

Creating Economic Impact Through Digital Innovation and Industry Collaboration

2023 Cisco Higher Education Study Tour to Norway and Denmark



Ambassador’s Message

Australia has much in common with Denmark and Norway, despite being on opposite sides of the globe. The Nordic countries are knowledge-intensive, highly creative and are playing an outsized role in the development of innovative solutions with global impact.

In June 2023, I had the great pleasure of hosting 14 university executives representing more than a quarter of all Australian universities. The delegation – coordinated by Cisco – had an opportunity to see innovation in action. Visits in Oslo included Radium University Hospital (a specialist cancer facility), Oslo University which is aggressively tackling sustainability through its courses and research, and OsloMet which is embracing AI and quantum to accelerate progress in digital solutions. The visit to Denmark was anchored by the Technical University of Denmark (DTU) and its world leading SkyLab innovation centre. The delegation also had the chance to visit Copenhill (the world’s cleanest waste recycling plant which imports waste to heat 90,000 households) and the Danish Outdoor Lighting Lab (DOLL).

Australia depends on the quality of our universities to solve economic and societal challenges. I am proud to be able to encourage the exchange of knowledge and technology, and see research collaborations and partnerships flourish between Nordic and Australian higher education sectors for mutual benefit. I would also like to acknowledge the important role that industry is playing to accelerate digitisation across the economy. Cisco’s leadership in bringing together this delegation demonstrates the power of collaboration between industry and universities.

I look forward to promoting the growing engagement and cooperation between Australia, Denmark and Norway.

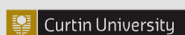


Her Excellency Kerin Ayyalaraju
Australian Ambassador to Denmark,
Norway and Iceland

Site visits



Australian University Delegates



For more information about the study tour, visit: cisco.com/c/en_au/training-events/events/europeanstudytour2023.html

Major themes from the study tour

The 2023 study tour provided an opportunity for Australian universities to discuss the big challenges and better understand how some of the world’s most digitally advanced and collaborative economies are responding to major global shifts related to digitisation, innovation and sustainability. Five major themes anchored the study tour, and form the basis for this report. Specific case studies are included that relate to site visits or presentations from Australian universities attending the tour.



Copenhill in Copenhagen, Denmark. The world’s most efficient combined heat and power waste-to-energy plant, and grass skiing resort and rock climbing facility.

The major themes:

1.	2.	3.	4.	5.
Role of government in the digitisation of the economy	Sustainability and Smart Zero	Industry co-innovation	Skills pipeline	Smart, secure efficient and immersive campuses

1. Role of government in the digitisation of the economy

Why it's important

The rate of digitation is accelerating across all industries. Technologies such as AI, cloud, IoT, robotics and advanced networks are catalysing innovation and fundamentally changing business and operating models.

Industry sectors experiencing the greatest disruption include advanced manufacturing (Industry 4.0) and health, which is experiencing surging demand caused by an ageing population, rising rate of comorbidities and increased complexity of care while also experiencing significant staff shortages.

Major insights

- Scandinavian universities are differentiated by their 'born global' outlook. It's a function of their small population but also the fact their economies are knowledge-driven and export focused.
- Startups are an important source of economic growth. The opportunity is not just digital applied to existing businesses, but how to use digital as the catalyst for creation of new companies and sources. At DTU alone there have been 780 startups created formation. Study tour delegates had an opportunity to meet founders of companies focused on areas as diverse as outdoor rescue, solar panel monitoring, tiny farms and hand health.

What we learned

- Oslo Cancer Cluster: industry-funded to shrink the time from research results to a patient benefit. Scale-ups have emerged from ideas that attract external money (and change patient lives).
- Digital is critical to providing the right treatment, to the right patient, at the right time. The partnership with Cisco has been important to ensure access to infrastructure that is fit for purpose (in collaboration with Cisco's development teams).
- Private-public approaches are critical. Oslo Cancer Cluster Innovation Park is an example of leveraging private funds for public benefit. "The whole hospital wouldn't be here if it weren't for private and public funding. The park was set up by private investors for public benefit."

Case studies

La Trobe University (LTU) virtual ED

LTU has worked with the Victorian Virtual ED in the application of AR, collaborative technologies and machine learning to improve healthcare delivery. This provides 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. An initial motivation for virtual ED was reducing risk of COVID-19 exposure but, over time, other benefits have become clear including improvement of ED lists and improved patient care. Using AR supports the assessment and management of patients.

Intelligent intersections

Use of sensors to model traffic flow, speed, vehicle type and a range of other factors to optimise traffic signalling. The sensors can be overlaid with other inputs including public transit and weather data.



Site visit

Specialist cancer hospital for the south-east of Norway - 40% of cancer patients will be treated at Radium. This is a major training hospital for cancer specialists. The hospital is not part of the university, but rather the hospital network. Radium treats around 30,000 patients per year. Part of a renewal project in Oslo where hospital infrastructure has been weak and suffered from under-investment.

Focused on:

- Co-location of all functions including diagnostics and treatment.
- Coordination of the patient pathway to minimise delays and optimise clinical and broader patient workflows.
- Integration of research and care; it's challenging given it's a moment of high stress for patients but crucial to improve mortality rates.

Major initiatives

- **Precision medicine implementation:** Focus is equal access to diagnostic services and experimental treatments, no matter where you live. Major challenge to link specialists and share data.
- **Oslo Cancer Cluster Innovation Park:** Major focus on embedding startups and industry on the hospital campus to help translate and commercialise research developed at Radium Hospital. Oslo Cancer Cluster's activities are aimed at accelerating the development of new cancer treatments and diagnostics to improve patients' lives. This is achieved by working in our three strategic roles as the Facilitator, the Ambassador and the Changemaker.
- **Collaborations with Cisco:** Using digital to increase access to care. A program providing access to physical therapy via Webex for cancer patients. Currently centres are using technology to increase access including an initiative training oncologists in Ethiopia. Have now trained 38 oncologists and cancer nurses in Ethiopia. Initially in person but now via digital channels, with plans to expand training globally using Webex.

“The complexity of cancer creates opportunities for innovation and entire industry segments that don't exist currently.”

- Ketil Widerberg, General Manager,
Oslo Cancer Cluster



2. Sustainability and Smart Zero

Why it's important

Modelling suggests Australia's transition to Net Zero could generate \$2.1 trillion in new economic activity by 2050, create 672,000 new jobs across the economy*, and enable Australia to capture a greater share of the growing global climate tech investment market.

Research capability and skills are needed to accelerate progress towards Net Zero, as well as making economies more complex and resilient. We will not reach our targets if we deal with the green transition in an analogue way.

Major insights

- The convergence of digital and sustainability is creating new inter-disciplinary research frontiers underpinned by data science.
- Exposing researchers to industry is a major challenge. Norway is experimenting with industry placements (6 months or more) for researchers to expose them to industry problems and give them domain knowledge to go with their technical expertise.
- Sustainability is a fertile ground for the creation of 'profitable' jobs.

What we learned

- Industry mentoring of young researchers delivers dividends to both parties; industry get access to a skills pipeline and the researcher gets exposed to an industry cadence and a professional network.
- Student-led projects are an important resource for universities to accelerate progress to Net Zero in their own institutions.
- University-supplier relationships will change. A supplier's circular economy processes will need to be factored into procurement decisions to avoid future emissions related to the disposal of equipment.

Case studies

Assessing Readiness to Adopt Smart Zero

Cisco and La Trobe University are developing an interactive tool to diagnose an organisation's capability to measure, monitor, reduce and report on emissions. The Web-based tool is being made available to universities and industry with a specific focus on the convergence of digital and sustainability targets.

Amager Resource Centre (ARC) at CopenHill

ARC is regarded as the cleanest waste-to-energy power plant in the world. It converts 440,000 tons of waste annually into enough clean energy to deliver electricity and district heating for 100,000 homes. ART was designed to contribute to the cultural fabric of Copenhagen. It sits within CopenHill, a recreational hub that's façade is climbable, roof is hikeable and slopes are skiable.



UNIVERSITY OF OSLO

Site visit

The University of Oslo (UiO) is Norway's oldest university and aligned to the UN Sustainable Development Goals. UiO has committed to cutting emissions (including scope 3) by >50% by 2030 (source: site visit presentation). UiO's sustainability efforts are guided by several principles:

- Activate action across multiple domains by strengthening collaboration between industry and interdisciplinary research teams.
- Pursue intensive, short and sharp projects that produce tangible results within a six-month time .
- Actively push for PhD students to be part of Energy Transition projects.
- Develop the future pipeline of sustainability expertise.

Major initiatives

- **Oslo Science City:** UiO is an anchor partner for Norway's first innovation district that brings together universities, research institutes and industry with a focus on deep industrial challenges and impact on society.
- **Sustainability Hub:** UiO is establishing a Sustainability Hub that will catalyse new and innovative teaching related to sustainability (including a new Masters program in digital sustainability research and summer school program in green industrialisation).
- **Student-led Green Office:** Students get 0.2 FTE funding to work on initiatives contributing to a greener, more sustainable campus.

“Digital technology, from smart meters to supercomputers, weather modelling and AI, could deliver nearly one third of the carbon emission reductions required by 2030.”

- Royal Society⁺⁺

“We want to be a laboratory for building new and better ways of collaboration between universities and industry.”

- David Cameron, dScience, UiO

“88% of new cars in Norway are electric; in Australia it's 3.8%.”

- The Age, May 2023⁺⁺⁺

⁺ <https://www.dailylegion.com.au/technology/environment/australias-21-trillion-future-with-672000-jobs-and-net-zero-emissions/news-story/46371a8616da08b1c36498f9462feec2> ⁺⁺ <https://royalsociety.org/news/2020/12/digital-tech-vital-net-zero-royal-society-report/> ⁺⁺⁺ <https://www.theage.com.au/national/victoria/in-norway-88-percent-of-new-cars-are-electric-in-australia-it-s-3-8-percent-why-20230526-p5dbfn.html>



3. Industry co-innovation

Why it's important

There is an expectation that research conducted in universities is industry-driven and creates economic, social or environmental impact. Traditional models are making way for more agile approaches that reflect how innovation is managed in industry, including greater emphasis on the role of digital. Digital is a major catalyst of innovation and not only provides a platform for university-industry collaboration, but is also an enabler of new product, process and business model innovations.

Major insights

- How building a sense of trust and community can help to create a thriving innovation ecosystem.
- The importance of triple helix partnerships (industry, government and universities) to maximise impact.
- The importance of interdisciplinary approaches to co-innovation – bringing all multiple disciplines under one roof.

What we learned

- Setting and capturing clear metrics is critical to catalysing co-innovation. DTU captures metrics around impact (i.e. funding, partnerships), competencies (i.e. how it's growing skills) and culture (i.e. how it's impacting mindset shifts).
- Activating co-innovation should involve a combination of startup support (e.g. mentorship, grant programs), facilitated collaboration (e.g. bringing together corporates, NGOs and government) and education activities (e.g. running university courses within the hub).

Case studies

National Industry Innovation Network (NIIN)

The NIIN is a collective of Australian universities and industry partners wanting to solve national challenges. It comprises 7 research chairs, 6 innovation centres and a number of specialist centres. Its focus is on short and medium-term impact and accelerating the pace of digitisation in priority industry sectors. Cisco is the founding member.

Queensland University of Technology

QUT is supporting students to turn ideas into technologically inspired products and services. QUT offers a major for students in both developing and scaling startups. It has also partnered with the Department of Environment and Science to sponsor an innovation challenge for plant-based protein.



Lighting the future
of Smart Cities

Site visit

DOLL is one of the world's first living labs. Built on an industrial estate outside Copenhagen in Albertslund, DOLL has more than 60 industry partners developing and testing solutions in intelligent lighting, smart waste, advanced networks/Edge AI, intelligent transport systems, system and data platforms. Strategic university partners include DTU, which provides technical expertise (including research) and its own use cases.

Major initiatives

- Collaboration with an Australian company (Feliciti) to test its ruggedised sensors at intersections. The technology is also in use with a University of Melbourne collaboration.
- Digital Twin at DOLL: a full working twin that allows data from multiple sources to be ingested and visualised. In time, the digital twin will be utilised to monitor potential interventions in a digital environment before doing so in a physical one.
- Use of outdoor lighting sensors to manipulate light levels on bike paths to minimise impact on animals.



“Our goal is to be a mutual playground for innovation.”

- Danish Outdoor Lighting Lab

4. Skills pipeline

Why it's important

There are two major dimensions to the digital skills challenge:

- Training people for job roles where there are significant shortages (cyber security, AI and data analytics).
- Improving digital literacy across the workforce as people experience turbulence within roles including the need to interact with technology. This will be even more acute as AI and machine learning are applied to more functions and even entire jobs.

Major insights

- Young people need to be prepared for an AI-enabled world. Universities are currently dealing with this issue as they develop their own policies on whether to embrace AI tools such as ChatGPT or take a more cautious stance. In many roles, including law, accounting and consulting, it is likely that AI tools will not only be used as part of standard workflows but potentially replace some of the entry-level positions that have previously existed in these industries.
- The importance of upskilling the general and university workforce. The University of Oslo is now offering an accredited sustainability certificate that will be open to its 26,000 students, regardless of discipline, as well as to academic and professional staff.
- Universities are focused on providing industry credentials – not just accreditations – to make people more employable. Employers want students to not only understand the theoretical concepts related to a role but also be adept at using relevant software (e.g. MYOB and Xero in accounting).

What we learned

- Student projects – including those focused on improving the university campus – provide exposure to industry and help to build professional networks before students graduate.

Case studies

Next-generation technologies at Oslo Experience Centre

A new generation of technologies is being developed to make hybrid work and hybrid learning more effective. Much of the focus is on taking technology out of the picture and have it fade into the background, whether that be noise removal or devices that automatically detect a teacher's device as they enter a learning space and allow one-button to activate a session.



DTU Skylab

Site visit

DTU is an engineering-focused university that aims to drive sustainable change and create value for society. At the core of its mission is startup support, company collaboration and education activities. DTU Skylab is its primary vehicle for prototyping, student innovation and entrepreneurship. It initially operated 'under the radar' and DTU asked users for feedback before offering anything. Students came first, then industry became interested, allowing it to create revenue streams to help sustain the operations. The final piece of the puzzle was getting younger researchers to get involved and applying for student accelerator programs.

Major initiatives

- PhD students are required to have an international stay as part of their program; 74% of papers have an international co-author.
- Undertake business development for the tech transformation office. Aim to improve rate of commercialisation for DTU research.
- Startup support including matching service for entrepreneurs matched with tech specialists from outside the university. Startups are in deep tech, mechatronics, AI, food and pharma, biotech and consultancy. Number of startups out of DTU has almost tripled.
- **Educational activities:** all engineering students do a course in Innovation and Entrepreneurship (replacing the core unit in economics). Creative thinking and working across teams.

“We didn’t have a lot of time for strategy – we had to basically start kicking the ball around to get traction quickly.”

- Mikkel Sorenson, MD Skylab

Labs that converge under the Skylab banner:

- Digital SkyLab
- FoodLab
- Science Lab
- Fabrication and Prototyping



5. Smart, secure efficient and immersive campuses

Why it's important

The impact of digital on universities is profound. Traditional models of teaching and learning have been challenged as students demand more flexibility, more personalisation and content that is both relevant and engaging. The promise of AR and VR is slowly being realised but is also putting pressure on underlying infrastructure including networks. Students also expect friction-free services and instant communication.

University leaders are having to design campuses that have fewer people on site (with the rise of hybrid work and learning), are more experiential and alive, have more porous boundaries to industry and are more automated and efficient.

Major insights

- The majority of meetings (including classes) have a remote participant. The challenge is providing equity of presence to all participants and delivering more than video; transcription, translation, noise cancellation, configuring for specific room layouts and meetings that are platform agnostic.
- Technology debt is a constant challenge and major cost impediment. Total cost of ownership needs to be considered for new technologies, including the capacity to invest in digital communication platforms that can reduce the need for – or even replace – AV.
- Cyber security is likely to become even more complex with AI-enabled attackers. Cyber security is as much a people issue as it is a tech problem as people often represent the weakest link in the most resilient systems.

What we learned

- Adopting new and more immersive ways of teaching means getting the tech out of the way (e.g. presenter tracking and intuitive interfaces).
- People want instant communication on their channel of choice; text, instant message, social media. The underlying principle of CPAS is to extract data from a range of platforms rather than trying to replace them.

Case studies

Danish Technology University (real estate services)

DTU undertakes real-time measurement of emission and costs related to campus infrastructure. Data is ingested from multiple sources and allows the real estate / facilities team to make decisions about emissions at an individual building level. The system used by DTU is bespoke as no commercial alternative existed to provide real-time data at a granular enough level.

Deakin university

More than 50% of Deakin students learn primary online, and all students (and teachers) need to complete a unit that is fully online. The pandemic highlighted that much more work is required to move from remote learning to true immersive, online learning experiences.

OSLOMET

Site visit

OsloMet is a large urban university with a comprehensive focus across a range of disciplines as well as specialisations in emerging technologies including AI and quantum. From a technology perspective the focus is on delivering services that create value, not just deploying infrastructure. OsloMet's strategy has a 20-50 year horizon targeting global problems including welfare, democracy, environment and geopolitical uncertainty.

Major initiatives

- **Digital transformation and leadership program:** OsloMet runs a program that provides upskilling in digital transformation and leadership. It was initially aimed at Masters students but OsloMet executives are encouraged to complete it.
- **Student projects in Quantum AI:** OsloMet students have been working with Ruter (the public transport operator) to understand load management by applying algorithms to actual databases rather than theoretical models.
- **Faculty-wide upskilling in Quantum:** OsloMet is now looking to provide all computer science and IT students with training in quantum computing. It has been offering the course since 2021 to make graduates more employable.

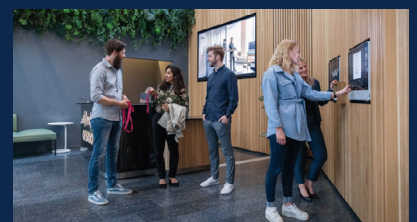
Cisco Oslo Experience and Innovation Centre

Located in Video Conference Valley in Lysaker, Norway, the Oslo Experience & Innovation Centre is a large Cisco research and development office housing over 400 engineers responsible for developing cutting edge technology hybrid workspace and learning solutions, including the full spectrum of capabilities (e.g., video endpoints and devices, software, acoustics, mechanics and quality assurance testing).

The centre also has an immersive showcase environment equipped for both in-person and virtual demonstrations, displaying devices in action.

During the visit a number of topics generated expansive discussions:

1. **Artificial Intelligence (AI):** AI for audio intelligence, video intelligence, gesture recognition and remote video improvement over low bandwidth was topical and applicable for universities. The role of conversational AI in the end user experience was explored, as well as AI's role in simplifying workspace and learning space interactions as well as use of AI artefacts to improve research outcomes.
2. **Sustainability:** intelligent, flexible and interoperable work and learning spaces (smart spaces) that are aware of their environment (sensing humidity, temperature, air quality, number of people) and can automate workflows such as lighting and air conditioning. These technologies can deliver energy savings using technologies such as AV over IP, Power of Ethernet, and lighting over ethernet to reduce total costs of ownership.
3. **Hybrid Work and Hybrid Learning:** While established and operational at most universities, challenges persist for many in terms of hybrid work and learning including the lack of meeting equity, the complexity of management and issues with interoperability.



The opportunity and way forward

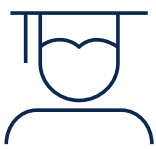
Many of the challenges explored on this study tour are global, not local. Environmental sustainability, digitisation, healthcare, skills shortages and economic headwinds are shared, and so is the opportunity to collaborate in solving them. Australia and Scandinavia have natural synergies including small populations, rich (but dwindling) natural resources, strong innovation ecosystems, and economies that are knowledge-intensive.

The relationships formed on the study tour are a starting point for genuine cross-border collaboration.

Specific collaborations were discussed including:

- Digital health partnerships between Norway and Australia (in exercise physiology / cancer care).
- Smart cities projects between Australia and Denmark.
- Sustainability projects between Norway and Australia.
- DTU student exchange with NIIN universities.
- Skylab healthcare start-up collaboration with NIIN universities.

Potential next steps for Australian universities on the study tour:



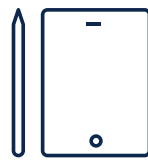
Co-funded proof of concepts

Opportunities available for universities to co-design proof of concepts focused on future hybrid learning spaces, digital student engagement and intelligent hybrid workplaces.



Commissioning Smart Zero readiness assessment

Smart Zero assessments will start in the second half of 2023. Universities can sign up for an ideation session with an Innovation Central or commission a paid assessment with Cisco's delivery partner Vector Consulting.



Registration of interest for 2024 study tour

Invitations are strictly by invitation but destinations for the 2024 study tour include the UK, Finland and Estonia.



2023 Study Tour Readouts

Cisco is happy to present to university executives on the recent study tour and organise demonstrations of technology seen at the Oslo experience centre

Role of the NIIN for creating impact

The National Industry Innovation Network (NIIN) is demonstrating that industry-university partnerships are stronger and more important now than ever. NIIN is focused on the role of digital technologies to tackle national challenges within a collaborative network.

The network comprises:

- Research Chairs
- Innovation Central Hubs
- Specialist Centres
- Skills and Talent Development
- University Partnerships

