

Convention gives way to real-world relevance

Industry demands solutions, so less-established universities must form strong links to learn what the market needs, and how to produce it. **By Leigh Dayton**

The appearance of three young universities among the top 20 fast-rising institutions in the Nature Index overall for 2019 to 2020 is evidence that age is no predictor of productivity. But what about capacity to innovate? Are young universities more adaptive, nimble and better able to translate their research to the wider world than their older counterparts?

“It’s an under-explored area,” says Aristidis Kaloudis, an industrial innovation policy researcher at the Norwegian University of Science and Technology (NTNU) in Trondheim, Norway, which is in 22nd position for output among universities 50 years old or less in the Nature Index. But as institutions seek to rebuild from the COVID-19 crisis with better capacity to address challenges, their comparative ability to innovate is a topic of growing interest.

To Kaloudis, it’s clear that young universities do things differently. “They’re often willing to take risks and search for strategies to increase their reputational standing,” he says.

Martin Bliemel, the director of research in the TD School for transdisciplinary education and research at the University of Technology, Sydney (UTS) in Australia, which ranks 40th among young universities by Nature Index’s key metric, Share, agrees. “Young universities innovate by necessity.”

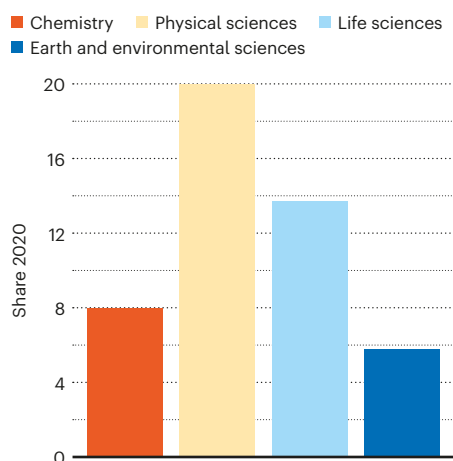
For universities founded by governments in emerging nations for a specific purpose, innovation is built into the design, says Kwang Hyung Lee, president of the Korea Advanced Institute of Science and Technology (KAIST) in Daejeon, which holds fourth position in the Nature Index young universities ranking.

Those such as KAIST were established for the purpose of driving economic growth with advances in science and technology, he says. Hence, ‘dynamic approaches’ and ‘differentiated strategies’, rarer in many established universities, are normal. For example, KAIST students may take up to ten years leave to establish a start-up, rather than the standard two years other universities offer.

And as Kaloudis observes, although older

Norwegian University of Science and Technology, Norway
NI young university rank: 22
NI academic rank: 303

Subject Share breakdown, 2020



universities often have long-term industry links, young institution strategists are keen to identify new niches and pursue “more risky research and development opportunities than incumbent universities”. That means, says Bliemel, spending more time with industrial partners and working to develop rigorous research-based solutions to “real-life challenges, relevant to the industry partner”.

Rethinking traditions

This approach requires rethinking conventional university structures and programmes to enable strong academic–industry collaboration. For instance, industry does not think in terms of disciplines when it seeks help with a problem. It wants solutions.

That imperative drove the launch of UTS’s TD School this year, bringing multidisciplinary researchers from appropriate faculties to university–industry collaborations.

UTS students also study across faculties. By collaborating closely with transdisciplinary experts, and industry partners who join classroom discussions about solutions to their problems, students learn to work with people

in and out of academia.

This willingness to experiment with curricula and prepare students for flexible careers is a focus of other young universities, such as NTNU and KAIST. Lee points to projects with South Korean ‘flagship companies’, such as SK-Hynix, LG Display and Samsung, to reskill company engineers and train students who will work for them upon graduation.

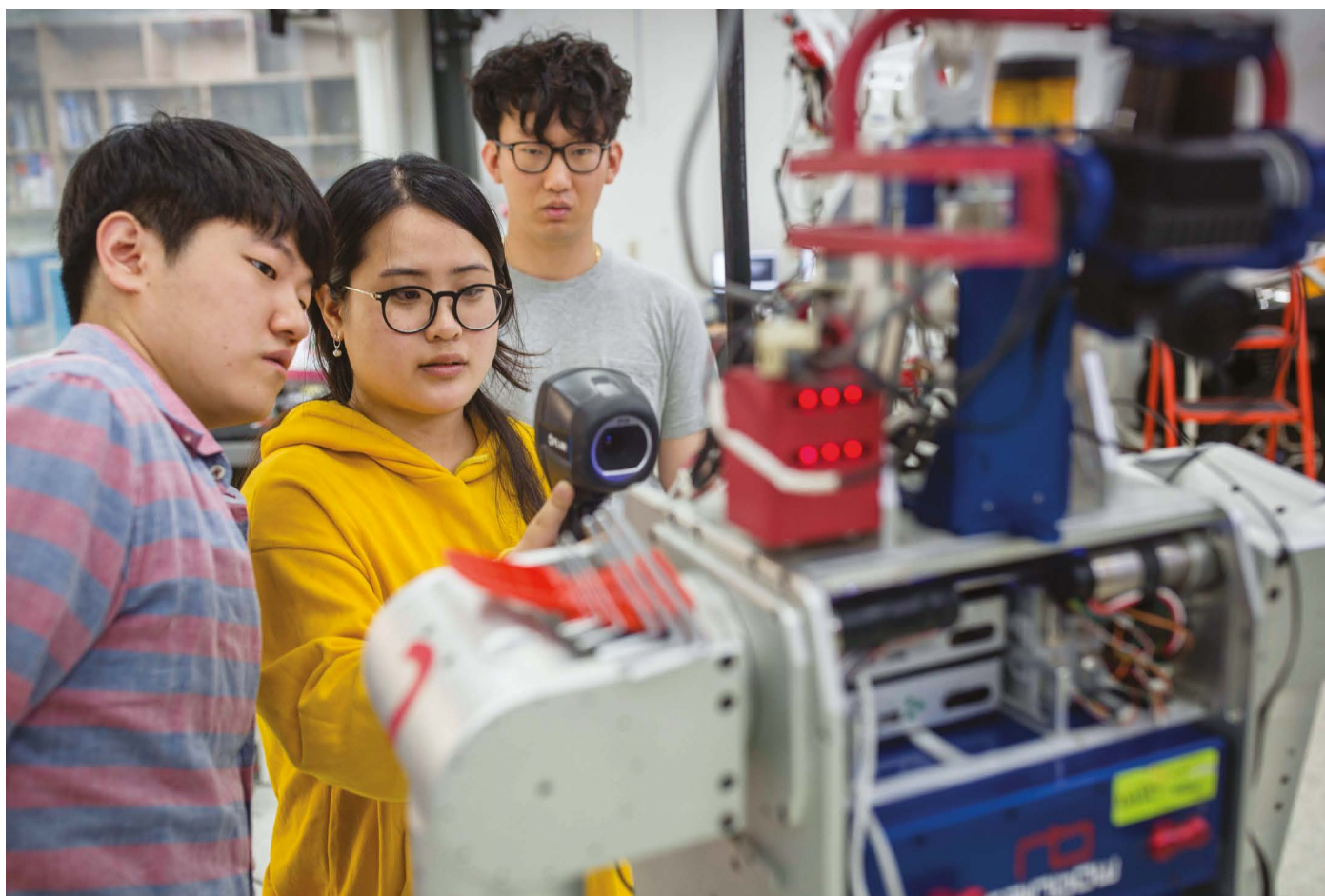
KAIST’s pairing with electronics giant Samsung was the most productive industry partnership for young universities in 2020 based on Collaboration Score, which is the sum of their Nature Index Shares on articles to which authors from both parties contributed. The collaboration spans diverse topic areas, ranging from cancer genetics and cellular immunity after COVID-19 infection or vaccination, to the use of deep learning in chemical and biological sensors.

Despite KAIST’s IP record and successes, such as retired KAIST engineer Jun-Ho Oh’s start-up, Rainbow Robotics, which this year donated US\$4 million to KAIST, Lee says it’s important to “learn from failures”. To that end, the university just opened its Centre for Ambitious Failure. The centre will conduct case studies of failures of R&D programmes and start-ups and include them in a database, providing examples of what not to do.

NTNU, too, focuses on tight links with industry, illustrated by the innovation centres that it hosts or participates in. These range from public–private centres for cybersecurity in critical sectors and for artificial intelligence, both established in 2020, to centres for ultrasound solutions and for autonomous marine operations and systems, which have developed technology such as handheld ultrasound devices and wave-powered vessels.

The university also enhances innovation with policies supporting student-based and researcher-based innovation and entrepreneurship, adds Kaloudis. He points to the fact that NTNU has the largest number of spin-offs and academic start-ups in Norway. Eelume, for instance, devises robotic technology with subsea applications, and Kahoot develops

SOURCE: NATURE INDEX



Students search for a robot error in a lab at South Korea's KAIST, where a new Centre for Ambitious Failure will investigate studies that go wrong.

game-based learning platforms.

Taking research risks, working closely with industry partners, developing industry-aware organizational structures, and reshaping curricula are all hallmarks of innovative young universities. But these activities do not help in the metrics by which they are ranked and judged by governments for funding eligibility. Individual scientists, too, receive funding and university support based on the number of publications and grants they obtain.

Measuring success

From patents to publications, the higher they rank, the more they receive. As Kaloudis says, however, the common metrics “do not capture the full scope of innovation impact”.

“Patents count, but are numerically tiny compared to collaborative research contracts,” says Bliemel.

Even so, university administrators must meet standard metrics targets in order to maintain the institution's standing and funding.

Increasing their metric scores is time-consuming. There is less time to spend working with industry partners and developing new

science. Potentially valuable, but risky, projects may be avoided in case they do not bring publications and grants. Potentially productive academic collaborations that explore new areas may also be avoided in favour of sticking with familiar subjects that generate findings already proven to be publishable.

Efforts are under way to enhance the evaluation system for innovation and knowledge transfer, so as to reduce the barriers the current metrics pose for innovation generally, and young universities specifically. On behalf of the Norwegian Ministry of Education and Research, for example, the pro-rector of innovation at NTNU, Toril Nagelhus Hernes, will develop a new set of indicators.

According to Kaloudis, the goal is to capture a broader range of measurable activities than the existing “metrics of commercialization”, such as patents and spin-offs.

“The additional indicators will capture the economic, people and networking activity channels through which universities contribute to innovation,” he says.

Trevor McMillan, vice-chancellor at Keele University, UK, chairs groups contributing

to the Knowledge Exchange (KE) Concordat. The evolving programme provides universities with tools to evaluate their KE performance. A metrics-focused KE framework is under development. McMillan says the Concordat recognizes that “each university is asked to play to its strengths, rather than strive to fit a particular model”.

Young universities, such as KAIST, UTS and NTNU, develop innovation-boosting strategies and projects grounded in their individual circumstances. “One size will not fit all,” as McMillan observes.

KAIST, for example, has worked to simplify regulatory barriers involving the handling of its intellectual property (IP) and trade. “KAIST Holdings, which will open in January 2022, will actively market KAIST IP as a private corporate entity, separate from KAIST,” says Lee. He adds that the goal is not just to maximize IP income, but to identify and support promising in-house start-ups at an early stage. “We want them to go global.”

Leigh Dayton is a freelance writer based in Sydney, Australia.

Correction

This article originally wrongly located the Korea Advanced Institute of Science and Technology (KAIST) in Seoul. It is in Daejeon. The text has been updated.