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**Headline: Smart city pours money into university-based research**

## **Smart city pours money into university-based research**

Singapore's major investment in becoming a knowledge economy and digital 'smart city', in particular SG\$19.1 billion (US\$14 billion) being poured into research and innovation in 2016-20, is an ambitious government project that provides huge opportunity for its three main research-oriented universities.

The sheer size of the research and innovation budget announced in January 2016, for a country of just five million people, has made Singapore the world's top research spending country per capita, and has propelled its publicly-funded universities to the top of regional university league tables.

"Singapore has achieved the status of a true research-oriented city. So it is positive for the universities," says Arnoud De Meyer, president of Singapore Management University. "The SG\$19.1 billion planned for 2016-2020 research is a huge commitment by the government."

Under the government's plan to 2020, Singapore's National Research Foundation will channel funding into four key areas: advanced manufacturing and engineering, health and biomedical sciences, the digital economy and services, and urban solutions and sustainability.

It will also fund academic research, including large interdisciplinary projects, the development of a pipeline of scientific talent, as well as investing in local start-up ventures and other business entities.

The government has made it clear universities will play a major part in transforming knowledge into new businesses and new jobs in Singapore, and "help us stay resilient despite all the changes we see", Singapore's Minister for Education (Higher Education and Skills) Ong Ye Kung said in July.

"Singapore has the concept of a smart nation and our research must further enhance that smart nation. Being a small country, it [research] is very co-ordinated," says Bertil Andersson, president of Nanyang Technological University or NTU.

The record five-year funding comes on top of SG\$13 billion allocated in the previous five-year period, 2010-15, which was double the SG\$6 billion allocated in 2005-10. University heads have been investing long-term, believing the government's commitment will continue beyond 2020.

"For universities it is a very positive thing because with the resources we get, we can attract some of the best minds to come and work with us and build up laboratories," De Meyer told University World News. "Singapore has become a very interesting environment for top quality researchers to come and work; they see a research environment in which they can explore new things; they can try out new things."

### **New higher education landscape**

The massive rise in research funding has pushed NTU from being an engineering-focused institution to a broad-based research university that, according to some regional league tables, is now the top university in Asia, a position previously held by the city's premier institution, the National University of Singapore or NUS, and others, such as the University of Tokyo and the University of Hong Kong, just over five years ago.

In an indication of the impact of government funding priorities, NTU last October announced it would set up two new schools this year, for humanities and social sciences respectively, to accommodate more interdisciplinary programmes and research in the wake of a government push for more funding in these areas. NTU already taught languages, linguistics, history, philosophy and psychology, public policy and sociology within its much smaller combined School of Humanities and Social Sciences.

The government's overall research push "has meant a big change in the academic map of Singapore", says Andersson of NTU. "Previously there was just NUS that was a top-ranked institution; now there are two in Singapore, including NTU."

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He sees this as the result of the competitive system for bidding for the government's research grants, where universities in Singapore are pitted against each other. It is a view shared by others.

"It is true that with quite generous funding there is a lot of money for good ideas," says Lily Kong, provost of Singapore Management University. "But it is very competitive and this competition is key to excellence," she says. "You don't simply get the grant even if funding is available."

At Singapore Management University, she notes, a number of the projects being funded were already being worked upon but the 2016 announcement by the government on research and innovation funding "gave it a fillip", she says.

Race for international talent

Nonetheless the competition has meant a race for talent. "There is a lot of hiring going on across the universities," particularly from abroad, she says, as universities are "so conscious of hiring the best".

"Singapore is very determined, as a very small country, to stay ahead of the big dragons like Japan, South Korea and China and realises that if we are going to stay ahead or stay in the competition being so small we have to be very focused on quality," Andersson says.

Hiring internationally appears to have paid off for NTU in particular. "NUS was the more established university but when this big investment in research started we were more hungry," says NTU's Andersson.

"We really went for all the grants and we recruited really top-level people from Caltech [California Institute of Technology], from MIT [Massachusetts Institute of Technology], Imperial College [London], from Germany and from Switzerland, so, in a sense, NTU changed from a mainly engineering college to a top research-oriented broader university."

"We recruited two types of people – the big whales, the superstars, and then we recruited a lot of young investigators that in Europe compete for the ERC young investigator grants," he said, referring to the prestigious and globally highly-competitive European Research Council or ERC awards, administered by the European Union Commission in Brussels.

This hiring spree has been accompanied by strong peer review and inspection of the universities to ensure they are world-class. "We have international panels coming to evaluate the research," says Andersson.

Once in five years a distinguished international panel spends several weeks at each of Singapore's universities evaluating how well the university has performed, says Tan Eng Chye, deputy president and provost of NUS, who will take over as NUS president in January 2018.

"These experts come from industry, the academy and from the government, and in a way they embody the different perspectives of higher education," Tan says. The universities take this extremely seriously, he says, as "this could possibly have an impact on the budgets of the university".

Burden of responsibility

But the huge push by the government and the pivotal role of universities have also meant a major responsibility for the institutions not just to produce high-quality research and be high-quality institutions but also to deliver on the government's project to ensure economic growth through high investment in innovation and the knowledge economy.

"The big question is will we see the results of all that research in our GDP [gross domestic product]? Will we have the ability to translate all the research efforts and research results into tangible commercial results," says Singapore Management University's De Meyer. "The lifetime between research and the commercialised results is often 20 years. It takes a lot of time and we are still waiting for those results."

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“Expectations are very high that we actually deliver on that research expectation. But research is always uncertain and we don’t know whether we will be able to deliver.”

Andersson notes that unlike some highly innovative small countries – such as Sweden, Finland, Switzerland and Israel – Singapore is more risk-averse. “Today the big success story is research. Innovation has not come that far in Singapore.”

“Research has to come before innovation and the country has very high ambitions to do that.” But it needs even more change, Andersson says, before all the research really transforms the economy into an innovation-based one.

Referring to the main propellers of the Singaporean economy, he says: “I don’t think it is going to be radically different by 2020 but maybe by 2025 and 2030. The question is, will the Singapore government, the Singapore taxpayer have the patience until then?”