

Smart Nation Initiatives at NUS

Presented By:

# Technology with a human touch



The National University of Singapore can contribute to a holistic understanding of Smart Nation activities as well as play a key role in preparing students for the future

Written by Grace Chng

Social science research has a key role to play in the Smart Nation initiative alongside science and technology which underpin the nationwide thrust.

Professor Tan Chorh Chuan, President of the National University of Singapore (NUS), points out that social science research will be crucial in helping Singapore better understand the impact of "smart" activities on people's lives, and their adoption of new services and technologies.

"It's not just about the technology, but how services can be improved to better people's lives," said Prof Tan in an interview on the university's contribution to the Smart Nation initiative.

"It's about whether and how people use the services. The social environment and people's behaviour are issues that we need to consider, especially as new technologies are often double-edged."

For example, if electric personal mobility devices become pervasive, taking people from their homes to the train station, it will be a good development.

"But speaking as a doctor, it has public health implications. People will walk less. As it is, many of us are already very sedentary," said Prof Tan, who is a renal physician by training.

The impact of Smart Nation — an initiative that aims to better the lives of Singaporeans through harnessing digital technologies — goes beyond the adoption of smart activities, into the realm of behavioural science.

"The time to work on these issues is (at) the beginning of the Smart Nation activities, and not when the issues have become prominent."

Universities like NUS, he adds, with deep expertise in technology and social and behavioural sciences, are well-placed to contribute to such research.

This would include two key areas critical for the Smart Nation initiative to move forward, namely trust and cyber security.

Smart sensors collect a great deal of information, he explains. Trust comes about when people feel assured that their personal details will not be divulged and

their privacy will be protected. In this regard, NUS' strengths in, and focus on, cyber security research would be another important way in which the university could contribute to the Smart Nation initiative, he added.

### System of innovation

As a comprehensive university, NUS has the capability to think about and research on a topic from both the technological and social science aspects. This is vital as many areas within the Smart Nation initiative that can deliver a high positive impact, are complex and challenging. Hence, an integrated approach is needed — what Prof Tan refers to as a "system of innovation" approach.

This is akin to a developer building smart homes. He would need individual sensors, connectors, controls and other components, but all these applications have to be integrated into a holistic system.

Prof Tan cites "smart" health promoting programmes as one key area that can significantly improve people's lives by actively encouraging well-being and preventing diseases.

"We already have devices that help people track how much they are walking. But we need to understand people's behaviour."

"How (do we) help them adopt healthy behaviours through incentives and nudges? How do we encourage many more people to go for health screening, and very importantly, to go for follow-up assessment and treatment if they have problems? What is the effect of fees and charges?"

This is a multi-dimensional issue involving individuals and the environment, which must be holistically studied in order to set effective policies on health promotion and disease prevention.

"NUS — with comprehensive research strengths and two medical schools, the Yong Loo Lin School of Medicine and the Duke-NUS Medical School — has the full suite of capabilities that allow us to contribute significantly to such efforts."

A system of innovation being piloted is an NUS-PUB project on water management and detection



of pollution levels. Two NUS research institutes — the NUS Environmental Research Institute and the Tropical Marine Science Institute — have developed robotic "swans" in a project called "New Smart Water Assessment Network" (NUSwan).

The robots — which are already at work at Pandan Reservoir — have shells that closely resemble swans and are fitted with advanced water monitoring technology. They can collect small samples of water to detect in real-time, common indicators such as acidity or alkalinity, dissolved oxygen, turbidity, chlorophyll and pollutants such as phosphates — all of which can determine if there are problems in a water source. This autonomous water monitoring system is also able to pinpoint the exact site of potential pollution.

"Because NUS has huge amounts of expertise in nearly all the required fields from the detection of pollutants, to the control of algal blooms to water purification membrane technologies," says Prof Tan, "we are able



to bring together different experts to create new solutions in a well-integrated manner. We also work closely with public policy makers, industry and overseas collaborators."

### Basic research

To undertake systems of innovation, Prof Tan points out that the university will continue to focus on basic research to develop the expertise that can provide more transformational

solutions in the future.

"Singapore needs basic research to build up expertise and connections to best centres of the world, in areas that may not be considered to be of practical value now, but which may become incredibly important in the future. At the university, we therefore do need to keep a strong base of diversified research to develop over the next 10 to 15 years."

"Local expertise and good researchers who are well-connected to top research centres in the world are also needed. They can provide the connectivity and absorptive capacity to make use of the knowledge and applications discovered elsewhere. This will give us resilience and responsiveness to new technologies as well as social science trends."

Hence, NUS has also substantially stepped up collaborations with industry, most notably by setting up corporate labs with companies like Keppel, Sembcorp and Singtel. NUS researchers are also working with public agencies, start-ups and industry on issues relating to Smart Nation.

### Educating tomorrow's workforce

A crucial role the university sees itself performing is in preparing its students for the future workforce. It is focusing on inculcating in students a new mindset — that of being entrepreneurial and appreciating the need for lifelong learning. It has also changed the way it is teaching students, moving away from the emphasis on learning facts to a stronger focus on solving problems.

NUS has also introduced a grade-free scheme to encourage first year students to take subjects that they are interested in, or which are challenging but useful for the future. It has also introduced about 200 blended online courses that comprise, among other things, quizzes and games that promote better learning outcomes.

NUS has assembled a powerful mix of talented researchers, students, start-ups, commercial partners, and public sector agencies that enables it to contribute to the Smart Nation aim of improving the lives of Singaporeans, says Prof Tan.

## Preparing students for tomorrow's workplace



Future entrants to the workforce must have four essentials: insight, curiosity, engagement skills and resilience. These are qualities that employers look for in their hires — entrepreneurial, innovative and collaborative individuals who can stay relevant in a fast-changing world.

In January this year, the National University of Singapore (NUS) introduced a course on maximising students' human potential.

Called "Roots and Wings", it teaches intra- and interpersonal skills, such as self-awareness, focus, empathic communication, resilience, forming values and building a vision through experiential exercises and group discussions.

So far, about 5,000 students have gone through the programme.

Professor Tan Chorh Chuan, President of NUS, says that Roots and Wings aims to help students

understand their own limiting beliefs, adopt a positive mindset to assess the potential opportunities in the environment around them, and realise that lifelong learning is a must.

"Focusing on developing a future-ready mindset is important in Singapore's Smart Nation drive because new skills will be needed as new industries emerge, and existing ones evolve or disappear," says Prof Tan.

## Computing is cool again

Higher salaries, better employment and the general buzz around the start-up ecosystem here are attracting top students to study computer science.

The National University of Singapore (NUS) School of Computing — which offers the largest number of degree courses in computer science, information systems and business analytics — has seen a sharp rise in the quantity and quality of applications.

This year, applications for the 450 to 500 undergraduate places in computing programmes as the top three choices shot up by 26 per cent compared to four years ago. Ninety per cent of the A-level students accepted into the courses offered by NUS Computing had at least three to four As, up from Bs and Cs in 2013.

This is good news for Singapore's Smart Nation initiative — which seeks to make daily

living more convenient — as computer science and other digital technologies form the backbone of this national thrust.

### Better employment opportunities

Compared to 2014, computing graduates from NUS last year enjoyed a 5 per cent rise in employment rates and a 6 per cent rise in median starting salaries. Computer engineering graduates had the biggest pay jump, from \$3,500 in 2014 to \$4,000 last year.

According to the Infocomm Media Development Authority, another 15,000 specialists are needed next year, to work in fields such as cyber security, data analytics and application development.

To meet this need, NUS launched a four-year Bachelor of Science in Data Science and Analytics degree in August, a multi-disciplinary programme

offered by NUS Science's Mathematics and Statistics & Applied Probability departments, in collaboration with NUS Computing.

Last year, NUS Computing also launched the inter-disciplinary Information Science degree, where students study computer science, mathematics, statistics and the legal aspects of information security with faculty from NUS Science and Law.

Giving tech skills a further boost, students from other NUS faculties may pursue computing courses, such as information security, as a second major or minor subject from this year.

NUS Institute of Systems Science offers graduate and executive programmes in data analytics, digital innovation, software development, artificial intelligence and cyber security, which are all critical capabilities needed to make Singapore a smart nation.

## NUS Smart Nation Research Cluster

This cluster brings together top researchers from multi-disciplinary backgrounds of engineering, mathematics, medicine, computing and social sciences, to create powerful solutions that will enhance the way Singaporeans live, work and play. Visit [smartnation.nus.edu.sg](http://smartnation.nus.edu.sg) for more information.