation go hand in hand, ensuring that the IT infrastructure is fit for purpose and able to support the rapidly evolving digital solutions for the hospitals of the future.

To deliver purposeful, long-term change, frontline staff need to be actively engaged in the digital transformation process, field testing digital solutions long before they become mainstream across the organisation.

To avoid and mitigate future IT failures, the NHS needs to ensure its digital ambitions are not let down by poor IT infrastructure. Unfortunately, the findings from our survey and from the media more generally, suggest that many organisations still do not have the basic IT infrastructure in place, to harness the full potential of digital. To help organisations assess their maturity and readiness, there are tools available¹². From Cisco's perspective, the technical transformation organisations need to embark on, starts with foundational elements, such as basic connectivity, data centres and a communications platform, all supported by a proactive IT service management function.

On top of this, the primary consideration is security, as set out in diagram 2.

Diagram 2: Building Blocks of digital and technological maturity



Conclusion

The Darzi report paints a damning picture of a healthcare system in trouble. Ballooning waiting lists and poor productivity, combined with an increasing burden of disease, means the NHS needs to undergo radical surgery to secure its future for generations to come. Accordingly, the Government is proposing three big shifts that will shape future policy: shifting care from hospital to community, accelerating digital transformation and focusing more resources on primary and secondary prevention.

Clearly, all three will impact on the form and function of the hospitals of the future. However, the recommendations outlined in this paper will still be

relevant, regardless of the size, shape and location of the buildings. The four tenets of a smarter hospital should apply to all healthcare facilities. Making buildings smarter provides a catalyst for improving productivity at a regional level. By considering ideas such as flow, experience, adaptiveness and infrastructure, across all parts of the ICS, with common underpinning co-design methodologies, ICBs can realise productivity growth across the entire system. Cisco remains committed to working in partnership with the NHS, to leverage the potential opportunities that the shift to smarter buildings presents and to ensure the NHS continues to deliver world-class healthcare well into the future.

Cisco is an international technology leader. Globally, we support over 17,000 healthcare organisations to deliver holistic, technology-enabled care. In the UK, Cisco is a well-established healthcare partner, supporting the NHS to deliver secure, resilient infrastructure that underpins digital solutions across the health and care system.

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