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Using Digital to Create Better Healthcare and More Resilient Communities

NIIN
National Industry
Innovation Network

Cisco
Country Digital
Acceleration

Introduction

The challenges associated with delivering quality healthcare are well-documented: rising demand, workforce shortages, compounding risk (including cyber security) in the delivery of services in hospitals, via allied health services and in the home. Integration of digital technologies into healthcare is being driven by a range of factors:

- **The rise in community-based / in-home care:** Remote clinical monitoring, in-home treatment and uptake of hybrid models for allied health delivery is being driven by patient preference and capacity to reduce demand on an overloaded acute sector. For example, in the aged care sector, the number of people using home care increased more than threefold over the period 2011-21.[1] Currently the level of in-home care people can receive is impacted by a digital divide. Providing effective and efficient healthcare, particularly in rural and remote settings, presents complex and varied challenges, largely limited by access to infrastructure, geographical distance, and unique community profiles.

- **Uptake of virtualised care:** The pandemic accelerated adoption of remote health consultations and created impetus for digitisation of other clinical and patient services that help patients take more control of their health and wellbeing, improve safety and create efficiencies in the health system. Virtualised care enables proactive self-management of health and wellbeing as well as remote diagnosis and health monitoring. This is particularly beneficial for older people, those who have difficulty accessing healthcare settings due to mobility issues, and those who are prone to iatrogenic risks in a hospital environment. The use of sensors for health, frailty and mobility assessment / diagnosis in older people can impact their independence and quality of life.

- **Strain on technology infrastructure in the acute setting:** The strain on technology infrastructure in acute healthcare settings has become a pressing concern, as evidenced by one Melbourne healthcare network where 46% of hospital internet traffic was funnelled through the wireless network – more than four times the initial forecast. This escalating demand is being generated by clinicians, administrators and patients, who are constantly creating and seeking diverse technology services such as data, voice and location-grade Wi-Fi coverage. Addressing this challenge, particularly during new builds, is crucial to avoid the costly and disruptive consequences of retrofitting an operational health environment. By establishing the right digital foundations from the outset, healthcare facilities can benefit from seamless connectivity and efficient infrastructure that has greater longevity.

This paper does two things:

1. Articulate opportunities and challenges associated with technology in healthcare, and

2. Profile digital innovation assets that can tackle challenges at scale and turn words into action.

The paper was developed by a coalition of universities, academics and industry partners associated with the National Industry Innovation Network (NIIN) described in detail in Part B.

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Part A: Framing the smart healthcare challenge and opportunity

What is smart healthcare, how is it enabled and why does it matter?

In a smart healthcare system, people, the environment and workflows are connected in real time.

Data generated through interconnectivity is used in intelligent ways to improve the quality of core processes in delivering personalised and safe patient care and efficient high-performance operations[2]. There are several critical elements to enable Smart Healthcare / Aged Care:

Workforce capability

This includes competence and confidence in using technology, with the time to innovate and transform clinical pathways and models of care. Delivering health transformation requires access to scarce technical skills and capacity to optimise underpinning infrastructure.

## Access to collaborative experimentation spaces

Healthcare innovation needs to be incubated and curated. Health systems and providers need access to a controlled environment that allows new technologies and models to be stress-tested in simulated environments, supported by expertise to ensure the proof of concepts and tests are valid. These spaces need to be separated from – but networked to – operational hospitals.

Technology

Infrastructure and applications that are secure, scalable, customisable and extensible. Clinicians and administrators need to have confidence that digital infrastructure will be able to flex with changing demands without compromising data privacy, cyber security or business continuity. Patients need to have access to tools such as smart agent interfaces that provide connectivity with doctors, help and assistance, and patient management support (such as reminders and informational support). Interoperability between systems and applications is also important to ensure patient data can be shared seamlessly between healthcare providers. Legacy systems (both infrastructure and applications) can be a significant challenge to integrate with modern solutions. Healthcare organisations need to consider migrating to more flexible microservices architectures to allow for easier integration of new technologies. The payoff from getting it right are significant. McKinsey suggests implementing digital healthcare technologies across OECD countries could save more than 10% of overall annual national healthcare expenditure.[3]

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Drivers of smart healthcare include improved clinical outcomes, better asset utilisation, patient experience and higher productivity
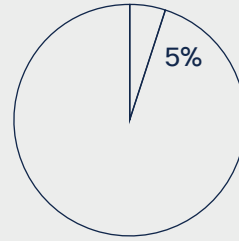
Delivering better
health outcomes

65%
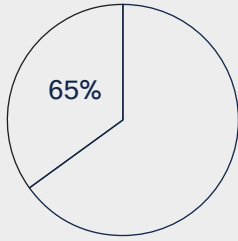
Did you know?
In the US alone, more than
$210B is spent annually on
'unnecessary services' that
don't contribute to health
outcomes[4]

Improving space and asset
utilisation to lower costs

17%
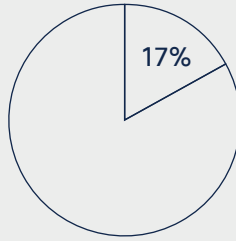
Did you know?
Hospitals have an
average asset utilisation
rate below 40%[5]

Improving staff
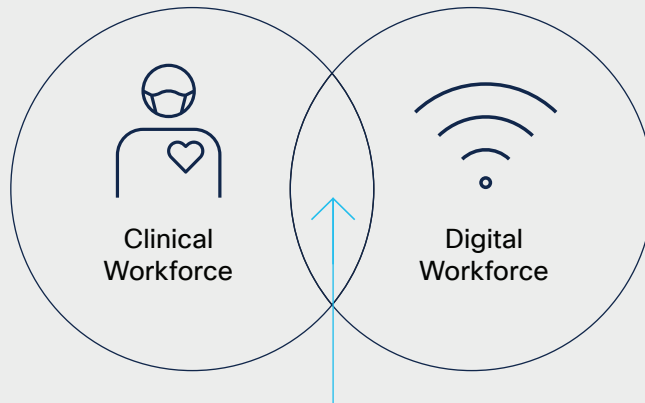experience and safety

5%

Did you know?
Nurses spend an average
of 42 minutes per shift
searching for equipment[6]

An enabled workforce: Building blocks of a smart healthcare system

**There are several integrated skills and capabilities
required to design and run a smart healthcare system**

Clinical
Workforce

Digital
Workforce

Major area of focus for smart
healthcare systems

Clinical workforce challenges

Workforce challenges in the healthcare system are profound, and deepening. A study by Oxford Economics (in partnership with Cisco) found 80,000 new jobs will be created in healthcare within a decade – the largest of any industry sector in Australia. At the same time, the sector is experiencing:

- Rising attrition driven by increased expectations, the cumulative effects of stress from the pandemic response and new skill requirements including digital literacy[7]

- Difficulties attracting new health care workers: for example, by 2025, anywhere from 20,000 to 40,000 nursing positions could be left unfilled in Australia[8] and an additional 35,000 aged care workers per year are needed to fill growing aged care skill shortages[9]

- Alternative options for employment in a buoyant labour market that are much lower stress, offer better working conditions and involve less physical risk (e.g., of infection).

The digital divide is exacerbating this issue and will impact the employee value proposition as more "digital natives" enter the workforce. With healthcare demand now surpassing supply at an increasing rate, the sector is facing a critical productivity issue from a resourcing perspective. In response, governments are focusing on increasing capacity by making significant capital investments in new and upgraded facilities. However, more beds without the corresponding uplift in resources will require an increased focus on workforce efficiency and productivity improvements. This reinforces the need for better planning of ICT and digital infrastructure requirements as digitisation becomes standard.

A Spotlight on Nursing[10]

The nursing profession makes up 55% of employees in the Australian healthcare system and 29% of the cost. On average, a nurse completes 72.3 tasks per hour, multitasks 34% of the time, is interrupted every 6 minutes (colleagues, patients) and more than half leave at least one task undone at the end of each shift. Opportunities exist to use technology to:

- Optimise augmentation/ cognitive assistance for clinicians that is sensitive to their workflow,

- Improve data-driven clinical decision making for personalised care that meets governance requirements and research to inform health services design and responsiveness. This includes considering what new types of data there is potential to collect that will support better efficiencies and patient-centred care, and

- Remove repetitive, process-oriented tasks (for example by providing multiple options for accessing digital documentation including thorugh fixed and mobile stations).

Ultimately the intent is to allow clinical staff (including nurses) to spend more of their time delivering care and less time on lower value tasks.
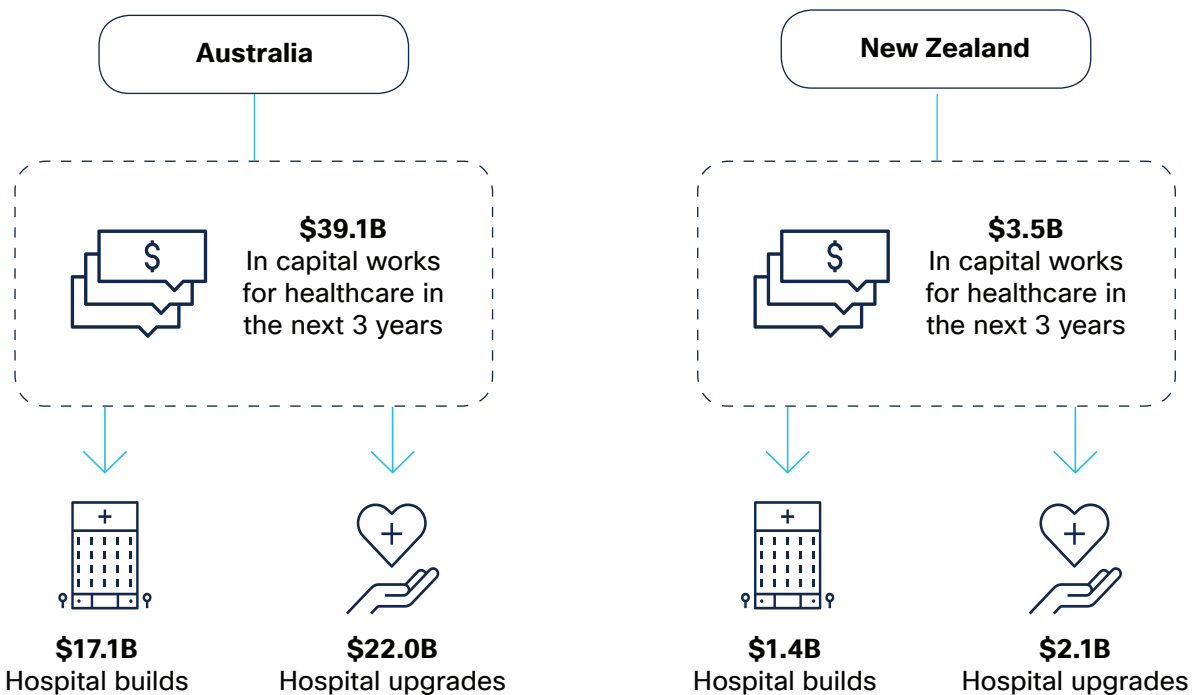
Digital workforce challenges

Healthcare systems deliver myriad professional services, ranging from non-clinical compliance to corporate functions (HR, legal, finance) and deployment and management of technology. The digitisation of healthcare is creating major challenges in terms of recruitment and retention of technology professionals. Research from Oxford Economics indicates that chronic skills shortages exist for many occupations, including cyber security, advanced programming and data analytics. For example, the massive volumes of data that are increasingly being generated by the healthcare

sector are placing specific emphasis on the need for data analytic skills. There is a need for both undergraduate degree preparation in this area (for example, in health informatics), as well as on-the-job training. The application of AI and machine learning also creates new workforce demands in areas where there is already a dearth of qualified professionals with relevant healthcare experience. There is an acute need for programming and technology design skills, with these skills respectively falling 55% and 42% short of the required level in the sector.[11]

Smart healthcare investment

As outlined above, technology has a major role to play in helping to address workforce challenges but there are a range of other factors that are also contributing to unprecedented investment into new hospital infrastructure, and the system more broadly. Questions persist about the efficacy of expenditure

on technology in particular and whether healthcare systems can realise maximum value from their built environment. Rather than simply building extra capacity in the healthcare system (for instance, additional beds), the focus needs to shift to a digital-first approach.

Australia	New Zealand
$39.1B In capital works for healthcare in the next 3 years	**$3.5B** In capital works for healthcare in the next 3 years
$17.1B Hospital builds	**$1.4B** Hospital builds
$22.0B Hospital upgrades	**$2.1B** Hospital upgrades

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The Digital Healthcare Summit in Singapore focused on four intersecting components of a resilient healthcare system. These components have come into sharper focus as research and practice has evolved, including through the pandemic.

1. Patient experience is now a non-negotiable	2. Healthcare assets must respond dynamically to changing demands	3. Smart healthcare is built on platforms, not just point solutions	4. Healthcare has to be treated as critical infrastructure from a cyber security perspective

1. Patient experience is now non-negotiable[12]

The approach to design and delivery of care is changing. Healthcare workflows, tools and spaces are becoming more health professional and patient-centred, accounting for two types of 'experience' expectations:

- Clinical needs and expectations: experiences that relate to their clinical outcomes, and

- Consumer needs: aspects related to the friction a patient experiences or their comfort levels.

These two factors are, of course, linked. Evidence says better patient experience leads to better long-term health outcomes for patients, which also reduces the overall cost of care delivery. The health system is expected to use technology to improve experiences for patients by employing new technologies, models of care and practices. These experiences occur in acute and non-acute settings and can be physical, hybrid or virtual, given care is what you need, not where you are.

While technology can help to drive improved patient experience, the experience of the patient is also an important consideration when deploying technology. Digital technology needs to be integrated into patients' daily lives to make tasks such as medication monitoring seamless and low friction. Use of technology among older patients requires special consideration due to overall lower levels of digital literacy and technology savviness among older Australians.

2. Healthcare assets must respond dynamically to changing demands

The focus is on making health systems, spaces and capacities more responsive to change. A crucial lesson from the COVID-19 pandemic is the pressure that critical events place on physical spaces. Health providers have had to re-think how they use and manage physical infrastructure, including:

- Converting non-healthcare spaces to deliver services. We saw carparks turned into mass testing facilities, and convention centres become pop-up ICU facilities.

- Rapidly repurposing existing inpatient healthcare spaces, such as converting general purpose wards into ICU facilities, as happened at St Vincent's on the Park in Melbourne.

- Reconfiguring and mobilising ICU facilities to deal with the infectious nature of COVID-19, its geographic elements, and overcoming barriers of distance through the use digital tools so clinicians, family and friends can communicate with patients safely.

3. Smart healthcare is built on platforms, not point solutions

There is a move away from point solutions to platform-based approaches. This has placed additional scrutiny on the quality and efficacy of the underlying infrastructure in hospitals and its ability to deliver the expected business outcomes. Cisco and Flinders University developed the Infrastructure Maturity Assessment (IMA) model to determine if hospitals have the maturity and capability to adopt smart health solutions. The work was taken up by HIMSS (and re-named INFRAM) and the assessment tool can provide guidance for building appropriate infrastructure to support a hospital's desired healthcare delivery outcomes and performance aspirations.

Currently there is a disparity in levels of digital maturity across healthcare providers, with significant lag, especially for clinical application providers to modernise their solutions to cloud-based platforms. Healthcare organisations' journey to the cloud is also a mixed. There is a significant opportunity to move towards a microservices architecture, as large monolithic solutions are more problematic to manage the change impact in complex environments like healthcare.

4. Healthcare must be treated as critical infrastructure from a cyber security perspective

Critical infrastructure is defined as "those physical facilities, supply chains, information technologies and communication networks, which if destroyed, degraded or rendered unavailable for an extended period would impact on the wellbeing of the nation or affect Australia's ability to conduct national defence and ensure national security". Hospitals have been officially classified by the Australian Government as pieces of critical infrastructure, placing even more scrutiny on their cyber resilience.[13] Approximately a quarter of all cyber incidents reported to the Australian Cyber Security Centre during 2020-21 were associated with critical infrastructure or essential services. The healthcare sector is facing increasing attacks; the number of hacking incidents reported climbed for the fifth straight year in 2020, rising 42%. Healthcare organisations are targeted by cyber attackers because they possess data that is of high monetary value. This includes patients' protected health information, financial information and intellectual property related to medical research and innovation.

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Deep dive: The case for a collaborative, data-driven approach to hospital transformation

The issue

Healthcare technology platforms, software and workflows are often not integrated. This can be traced to several potential issues; primarily that digital transformation is too often IT-led and without requisite input from users (staff and patients). This results in systems that are complex to use and frequently do not realise benefits (process simplification, time savings, and improved clinical and operational outcomes).

Pre-requisites for success

There are several capabilities and processes required to avoid these issues and creation of technology debt. They include:

1. Clear leadership: strategy, governance and guiding principles that support implementation through collaboration between IS, clinicians, HR, corporate real estate and business leaders

2. Co-defining basic requirements with users to ensure objectives drive the project, not functions

3. Engaging in innovation, teaching, learning and professional development to enable new ways of working to speed-up design and deployment and build in agility, and

4. Identify and address learning gaps: training and recruitment to find the right people and upskill using process innovations is critical, underpinned by enhanced HR and hiring practices.

The critical role of networks

Advanced networks are a building block for healthcare transformation. Data from networks can be integrated with workflow data to not only create a richer picture of the current state, but also to create a basis for policy settings to be tailored to individual users and devices.

The need for a new type of digital maturity

Digital maturity is not just about infrastructure and technology. It includes:

- Digital culture: advanced analytics and visualisation from platforms that provide network data services, sophisticated use of AI and clinical virtualisation

- Knowledge work practices: knowledge management by communities of clinicians

- Collaborative IQ: expertise networks defined by clinical support processes enabled by HR, workplace and IT professionals

- People-capability maturity: managed core competencies aimed at clinical best practice with KRAs for digital literacy, and

- Platform reliability: agile, platform / data integrations driven by clinical requirements.

A non-traditional ICT management approach is needed that combines technology, people, and processes to support cultural shifts that enable this new type of digital maturity. This is a challenge for many traditional ICT service providers with their top-down and centre-led approach. This challenge can be overcome by adopting a different engagement approach, agile development, and governance structures that prioritise co-creation and involvement of clinical leadership. As an example, by engaging with clinical leads and leveraging available platforms and existing integrations to clinical systems, was successful in its rapid response to the pandemic.

Part B: Digital innovation capability and assets that can be leveraged

Assets and capability

The National Industry Innovation Network (NIIN) is a collaborative vehicle for health innovation at scale. NIIN members are focused on creating impact through collective action.

The NIIN comprises a broad range of digital innovation assets including:

· Dedicated health innovation assets (highlighted in red)

· Specialist centres with an industry or technology focus (highlighted in blue)

· General purpose innovation vehicles (highlighted in green)

Brisbane — QUT
- Innovation Central Brisbane
- Trust, Retail & Logistics Research Chair
- Networking Academy

Sydney — UNSW
- Innovation Central Sydney
- Digital Transport Research Chair
- Cisco Proof of Concept Lab (CPOC)
- Networking Academy

Canberra — UNIVERSITY OF CANBERRA
- Innovation Central Canberra
- Critical Infrastructure Research Chair

Melbourne — RMIT / LA TROBE UNIVERSITY
- Innovation Central Melbourne
- IoT & AI Research Chair
- RMIT Health Transformation Lab
- Networking Academy
- Centre for AI and IoT

Perth — Curtin University
- Innovation Central Perth
- Future Networks Research Chair
- Learning Futures Lab
- Center for Advanced Networking
- Networking Academy

Adelaide — THE UNIVERSITY of ADELAIDE / Flinders University
- Innovation Central Adelaide
- Digital Health Research Chair
- Cisco-Flinders Digital Health Research Centre
- Networking Academy
- Critical Infrastructure Lab — Australian Cyber Collaboration Centre

Dedicated health innovation assets in Asia-Pacific

Lead researchers

- Prof Vishaal Kishore
- Nithya Solomon

Location

- Melbourne

Year established

- 2020

RMIT Health Transformation Lab

Major focus

- Proving the efficacy of digital solutions in a healthcare setting
- Targeted thought leadership to create system-level change

Facilities

- Simulated healthcare space including a patient ward and reception space
- Advanced Cisco networking equipment and collaboration technologies

Services offered

- Ideation and planning session
- Co-innovation service including proof of concepts with providers and industry
- Showcasing space for health ecosystem partners

Examples of past projects

- Aged care submission to government including relevant use cases (e.g. alarms for tripping hazards, fall detection, robotics in aged care, monitoring food consumption)
- Dynamic Healthcare Whitepaper demonstrating how spaces need to be adaptable to changing demands and how to make health systems 'anti-fragile'

What differentiates this capability

Digitally rich physical space and use of a proven, repeatable innovation methodology

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Flinders University

Flinders Digital Health Research Centre

Major focus

- Proving link between patient experience and maturity of digital health infrastructure

Facilities

- Dedicated digital health lab
- Cisco networking equipment

Services offered

- Digital and cyber security advocacy to health systems and health providers
- Health infrastructure maturity assessments

Examples of past projects

- Flinders co-designed the INFRAM infrastructure maturity assessment methodology which was later adopted by global standards body HIMSS. The approach measures five subdomains including mobility, security, collaboration, transport and data centre
- Virtualised Care White Paper outlining how systems can move from telehealth to virtualisation of a broad range of healthcare services (acute and in-home care)
- Flinders contributed to the healthcare chapter of Cisco's 'Securing Australia's Critical Infrastructure' report which identified major cybersecurity threats challenging Australia's healthcare sector.

What differentiates this capability

Depth of understanding about the relationship between digital health infrastructure and patient experience.

"The Lab (is) a place for demonstration of practical and scalable outcomes to improve healthcare delivery though smart application of technology to support people and process. This exciting venture will be driven by industry collaboration and 'possibility thinking,'"

– Professor Trish Williams

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Lead researcher

- Jeff Jones, Director Digital Innovation Hub

Location

- Tonsley Innovation District (South Australia)

Year established

- 2021

LA TROBE
UNIVERSITY

La Trobe Digital Innovation Hub

Major focus

- Industry-driven healthcare solutions

Facilities

- Innovation centre with advanced networks
- 5G test lab with Optus

Services offered

- Ideation
- Rapid prototyping
- Commercialisation support

Case study: Virtual Emergency Department

The Virtual ED was established to provide patients with access to virtual nursing and medical care so that a patient's condition can be managed at home, in an aged care facility or at the roadside (in the case of attending ambulance). An initial motivation for the Virtual ED was reducing the risk of COVID-19 exposure for patients and staff. In time, other benefits became clear, including reducing demand on emergency department facilities through more effective triaging and fast access to advice from specialist ED clinicians. The Virtual ED is underpinned by advanced networks and collaboration technology, which allows care to be provided beyond the walls of the traditional emergency department. In time, the Virtual ED will help healthcare providers more effectively manage surge demand.

What differentiates this capability

- Industry focus and collaboration with State Government
- Connections to healthcare networks under the umbrella of the Academic and Research Collaborative in Health (ARCH)

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General purpose innovation assets that can be applied to healthcare

Lead researcher

- Prof Reza Nejabati

Location

- Perth

Year established

- 2020

Curtin University

Cisco-Curtin Centre for Networks

Focus

- Proving value of advanced networks in different industry sectors (education, resources, and healthcare)

Facilities

- Innovation centre with advanced networks

Perspectives relevant to healthcare

- White paper on Smart Zero explores the role of digital technology to monitor, measure and reduce carbon emissions in a hospital setting

Assets that exist

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LA TROBE
UNIVERSITY

Cisco-La Trobe Centre for AI and IoT

Lead researcher
- Prof Wei Xiang

Location
- Melbourne

Year established
- 2021

Focus

- Demonstrating how industrial IoT and AI can transform system performance

Facilities

- Cisco IoT equipment
- Meraki cameras

Perspectives relevant to healthcare

- Deep understanding of the role universities can play as Living Labs across a range of industries including healthcare
- Perspectives on the role and value of Digital Twin technologies to improve processes and drive efficiencies in the management of built and digital infrastructure

Assets that exist

Lead researchers

- Various

Location

- Sydney, Brisbane, Adelaide, Melbourne, Perth and Canberra

Year established

- 2016 (Perth)

Innovation Central

Focus

- Accelerating speed of technology adoption across industries

Facilities

- Purpose-built facilities that support industry collaboration at scale including advanced network technology, collaboration tools and data management capability

Model

- University (anchor partner, provides facilities and access to researchers / students)
- Cisco (co-funder, provides access to global network and deep technology expertise)
- Industry partners (provide industry challenges and commercialisation pathway)

Perspectives relevant to healthcare

- Can identify off-the-shelf solutions that exist before spending development resources
- Capacity to run proof of concepts in healthcare with expert facilitators / partners
- Mobilise relevant researchers and students to work on industry projects

Location

- Sydney, Brisbane, Adelaide, Melbourne, Perth, Canberra and Hobart

Year established

- 2002

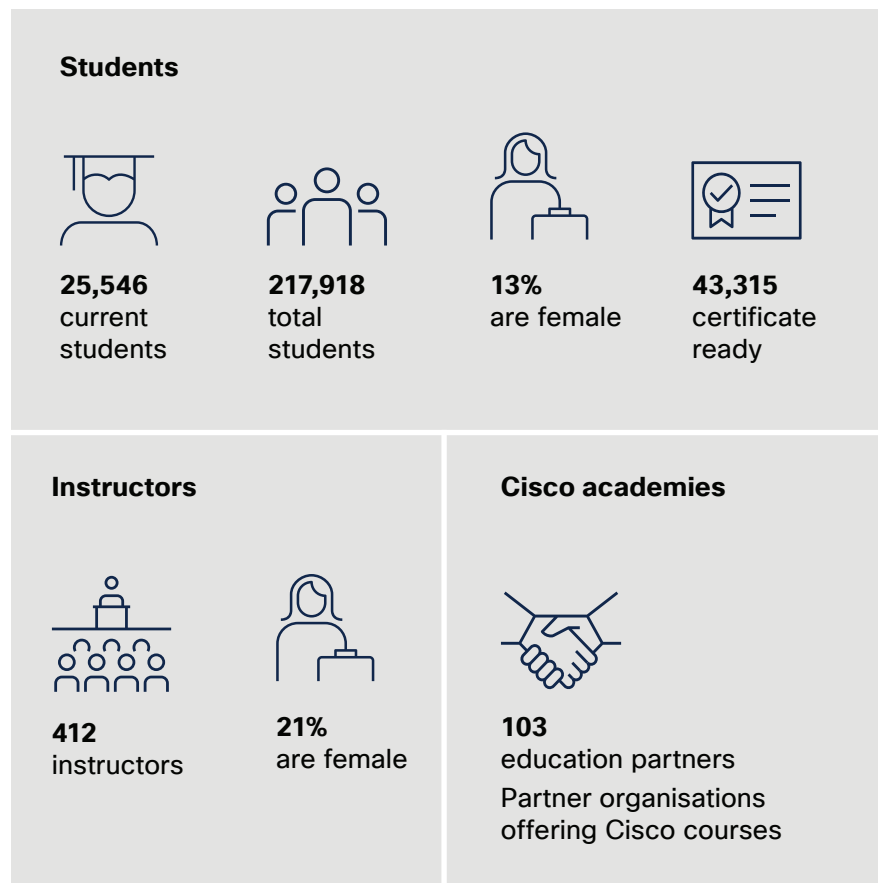CISCO Networking Academy

Cisco Networking Academy

Focus

- Training students in specialist technology including networking, cyber security, IoT and entrepreneurship

Model

- Cisco provides free access to its curriculum and teacher training

- University / vocational partners provide teachers, assessment and scaffolding for learning modules

- Any revenue for training is retained by the education institution

Capability relevant to healthcare

- The Academy program is accessible to healthcare providers (via education institutions) and can be an effective model for building digital talent organically

Students

25,546
current students

217,918
total students

13%
are female

43,315
certificate ready

Instructors

412
instructors

21%
are female

Cisco academies

103
education partners

Partner organisations offering Cisco courses

Lead researcher

· A/Prof Kumudu
  Munasinghe

Location

· Canberra

Year established

· 2022

UNIVERSITY OF
CANBERRA

Critical Infrastructure Research Chair

Focus

· Cyber security resilience of critical infrastructure
  (including in Defence)

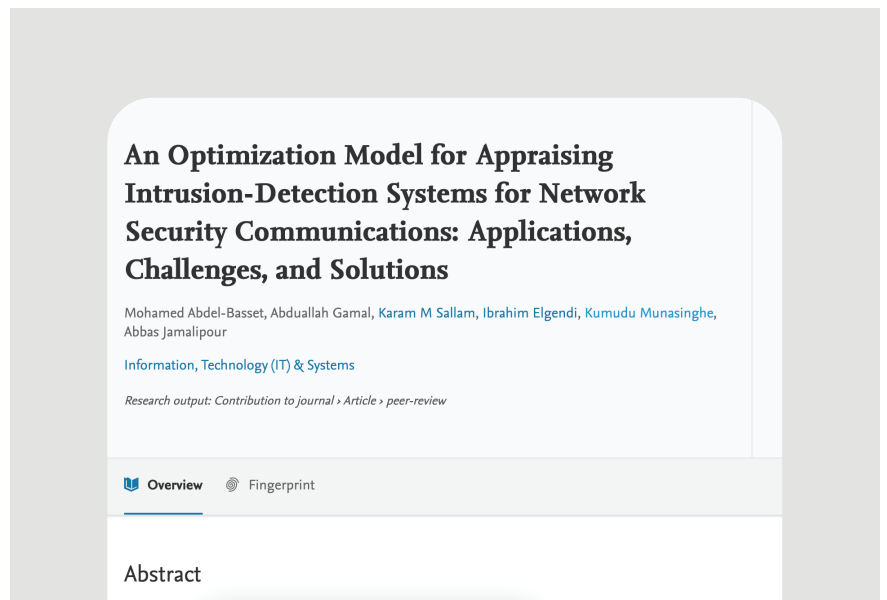**Facilities**

· Fully equipped innovation centre with latest Cisco advanced
  networks and security applications

Perspectives relevant to healthcare

· Healthcare providers' obligations under new Critical Infrastructure
  legislation

· Strategies to secure health data against increasingly sophisticated
  threat vectors

Assets that exist

An Optimization Model for Appraising Intrusion-Detection Systems for Network Security Communications: Applications, Challenges, and Solutions

Mohamed Abdel-Basset, Abduallah Gamal, Karam M Sallam, Ibrahim Elgendi, Kumudu Munasinghe, Abbas Jamalipour

Information, Technology (IT) & Systems

Research output: Contribution to journal › Article › peer-review

📖 Overview   ⊚ Fingerprint

Abstract

Opportunities to implement digital innovation in healthcare

Use cases related to building dynamic health capacity

There are a range of opportunities to use digital technology to improve dynamic health capacity. These opportunities span from making existing health spaces more dynamic and adaptable, to utilising non-health spaces for healthcare purposes, and mobilising health services using next-generation connectivity for remote locations.

Dynamic health capacity

Making existing health spaces dynamic
Creating surge and reorientation capacity by designing hospital infrastructure to be smart, connected and able to automatically scale with demand.

Making non-health spaces into health spaces
Rapidly repurposing existing assets (e.g. convention centres) into health spaces by using technologies such as software defined networking and network security to support new levels of remote configurability.

Mobilising health spaces
Overcoming barriers of distance and fixed infrastructure by using next-generation connectivity (including 5G and satellite communications) to provide health services in remote locations.

Case study: Promoting continuous care and active ageing

Cisco, Taiwan's top medical university National Yang Ming Chiao Tung University, and Jintai Technology have announced a collaboration aimed at promoting continuous care and senior living by seamlessly connecting public and medical resources to address healthcare needs in elderly and rural populations.

The partnership leverages industry-university research, technology applications, and Cisco's Taiwan Digital Acceleration Plan to extend resources to underserved areas. The collaboration is designed to achieve the third United Nations Sustainable Development Goal by ensuring healthy lives and well-being for all age groups, particularly those in remote areas and vulnerable communities. Utilising Cisco's high-speed networks, mobile devices and Webex video technology, the partners will enhance the overall quality of life for the elderly through telemedicine, remote care and health education.

The technology can also be applied to reduce medical resource consumption by enabling remote consultation and referral monitoring in regional hospitals, improving diagnostic efficiency and timeliness.

**Use cases related to improving productivity and cost efficiencies**

Digital technology to enhance productivity and cost efficiencies in healthcare. These opportunities range from asset tracking for improved staff coordination and patient care, to utilising IoT-based space analytics for optimising facility usage, implementing eConcierge services for efficient patient check-ins, optimising scheduling through big data analytics, and leveraging predictive maintenance for increased operational efficiency. Opportunities for asset tracking, space analytics and optimised scheduling are particularly promising when it comes to ambulances and ramping, which is under significant pressure.

Productivity and cost efficiencies

Asset tracking
Enabling staff to track assets and coworkers, control patient throughput, and find wandering patients in real-time.
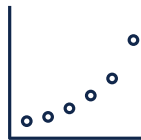
Space analytics
Using IoT-based multi-sensors to visualise space utilisation history, provide important insights on room usage, unused square footage and peak times in waiting rooms, as well as show conflicting flows of people.

Optimised scheduling
Leveraging big data analytics to integrate a host of variables from hospital records to improve operating room schedules and reduce the amount of idle time between procedures.

eConcierge
Using kiosks and digital tools to allow patients to efficiently check-in to healthcare environments, while reducing contact with frontline staff.

Predictive maintenance
Leveraging Building Information Modelling to enable condition-based or predictive maintenance and increase operational efficiency.

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Use cases related to Net Zero and decarbonisation

Digital technology is helping to achieve Net Zero and decarbonisation goals in healthcare. These opportunities extend from implementing automated energy management systems for heating and cooling, to consolidating energy tracking dashboards for enhanced environmental performance, developing digital twins for simulating and optimising energy consumption, and utilising smart waste solutions to minimise waste and increase collection efficiency.

Net Zero / Decarbonisation

Automated energy management
Automated heating and cooling including integration of Building Management Systems and wireless infrastructure.

Energy tracking
Consolidating energy dashboards that integrate with all building systems to help hospital management track and improve environmental performance.

Digital twins
Developing digital twins of the hospital environment to simulate the impact of different variables on energy consumption.

Smart waste
Minimising waste and increasing the efficiency of waste collection with smart bins that automatically sort waste and provide real-time data on bin capacity levels.

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Use cases related to security

There are a range of opportunities to use digital technology to enhance security in healthcare settings. These opportunities range from connected security systems integrating access control and monitoring, to mobile security tools for staff to trigger emergency responses, implementing smart lighting solutions for improved safety and energy efficiency, and embedding cyber security measures, such as Zero Trust models, to protect data, systems, and medical devices.

Security

Connected security
Integrating access control, infant tagging and CCTV to continuously monitor – and improve – hospital security and safety.

Mobile security tools
Mobile tools that enable staff to easily trigger emergency responses at the point of need, for example, allowing staff to trigger a security response when they are under duress.

Smart lighting
Automating lighting in indoor and outdoor environments (including carparks for staff and patients) to improve security and safety, while increasing energy efficiency.

Cyber security
Embedding cyber security including Zero Trust models at a network level – and requiring the same of supply chains – to protect data, systems and medical devices from attack.

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Use cases related to occupational health and safety

Opportunities to use digital technology to improve health and safety range from monitoring airflow based on occupancy, CO2, and air quality data for a safe environment and better energy efficiency, to utilising tools like Webex for occupancy reporting to ensure adherence to density limits and social distancing requirements.

Health & safety

Airflow monitoring
Managing airflow based on occupancy, CO2 and air quality data to create a COVID-safe environment while improving energy efficiency.

Occupancy reporting
Leveraging tools such as Webex to automatically record and report on density limits in rooms and ensure social distancing requirements are adhered to.

Health and safety considerations should also be applied to other technologies being deployed within healthcare settings. For example, the deployment of eConcierge kiosks can introduce new infection transfer sites that needs to be taken into account.
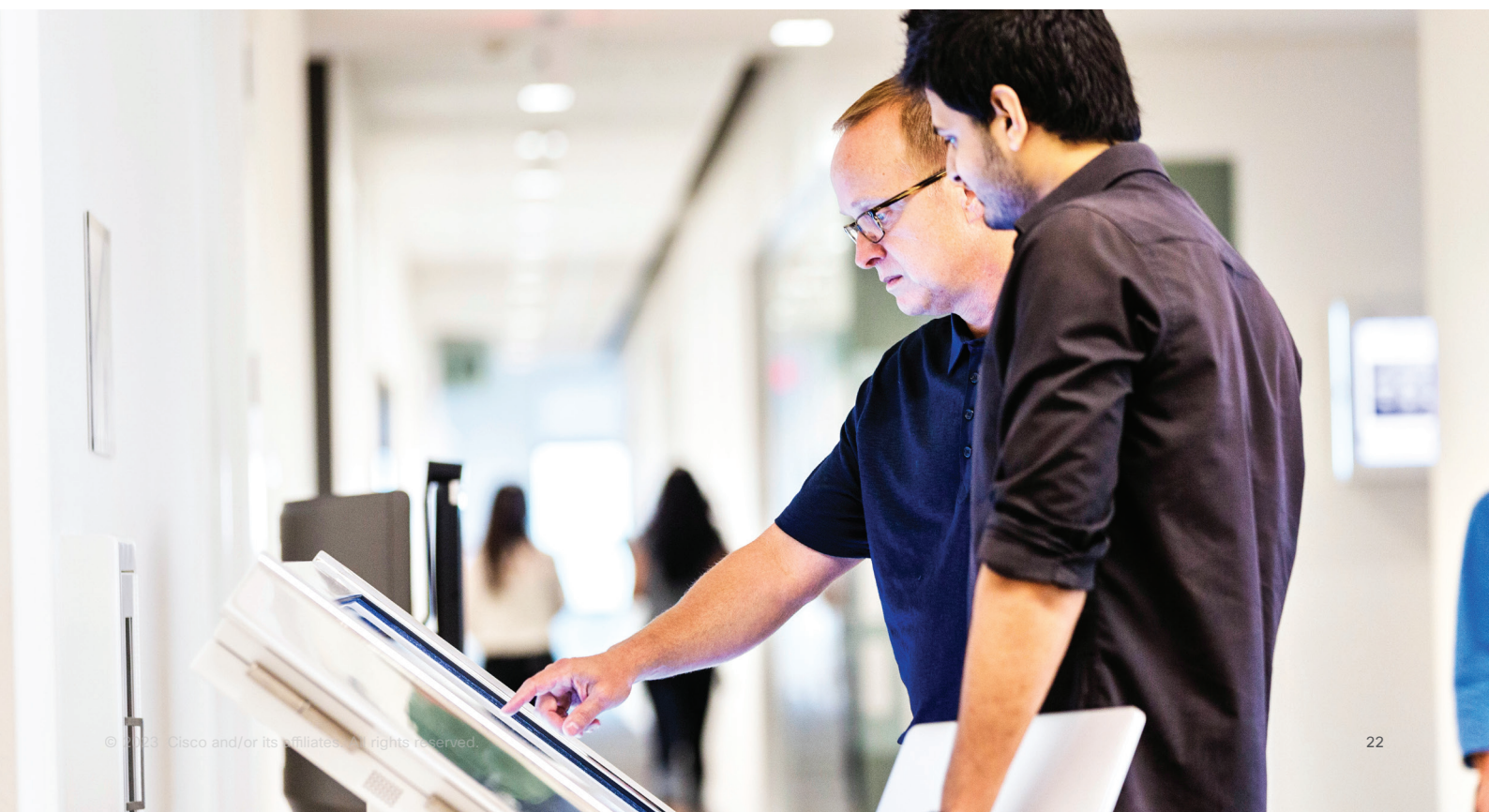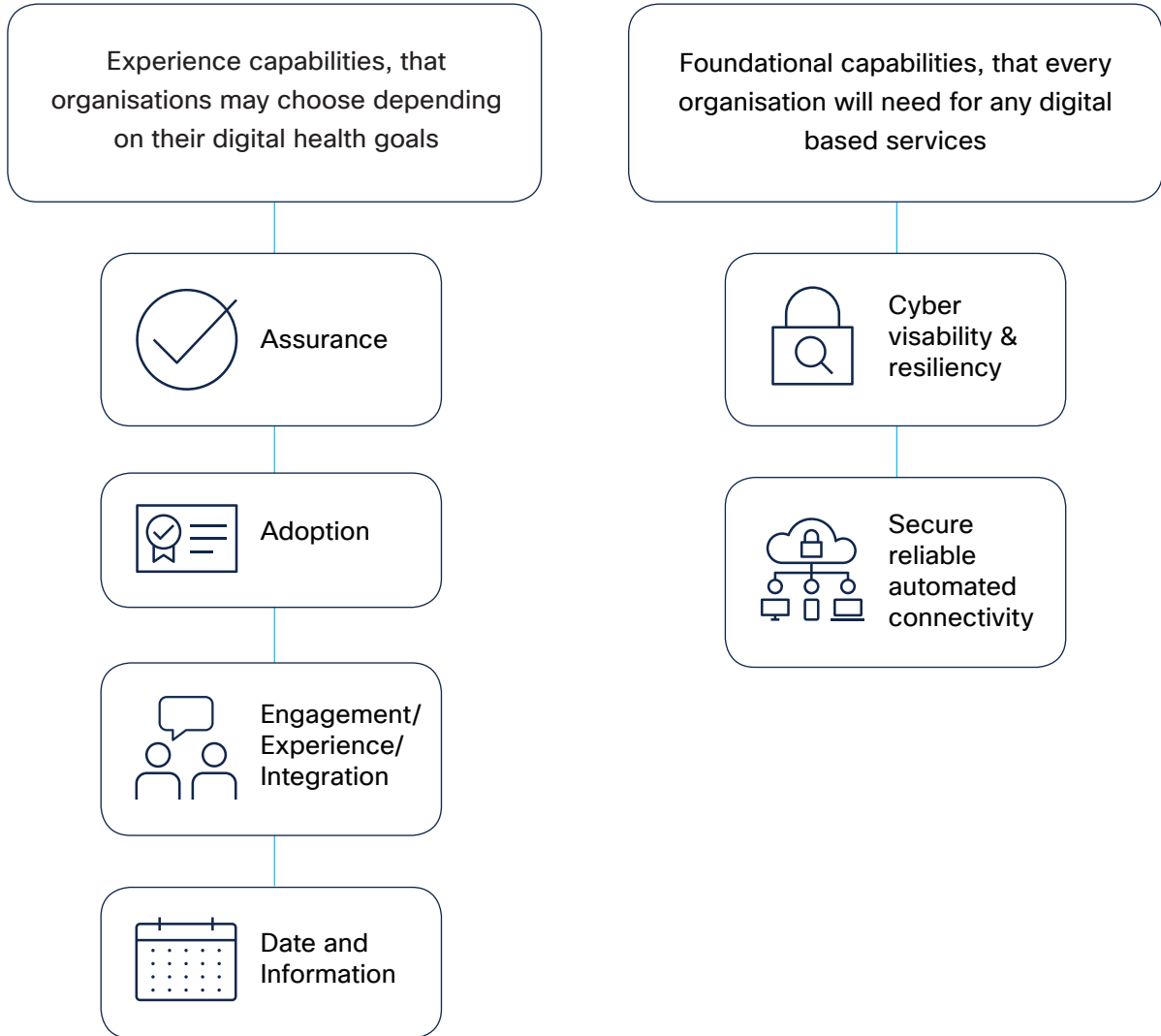
How digital innovation assets and capabilities can de-risk smart healthcare

The NIIN assets and capabilities described in this section are accessible to health systems and providers nationally. While some providers will want their own innovation capability, few will have access to the breadth and depth of technical expertise that exists within the network. There are several potential benefits if healthcare stakeholders can leverage the capabilities that exist in the NIIN:

1. The potential to de-risk implementation	2. Scale economies	3. Speed of progress
Investing in limited scope proof of concepts before committing to major deployments can save money and deliver better outcomes. It can also be useful to ensure smart healthcare solutions comply with relevant legislation (e.g., the Privacy Act).	By taking a collaborative innovation approach, healthcare providers can benefit from collective investments as well as collective expertise across the NIIN.	Digital innovation projects are difficult to manage off the side of a desk; they require dedicated experts in both healthcare and innovation (which exists across the NIIN).

Practical actions that can be taken

- Expanding the NIIN Network into the Asia region and aged care.

- Creating a health community of practice within the NIIN that draws together health experts, technology experts and innovation specialists. The community can be enabled by joint projects, events and other collaborative activities. A prospectus will be developed that sets out how individuals can join the NIIN Health Community of Practice.

- Canvassing ideas from experts about how to scale use of the Experience Framework in health.

- Collaborative projects between NIIN members including a focus on ways to develop a Smart Healthcare workforce and how to automate of clinical functions (starting with nursing, which is suffering acute shortages and retention issues).

- Creation of a Smart Healthcare reference design and engagement model for new hospital builds / upgrades: working with providers and ecosystem partners (architects, quantity surveyors, facilities managers and builders) to ensure major projects are underpinned by the latest digital thinking. The reference design would need to be person-centric and incorporate workflow considerations, for example, focused on identifying how the application of digital technology not just changes physical design of hospitals but also how they operate.

- Joint submission to Federal and State Governments on the value of the NIIN as a digital health innovation capability for the nation.

- Create reference capability bundles with easy to consume services based on global and local best practices. The purpose is to uplift the baseline capabilities so that more patient relevant and healthcare focused outcomes can be achieved.

Experience capabilities, that organisations may choose depending on their digital health goals

Foundational capabilities, that every organisation will need for any digital based services

Assurance

Cyber visability & resiliency

Adoption

Secure reliable automated connectivity

Engagement/ Experience/ Integration

Date and Information

Conclusion

The time has come to stop talking about innovation, and simply start. The mechanisms now exist via the NIIN to create networks of innovation spaces, capability and expertise across Australia and into the region. The commitment to and resourcing of innovation needs to change and innovation should not be treated as something you do when your substantive duties are complete. Innovation needs to be driven by the belief that without substantial change, our healthcare system will never be truly resilient, dynamic or data-driven. The NIIN presents an opportunity to harness the collective will and expertise of health innovators and thinkers who desperately want to collaborate with their peers in healthcare to effect real change.

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