

Report on
Participation in
'Programme for Leadership
in University Management'

at

National University of Singapore

[NUS]

by

Dr P S Adwani

(Principal, Govt. Engg. College, Aurangabad)

During

23 September 2014-25 September 2014

Brief Summary:

The programme of visit to National University Of Singapore, was arranged by Ministry of Human Resource Management (MHRD) for higher education, India in collaboration with Indian Institute of Management (IIM) Trichy. This programme was spread over in three phases. The phase I was a conducted by IIM Trichy, between 19th September 2014 to 21st September 2014 at the extension centre of IIM Trichy's Chennai Centre. The phase I broadly prepared the all the participants to remain prepared with significantly useful background for academic leadership programme in higher education.

The phase II was conducted at National University Of Singapore, [NUS] between 23rd September 2014 to 25th September 2014. The experiences at NUS by participants were highly enlightening and useful. The NUS has strived hard to march ahead in their world rankings and now stands at the world rank of 23rd. It was possible for them as they were completely committed and all the way tried hard to bring about improvements in all the parameters which matter in counting the world rankings.

The learning experiences of NUS are expected to be implemented in the respective institutes by the leaders who represented their institute and participated in this programme. The feedback on this issue is going to be an important part of the programme which will be covered in phase III. IIM Trichy is planning to arrange the feedback presentations by participants in the presence of the representatives from NUS. The programme of phase III shall be arranged at IIM Trichy soon.

The best practices adopted by NUS in research benchmarking, innovative educational programmes, and sharing of experiences on internationalization with student mobility were also the part of the programme. The programme made it possible for the participants to visit various laboratories. The new practices that are being adopted at NUS in IT enhanced learning, instructional technology, entrepreneurship in academia and University Governance and global talent management were also shared with all participants.

The presentations on overview of NUS, and the laboratories at NUS are separately put up for better understanding into the working of the University. This programme was supported by TEMASEK foundation and their team at National University of Singapore. The efforts by NUS and TEMASEK foundation were highly appreciated by all participants and their professional efforts with nice arrangements and hospitality served to bring about good level of interaction among all and will be remembered.





National University of Singapore

An Overview

NUS today

A global, research-intensive university

- ✓ 16 Faculties and Schools across 3 campuses
- ✓ 8 Overseas Colleges
- ✓ 24 Research Institutes and Centres
- ✓ 3 Research Centres of Excellence + partnership with NTU in a 4th

Nurturing leaders for Singapore and beyond since 1905

- ✓ Presidents & Prime Ministers
- ✓ Leaders in international agencies
- ✓ Key government figures
- ✓ Captains of industry
- ✓ Entrepreneurs
- ✓ Community leaders

Vision

A leading global university centred in Asia,
influencing the future

Mission

To transform the way people think and do things
through education, research and service

The NUS Difference: A Leader in Global Education

**Bring the world
to NUS**

**Take NUS students
to the world**

A Leader in Global Education

Bring the world to NUS

Take NUS students
to the world

Students and faculty from 100 countries

18% undergraduates and 60% graduate students from abroad

Partnerships with overseas institutions

E.g. Duke-NUS, Yale-NUS, YSTCM with Peabody Institute, TLI-AP

Inbound exchange students

>1,800 per year

A Leader in Global Education

Bring the world
to NUS

**Take NUS students
to the world**

Nearly 70% undergraduates go overseas;
30% for > 6 months

> 70 double, joint & concurrent degree programmes
with top universities internationally

Reciprocal student exchange arrangements with
300 top universities in 40 countries

8 NUS Overseas Colleges across
the US, Europe, China, India and Israel

NUS Overseas Colleges

Experiential entrepreneurship education

immersing NUS students in leading entrepreneurial hubs around the world

- Few months to a year
- Full-time interns in high-tech startup/innovative companies
- Learn from the founders and entrepreneurs
- Take courses at partner universities



Eight NUS Overseas Colleges

NUS College in Silicon Valley (2002)

- Work in America’s innovation “habitat” and study at Stanford University
- Focus on technology start-ups in Silicon Valley

NUS College in BioValley, Philadelphia (2003)

- Work in America’s pharma hub and study at University of Pennsylvania
- Focus on bio/medical technology

NUS College in Shanghai (2004)

- Work in China’s commercial hub and study at Fudan University
- Focus on China-related business

NUS College in Stockholm (2005)

- Work in Europe’s No. 1 IT nation and study at KTH, Royal Institute of Technology
- Focus on mobile/IT with European perspective

NUS College in India (2008)

- Learn about India’s grassroots innovation and take part in entrepreneurial workshops by top India institutions
- Focus on business/social innovations in India

NUS College in Beijing (2009)

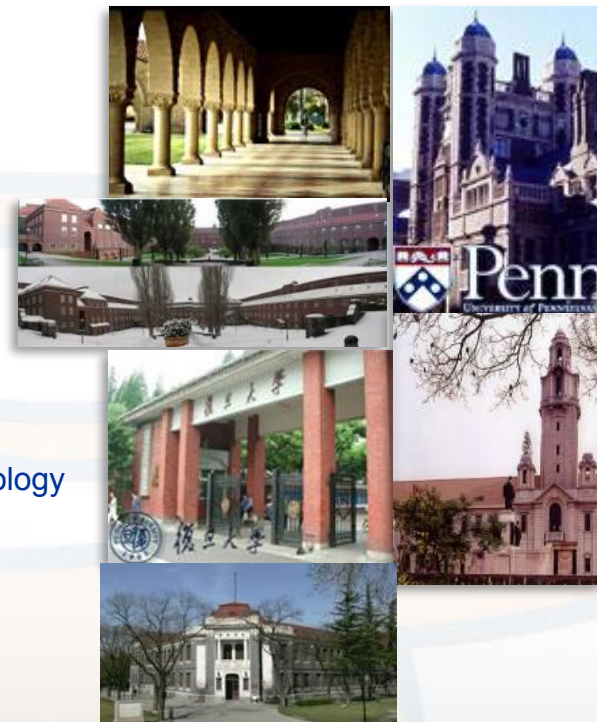
- Work in China’s political and hi-tech hub and study at Tsinghua University
- Focus on tech start-ups with China focus

NUS College in Israel (2011)

- Experience the dynamic start-up culture that defines Israel
- Uncover Israel’s heritage of innovation and entrepreneurship

NUS College in New York (2014)

- Ride on the adrenaline of fast-paced New York City
- Immerse in a global city of diversity and connectivity



NUS' Vibrant Research Culture

- ✓ Building peaks of research excellence
- ✓ Cutting-edge research of global impact while supporting national research objectives
- ✓ Building a seamless transition from research discovery to “exploitation”

24 University-Level Research Institutes or Centres

- Asia Research Institute
- Centre for International Law
- Centre for Maritime Studies
- Centre for Remote Imaging, Sensing & Processing
- East Asian Institute
- Energy Studies Institute
- Interactive & Digital Media Institute
- Institute for Mathematical Sciences
- Institute of Real Estate Studies
- Institute of South Asian Studies
- Life Sciences Institute
- Middle East Institute
- NUS Environmental Research Institute
- NUS Global Asia Institute
- NUS Nanoscience & Nanotechnology Initiative
- NUS (Suzhou) Research Institute
- Risk Management Institute
- Singapore Institute for Neurotechnology
- Singapore Nuclear Research and Safety Initiative
- Singapore Synchrotron Light Source
- Solar Energy Research Institute of Singapore
- Temasek Laboratories
- The Logistics Institute-Asia Pacific
- Tropical Marine Science Institute

Research Centres of Excellence (RCEs)

Centre for Quantum Technologies (2007)

Conducts interdisciplinary theoretical and experimental research in quantum theory and its application to information technologies

Cancer Science Institute of Singapore (2008)

Pursues a coordinated and multifaceted approach to cancer research

Mechanobiology Institute, Singapore (2009)

Aims to develop new ways of studying diseases through the mechanisms of cell and tissue mechanics

Singapore Centre on Environmental Life Sciences Engineering (2011)

Explores and translates the life of microbial biofilms into environmental solutions with significant economic benefits

NUS' high and steeply rising reputation as a leading university

TIMES HIGHER EDUCATION WORLD REPUTATION RANKINGS 2014

Reputation / Rank	Institution	Country / Region
21	National University of Singapore	Singapore

TIMES HIGHER EDUCATION WORLD UNIVERSITY RANKINGS 2013-2014

Rank	Institution	Country / Region
25	University of Washington	United States
26	National University of Singapore	Singapore
27	University of Texas at Austin	United States
28	Georgia Institute of Technology	United States
29	University of Illinois at Urbana Champaign	United States
30	University of Wisconsin-Madison	United States

TIMES HIGHER EDUCATION ASIA UNIVERSITY RANKINGS 2014

Rank	University	Country
1	University of Tokyo	Japan
2	National University of Singapore	Singapore
3	University of Hong Kong	Hong Kong

QS UNIVERSITY RANKINGS: ASIA 2014

Rank	University	Country
1	National University of Singapore	Singapore
2	Korea Advanced Institute of Science and Technology	Korea
3	University of Hong Kong	Hong Kong

QS WORLD UNIVERSITY RANKINGS 2013/2014

Rank	Institution	Country / Region
21	McGill University	Canada
22	University of Michigan	United States
23	Duke University	United States
24	National University of Singapore	Singapore
25	University of California, Berkeley	United States
26	The University of Hong Kong	Hong Kong
27	Australian National University	Australia

Global & Asian Alliances



International Alliance of Research Universities (IARU)

Association of Pacific Rim Universities (APRU)

ASEAN University Network (AUN)

Universitas 21 (U21)

New Strategic Thrusts: Positioning NUS for the future



1. Yale-NUS College

- ✓ Singapore's first liberal arts college
- ✓ Provides a new model of liberal arts education for Asia
- ✓ A collaboration with Yale University, the first campus developed outside New Haven, Connecticut
- ✓ A 4-year programme commencing in 2013
- ✓ About 1,000 students at steady state



Yale-NUS College

Four distinctive features:

- ✓ **New curriculum**
Synthesises Western and Asian perspectives with an integrated general education
- ✓ **Pedagogy**
Emphasises critical thinking and high level of interaction
- ✓ **Residential colleges**
Create a sense of community with integrated living and learning
- ✓ **Extra- and co-curricular activities**
Develop leadership skills, teamwork and community service, with global experience and internship opportunities



2. NUS University Town

Transformative Global Education



A link bridge connects Kent Ridge Campus to University Town



Residential Colleges and UTown Residence

NUS University Town

Three distinctive features:

- ✓ **Diverse Student Community**
 - A good mix of local and international students
 - All disciplines
 - Graduate and undergraduate students
- ✓ **Residential College Learning**
 - Small groups exploring global issues with Asian perspectives
- ✓ **Interaction with research faculty from NUS, MIT, ETH Zurich and Technion**



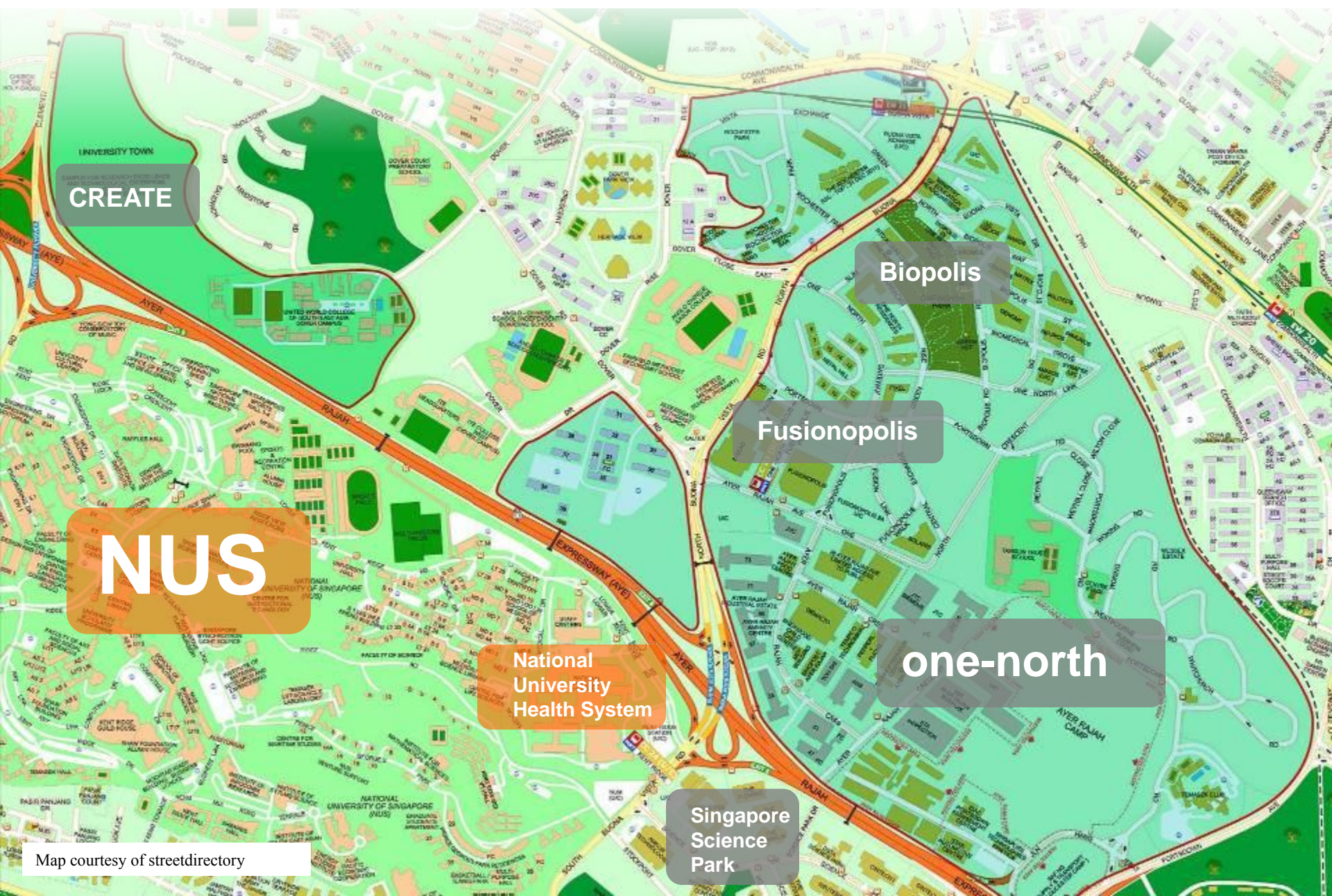
Launched by Singapore's National Research Foundation, the Campus for Research Excellence And Technological Enterprise (CREATE) is located at University Town



3. Six integrative research clusters



Synergy in Proximity



CREATE

Biopolis

Fusionopolis

one-north

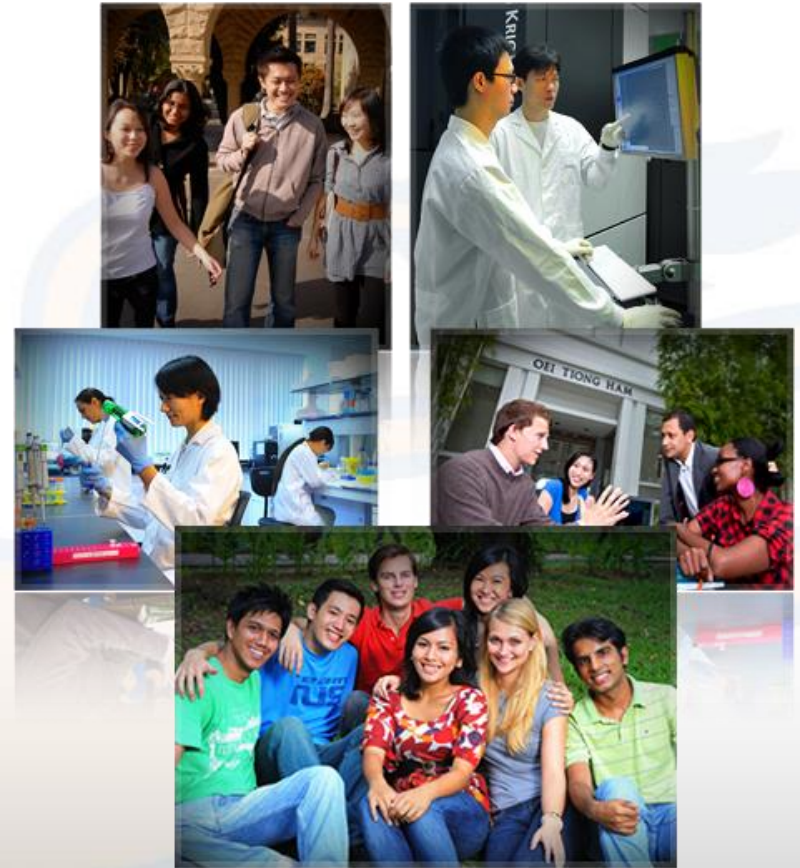
Singapore
Science
Park

National
University
Health System

NUS

NUS in Summary

- ✓ A global research-intensive university
- ✓ Rich tradition of nurturing leaders
- ✓ A leader in global education
- ✓ Rising research quality and impact
- ✓ A leading global university centred in Asia





Thank you

Introduction to NUS Enterprise



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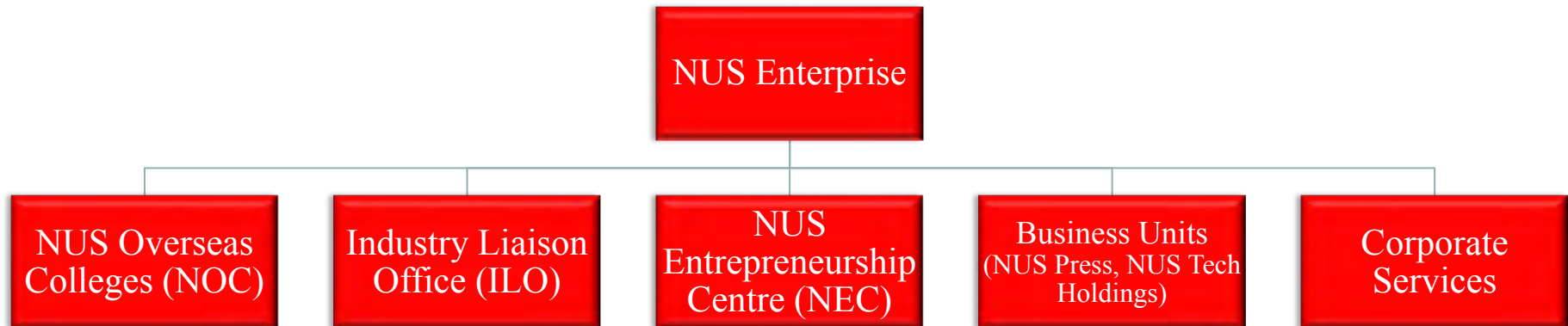
April 2014

NUS Enterprise – What We Are



NUS Enterprise

NUS Enterprise was established as a University-level cluster to provide an enterprise dimension to NUS teaching and research involving the University's students, staff and alumni.



NUS Enterprise – What We Do

NUS Enterprise promotes the spirit of innovation and enterprise through the following:

Experiential
Entrepreneurial Education

Active Industry
Partnership

Entrepreneurship Support

Asia's Thought Leader for
Innovation & Enterprise

NUS Enterprise – What We Do



NUS Enterprise

**Experiential
Entrepreneurial Education**

**Active Industry
Partnership**

Entrepreneurship Support

**Asia's Thought Leader for
Innovation & Enterprise**

Experiential Entrepreneurial Education

Our hallmark programmes



NUS Enterprise

NUS Overseas Colleges (NOC) (2002)

Provides students a full-time internship in startup/innovative companies **around the globe**, as well as entrepreneurial classes at prestigious partner universities.

Innovative Local Enterprise Achiever Development (iLEAD) (2008)

Offers students the opportunity to intern at innovative companies and be exposed to **entrepreneurial challenges** in **Singapore**.

Aims to:

- **Cultivate entrepreneurial mindset**
- **Develop leadership and management skills**
- **Provide insight into the business world**
- **Provide opportunities to learn from entrepreneurial leaders**



Experiential Entrepreneurial Education

NUS College in Silicon Valley (2002)

- Work in America's innovation "habitat" and study at Stanford University

NUS College in BioValley, Philadelphia (2003)

- Work in America's pharma hub and study at University of Pennsylvania

NUS College in Shanghai (2004)

- Work in China's commercial hub and study at Fudan University

NUS College in Stockholm (2005)

- Work in Europe's No. 1 IT nation and study at KTH, Royal Institute of Technology

NUS College in India (2008)

- Learn about India's grassroots innovation and take part in entrepreneurial workshops by top India institutions

iLEAD, Singapore (2008)

- Intern at Singapore start-ups

NUS College in Beijing (2009)

- Work in China's political and hi-tech hub and study at Tsinghua University

NUS College in Israel (2011)

- Experience the dynamic start-up culture that defines Israel



Experiential Entrepreneurial Education

Challenge: To groom a generation of NUS students into dynamic young entrepreneurs, change-agents and thought leaders

Approach:

- Experience-based model to effect personal transformation
- Close alignment of students' interests/objectives with internship placements
- Full time internship maximizes self-directed learning & application
- Part-time entrepreneurial classes at partner universities for a globalized approach
- Venture creation workshops provide platform for personal action
- Venture Ideation grants to develop business ideas
- Local networking, mentorship, business pitches & other entrepreneurial activities to enhance learning journey
- NUS ecosystem sustains/builds on entrepreneurial momentum upon return



NUS Enterprise

An entrepreneurial-themed residence hall for NOC & iLEAD alumni, as well as other enterprising NUS students

Objectives:

1. Harness the creative energy of entrepreneurial NUS undergraduates
2. Create a community of like-minded undergraduates in a stimulating and supportive environment. This will allow them to:
 - share and apply entrepreneurial skills continuously through structured and informal activities
 - recognize opportunities, innovate constantly and create new value
 - enlist potential collaborators and make use of shared resources to form effective work teams for developing their business enterprises
 - build a robust and dynamic entrepreneurial ecosystem that will infuse the spirit of enterprise into the campus
3. Serve as NUS' Entrepreneur-Ambassadors.



Importantly, the NOC program provides a direct pipeline for our incubation system and community, with many alumni returning to start their own companies....

NOC Startups...



Success Stories



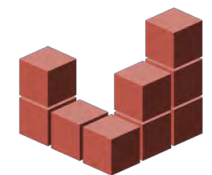
2005
Oliver attended NOC at Silicon Valley.

2006
Oliver and Wesley graduated from SOC (2006) and SDE (2008) respectively

2008
Peekspy was founded in 2008. Developed a prototype of an online 3D view of chosen seats in a venue at PGP incubator

2008
First commercial project secured with NUS Central Library

2012
March 2012 acquired by Stubhub, subsidiary of eBAY



tenCube

2003
Darius Cheong and Varun Chatterji graduate from NOC.

2005
Found tenCube in along with NUS alumni Rishi and Indradeep. Incubate at NEI.

2006
Group wins Start-Up@Singapore business plan competition. \$30,000 prize is used as seed funding.

2007
Launch WaveSecure technology.

2010
tenCube is acquired by McAfee



McAfee®
An Intel Company

McAfee (MFE) Announces Acquisition of tenCube

July 29, 2010 5:00 PM EDT
McAfee, Inc. (NYSE: MFE) today announced that it has entered into a definitive agreement to acquire privately owned tenCube, the provider of the WaveSecure mobile security service. Adding WaveSecure's locate, lock, back-up and wipe technology to Trust Digital's enterprise mobility management and McAfee's mobile security technology, gives McAfee the capabilities it needs to deliver the industry's most complete next generation mobility platform. McAfee will now have a single platform, from the consumer to the enterprise, to address the management and security of all device types, to all markets and with the most robust feature set.

People today are 15 times more likely to lose their phones than their laptop. Device loss is currently the most worrisome and likely security incident that consumer mobile users face today. Losing the device means losing personal data like pictures, contacts and personal financial information. It also means losing the ability to communicate and the value of the device. Through this acquisition, McAfee plans to offer users of all sizes the broadest platform available and the easiest and most

Success Stories



2005

2005. Rex Huang sets up TechSailor as a design and development company

2006

2006. Rex attends NOC, where he meets Wayne Chia and Leon Leong. TechSailor is repositioned as a digital marketing solutions company; incubates under ETP in FOE.

2009

2009
Techsailor “graduates” from the incubator and expands to 40 staff located in Singapore, China and Malaysia

2013

July 2013. TechSailor is acquired by TO THE NEW, a new media conglomerate and India’s leading digital services company.



TO THE NEW™

NUS Enterprise – What We Do



NUS Enterprise

Experiential
Entrepreneurial Education

Active Industry
Partnership

Entrepreneurship Support

Asia's Thought Leader for
Innovation & Enterprise

Asia's Thought Leader for Enterprise and Innovation



NUS Enterprise

What We Are Doing....

- Participation in international collaborative research projects with leading foreign universities (e.g. Stanford Project on Regions of Innovation and Entrepreneurship (SPRIE) and the Global Entrepreneurship Monitor (GEM) Project)
- Production of high-impact applied research e.g. the annual Asia-Pacific IP ScoreCard and the annual GEM report on **Singapore's entrepreneurial development**
- **NEC's research findings are disseminated through scholarly journals e.g. Journal of Business Venturing, commissioned policy reports for government agencies, and public seminars and conferences.**

IP-Related Research Projects



NUS Enterprise

- **IP Creation Pattern and Economic Impact in Singapore**
 - Commissioned by Ministry of Law; Completed 2003
- **Asia Pacific Intellectual Property Scorecard 2005, 2009/10**
 - Commissioned by IPA; Completed 2007 & end Dec. 2010
- **Factors Influencing the Emergence and Growth of Intellectual Property-based Industries in Singapore**
 - Commissioned by IPA; Completed 2006
- **The Role and Impact of Universities in a National Innovation System**
 - Funded by a Japanese Foundation; Project completed in 2009, book published by Edward Elgar to be released in December 2011
- **Evaluation of Exploit Technologies IP and Technology Transfer Services**
 - Commissioned by Exploit Technologies; Completed 2011
- **Patent Analytics and Landscaping of Key Technological Sectors**
 - Research Collaboration Agreement with Patsnap; Ongoing
- **Intellectual Property Rights in the Global Digital Convergence Space: Opportunities for Singapore as an IP Hub**
 - Commissioned by IPOS; commencing late November 2011

Selected Academic Journal Publications



NUS Enterprise

Wong, P.K. and Singh, A. (2010). "University patenting and their link to the quantity and quality of scientific publications", *Scientometrics*, 83:271-294

Ho, Y.P., P.K. Wong and M.H. Toh, "The impact of R&D on the Singapore economy: An empirical evaluation", *Singapore Economic Review* Vol. 54 No. 1: 1-20, March 2009

Wong, P.K., Ho, Y.P. and Chan, C.K. (2007). "Internationalization and evolution of application areas of an emerging technology: The case of nanotechnology", *Scientometrics* 70(3): 715-737

Wong, P.K. and Ho, Y.P. (2007). "Knowledge sources of innovation in a small open economy: The case of Singapore", *Scientometrics* 70(2): 223-249

Wong, P.K., "Commercializing Biomedical Science in a Rapidly Changing "Triple-Helix" Nexus: The experience of the National University of Singapore", *J. of Technology Transfer* 32: 367-395, 2007

Wong, P.K., Ho, Y.P. and Singh, A. (2007). "Towards an "Entrepreneurial University" model to support knowledge-based economic development: The case of the National University of Singapore", *World Development*, 35(6): 941-958.

NUS Enterprise – What We Do



NUS Enterprise

Experiential
Entrepreneurial Education

Active Industry
Partnership

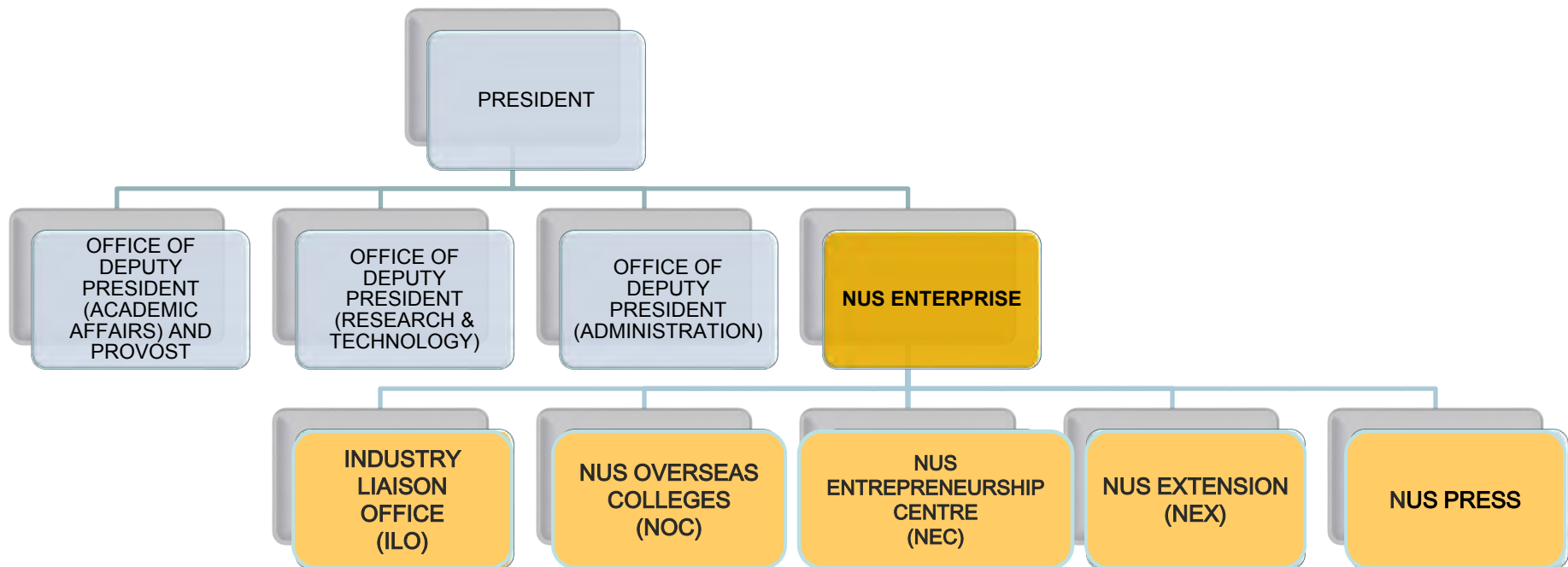
Entrepreneurship Support

Asia's Thought Leader for
Innovation & Enterprise

NUS Enterprise promotes innovation through the commercialization of NUS technologies, IP management, and the active engagement of industry partners...

NUS Enterprise

providing an entrepreneurial and innovation dimension to the university



The Industry Liaison Office (ILO):

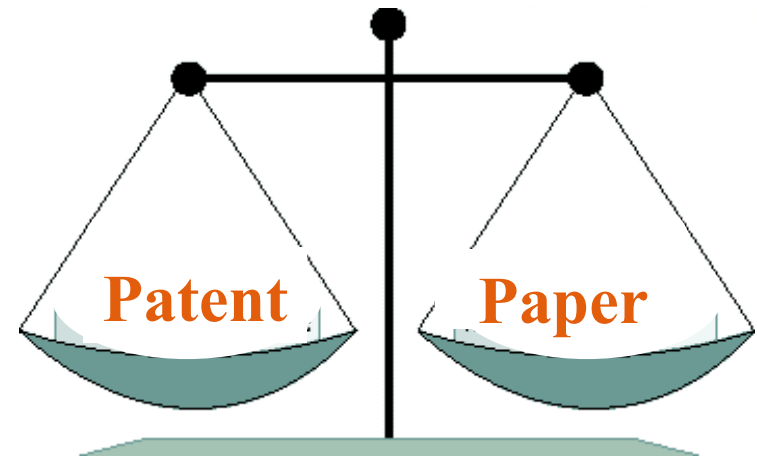


NUS Enterprise

- Promotes research collaborations with external parties
- Manages and seeks protection of NUS' intellectual property
- Facilitates technology transfer and commercialisation of NUS' innovations and expertise



Patent OR Publish



Choose Both...

Publish OR Perish



Why Pursue IP?

Research Policy 42 (2013) 23–34



Contents lists available at SciVerse ScienceDirect

Research Policy

journal homepage: www.elsevier.com/locate/respol



The economic impact of licensed commercialized inventions originating in university research

David Roessner^{a,*}, Jennifer Bond^b, Sumiye Okubo^c, Mark Planting^d

^a 2425 Pemberton Drive, Prescott, AZ 86305, USA

^b 3143 East Lester, Tucson, AZ 85716, USA

^c 6268 Kingfisher Lane, Alexandria, VA 22312, USA

^d 1628 Yorktown Drive, Charlottesville, VA 22901, USA

2012 study published in *Research Policy* analyzes data from 1996-2010, demonstrating:

- Estimated \$122.2B contribution to the US GDP
- More than 277,000 person-years of employment created over 15-years

Examples: Successful Economic Impact of University-Innovation



Sparking Economic Growth

Federal Funding + University Research = Innovation, Companies and Jobs

- April 2010 report identified a small sampling of 100 US “**success stories**”- **companies that can be directly traced to federally-funded and university-based basic research.**
- Together, these 100 companies employ over **100K people** and have annual revenues approaching **\$100 billion**
- Familiar names include: Google, Genentech, Cisco and SAS



Google™



Genentech
A Member of the Roche Group



CISCO



sas | THE
POWER
TO KNOW.

The Changing Role of the University

Old Model

New Model

Knowledge- Transfer

Knowledge-Creation

Focus on basic research

Focus on basic AND applied research

University seen as free of commercial interests

University encourages tech transfer, commercialization and industry partnership

University has a relatively passive role in relation to economy

University takes on active role and responsibility in economy

“As argued by Etzkowitz et al. (2000) and Etzkowitz (2003), universities around the world are increasingly shifting from their traditional primary role as education providers and scientific knowledge creators to a more complex ‘entrepreneurial’ university model that incorporates the additional role of commercialization of knowledge and active contribution to the development of private enterprises in the local and regional economy.” (Wong, Ho and Singh, 2011, p. 169)

Wong, P.K., Y.P. Ho and A. Singh, (2011). Towards a ‘Global Knowledge Enterprise’: the entrepreneurial university model of the National University of Singapore. In Wong, P.K., Y.P. Ho and A. Singh (Eds.), *Academic Entrepreneurship in Asia: The Role and Impact of Universities in National Innovation Systems* (pp. 165- 198). Cheltenham, UK: Edward Elgar.

INDUSTRY LIAISON OFFICE

Transform Innovation into Products and Services



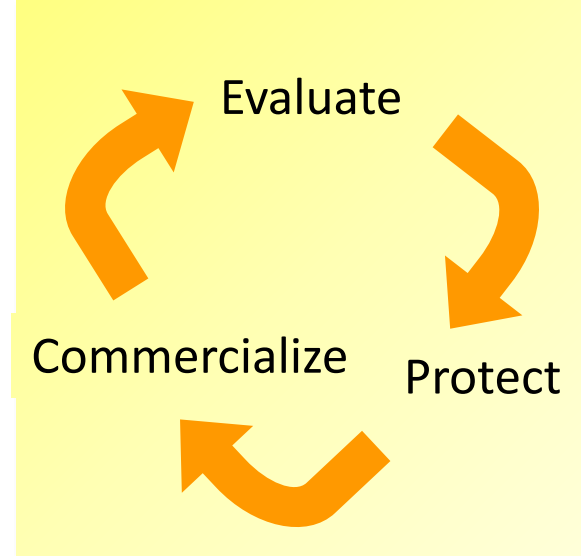
NUS Enterprise

Industry Relations – Promote Collaboration



- Strategic engagement with industry
- Close interaction with faculties and research centers
- Lead in negotiations for external collaborations

IP Management – Commercialize IP



Managing IP Beyond NUS

Research Center of
Excellence:



Mechanobiology
Institute,
Singapore

CREATE:



Singapore-MIT Alliance for Research and Technology

Hebrew University of
Jerusalem's Research Centre
on Inflammatory Diseases

Students (AY 2013-14)

Total Student Population	37,452
Undergraduate Students	27,391
Graduate Students	10,061



NUS Enterprise

Class of 2013 (As at September 2013)

Bachelor's Degree	6,750
Ph.D Degree	837
Master's Degree	2,904
Graduate Diploma	299

Faculty and Staff (As at June 2013)

Faculty Members	2,314
Research Staff	2,999
Executive and Professional Staff	2,493
General Staff	2,391



NUS Enterprise

- **Faculties and Schools- 16**
- **National Level Research Centers of Excellence – 3.5**
- **University-level Research Institutes and Centers – 23**
 - **Quantum Technology**
 - **Cancer**
 - **Mechanobiology**
 - **Environmental Life Sciences Engineering**
 - **Graphene**



CAMPUS FOR RESEARCH EXCELLENCE AND TECHNOLOGICAL ENTERPRISE (CREATE)

Collaborative Interdisciplinary Research in Four Areas

human systems / energy systems / environmental systems/ urban systems

- Swiss Federal Institute of Technology (ETH)
- Massachusetts Institute of Technology
- Technical University of Munich
- Technion-Israel Institute of Technology
- Hebrew University of Jerusalem
- Ben-Gurion University
- University of California, Berkeley
- Peking University
- Shanghai Jiao Tong University
- Cambridge University

INDUSTRY LIAISON OFFICE

Transform Innovation into Products and Services



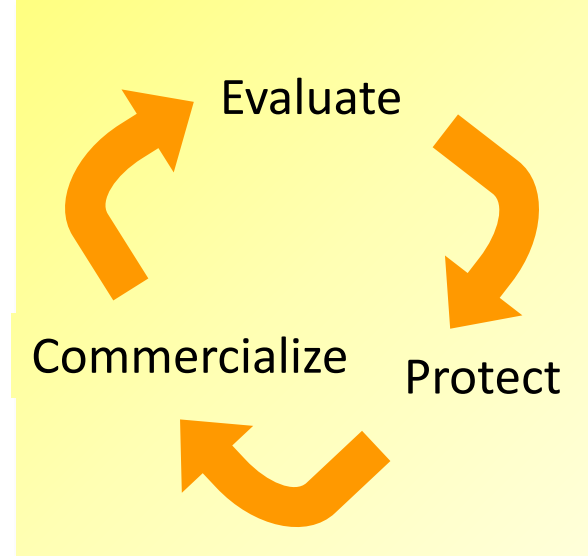
NUS Enterprise

Industry Relations – Promote Collaboration



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IP Management – Commercialize IP



Managing IP Beyond NUS

Research Center of
Excellence:



Mechanobiology
Institute,
Singapore

CREATE:



Singapore-MIT Alliance for Research and Technology

Hebrew University of
Jerusalem's Research Centre
on Inflammatory Diseases

- ***Going beyond the usual tech transfer office through active industry Outreach, Engagement & Partnership***
 - ***Successes in licensing and industry sponsored funding***
 - ***Get involved at early high-risk IP protection stage***
 - ***Provide sustained administrative support***
 - ***Be flexible and supportive in licensing terms***
 - ***Play proactive role in bridging gap between company's commercial requirements and NUS academic interests***

NURTURING: FROM TECHNOLOGY TO START-UP (IN MAKING)



NUS Enterprise

Articulating Ablation and Division Device with blood flowing sensing capability
Dr Stephen Chang, Senior Consultant, NUH/NUS Department of Surgery



New ablation-division device
Resection time – 20 min, blood loss – 100 ml

LigaSure™ (existing device by Covidien, gold standard in practice)
Resection time – 25 min, blood loss – 150 ml



Early relationship building– Strategic IP advice– Leading marketing and commercialization– Nurturing entrepreneurial spirit– LLP workshop– mentoring-- biz team building

TECH TRANSFER PLUS

Many programs to Facilitate
“push” to industry



Partnering to
Enhance
Market Pull



LEAN LAUNCHPAD@SINGAPORE



NUS Enterprise



Steve Blank,
Stanford



Jerry Engel,
UC Berkeley



LeanLaunchPad@Singapore

Program fosters:

- entrepreneurial interest
- develops early knowledge of the tech commercialization process.
- participants learn business model design, customer development and agile engineering

SUCCESS STORIES



New NUS spin-off company BioLynx boosts malaria research

13 October 2011

NUS has spun off a new biotech company, BioLynx Technologies Pte Ltd, which provides high quality, multi-functional, fluorescent-tagged drugs. The company is currently focusing on further developing and commercialising its flagship product, LynxTag-CQTM, a useful tool for research on malaria.

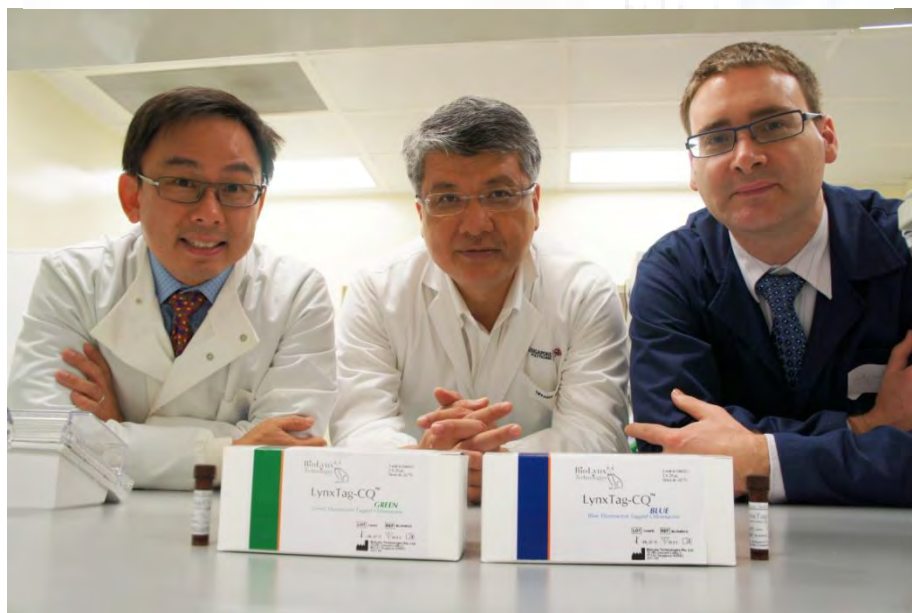
Co-founded and directed by Dr Martin Lear of the Department of Chemistry and Dr Kevin Tan from the Department of Microbiology, BioLynx is launching its presence at TechVenture 2011 (13-14 October), Asia's premier event for the finance community to engage with the latest high technological innovations.

As part of an NUS research project, the researchers successfully tagged a fluorescent marker to chloroquine, a drug that has been used in the treatment of malaria since 1947. The fluorescent-labelled chloroquine molecule, LynxTag-CQTM, allows researchers to visualise intracellular drug-cell interactions in an easy and cost-effective manner. Currently the only chloroquine-based fluorescent probe in the market, LynxTag-CQTM proves to be a useful tool for malaria studies into chloroquine resistance, drug uptake, mechanism of drug action, or chemosensitisation. The use of LynxTag-CQTM has been featured twice in the prestigious journal *Cell Death & Disease*.

Dr Kevin Tan said that besides malaria research, LynxTag-CQTM can also be used to study mechanisms of other diseases at a cellular level. "For example, chloroquine is also used in treating immune diseases, cancer and some viral infections. Moving forward, we plan to go beyond just chloroquine, to have a pipeline of products, synthesising chemical tags for other high value drugs," noted Dr Tan.

Dr Martin Lear shared that some S\$1 million had been raised to commercialise the technology and bring it to market. He hopes to excite some venture capitalist companies present at TechVenture 2011 to invest in BioLynx, so as to grow the company and boost international marketing of its product.

For more information on BioLynx, please visit www.biolynxtech.com.



money.sme spotlight

THE STRAITS TIMES WEDNESDAY, SEPTEMBER 28 2011 PAGE B19

In a six-part series sponsored by Spring Singapore, we look at innovative start-ups. **Joyce Teo** examines Clearbridge Biomedics

‘Nerds’ fight cancer with med tech

Their machine traps tumour cells; hope for personalised treatment

A COUPLE of self-confessed nerds seem an unlikely pair to lead the charge to a new medical frontier but there is no holding back entrepreneurs Johnson Chen and Chong Chee Wah, both 39.

The friends set a high goal – producing a machine that can trap rare cancer cells in blood samples and allow researchers to

doing a blood test and then you can take out the CTCs to study it.

“It opens up the potential for personalised cancer treatment. We can not only count the number of cells, but also take the cells and do further downstream analysis. That’s where the key value proposition is.”

Their ambitious venture started less than three years ago when Mr Chen returned from a seven-year work stint in Hong Kong where he ran the venture capital arm of Pacific Century CyberWorks, the telecoms company owned by tycoon Li Ka-shing’s son Richard Li.



Clearbridge’s Johnson Chen (left) and Chong Chee Wah have already built versions of their machine to be used for research and they are now working on selling them to top researchers across the globe. ST PHOTO: DESMOND LIM



The ClearCell™ System

For the label-free isolation, enumeration and retrieval of viable Circulating Tumour Cells (CTCs) from blood.

The next generation non-invasive “liquid biopsy” for cancer.

Media release – embargoed till 1 August 2011



Singapore technology incubator receives investment from Silicon Valley “super-angel”

1 August 2011, Singapore – Clearbridge Accelerator announced today that it has received an investment from Tim Draper, a well-established venture capitalist based in the Silicon Valley. Mr Draper, who is the Founder and a Managing Director of Draper Fisher Jurvetson (DFJ), is well known for making early-stage investments in dynamic companies in new markets.

SUCCESS STORIES

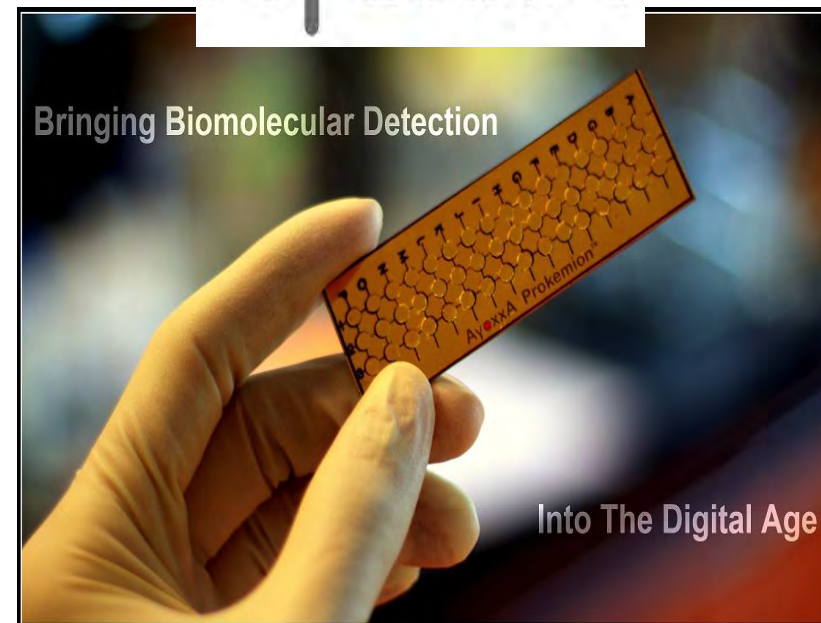
Prospective and proactive support:

- interactive IP protection strategies aligning with future start-up plans;
- prestart-up funding for technology development- POC/POV;
- support to assist incorporation of start-up

Assoc. Prof. Dieter Trau

- ❖ Next generation micro-bead arrays for multiplexed protein detection
- ❖ NUS start-up: POC/POV funds
- ❖ German company now set-up through German investors
- ❖ R&D in Singapore
- ❖ Corporate and BD activities via German entity
- ❖ 2014 successful EU series B

Ayoxxa



NUS Enterprise – What We Do



NUS Enterprise

Experiential
Entrepreneurial Education

Active Industry
Partnership

Entrepreneurship Support

Asia's Thought Leader for
Innovation & Enterprise

NUS Enterprise Incubator (NEI):



NUS Enterprise

Incubation & Mentoring Support

- Physical Incubation Facilities & Support Services (e.g., Corp Sec, Bookkeeping, Marcom)
- Mentoring Program

Access to Funding

- Assistance in applying for NRF/SPRING POC & SMART grants
- I&E Practicum grants, iJAM, YES, etc.
- MDA
- Angel Funds/ VCs

Infrastructure

- Access to NS R&D resources
- IP Advisory
- Legal/accounting services
- Workshops for business/financing training

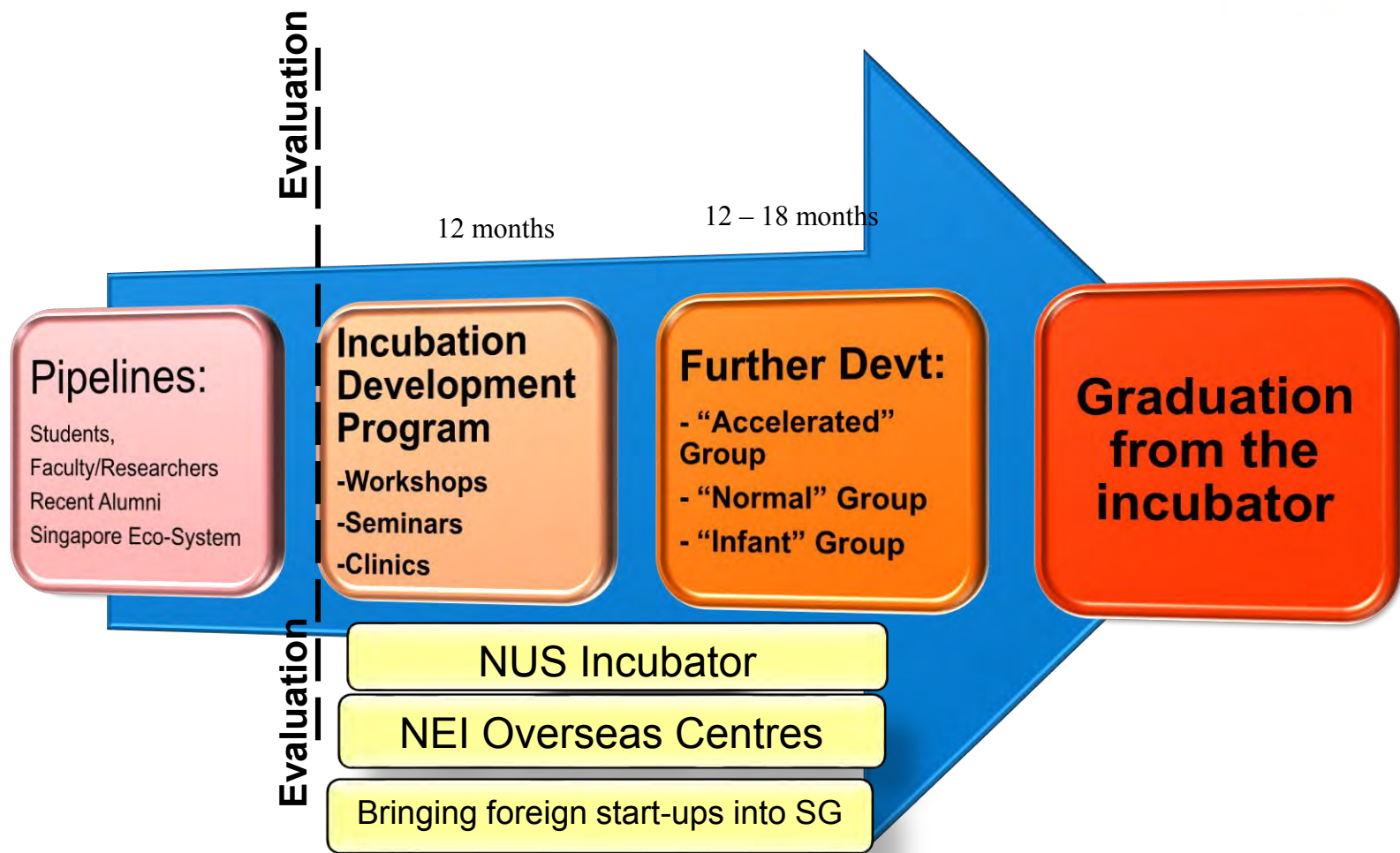
Marketing

- Roadshows
- Investor Forums
- Networking (connect to local network e.g. SVCA & BANSEA and global network e.g. SV & NOC connections)
- Business Leaders Roundtable

Our Comprehensive Eco-System & Structured Incubator Framework



NUS Enterprise



Funding Support for Entrepreneurs



Innovation Catalyst

- Develop innovative idea into potential business venture
- Translate research into commercializable technologies

Start-Up Support

- Mentorship & advice on business strategy and operations
- Physical Space
- POC/Pre-Seed Funding Schemes

Growth Support

- Attract external investors
- Achieve sustainable business growth
- Overseas Launchpad

University Innovation Fund

- **Practicum Award:** Undergrad/ Postgrad students may receive up to \$10k per project to dev/ implement their innovative ideas
- **XCC:** PhD students may receive up to \$19.2k to develop a commercialization plan for their research

iJAM Grant

- Supports Interactive Digital Media projects
- The grant support is up to S\$55,000



ACE Startups Grant

- Match with \$7 by SPRING for every \$3 raised by applicant.
- Maximum \$50,000.

CleanTech Grant

- Supports Cleantech (water, environment and renewable energy) projects
- The grant support is up to S\$500,000

NEI@PGP



NEI@FOE



NUS Enterprise

Plug-In@Blk71

Managed by NUS Enterprise. Supported by MDA



NUS Enterprise



Jointly set up by NUS Enterprise, Media Development Authority and SingTel Innov8 to boost Singapore's interactive digital space, Plug-In@Blk71 provides start-ups and entrepreneurs one-stop access to the resources they need, as well as a common space to network and meet potential partners/investors.

We have developed a thriving and dynamic community both on-campus and off-campus, enabling growing start-up companies to transition beyond NUS

OCTOBER 30, 2013, 8:30 AM | 9 Comments

In Singapore, Building Businesses for the Next Billion

By QUENTIN HARDY



Quentin Hardy/The New York Times

Venture capitalists, accelerators and start-ups house five floors of a warehouse, called Block 71, in Singapore.

E-MAIL

SINGAPORE — Years back, my first serious job began in a warehouse in a juncture of this island nation. I returned there

Business communities

All together now

What entrepreneurial ecosystems need to flourish

Jan 18th 2014 | From the print edition

399 325

BLOCK 71 HAS long been slated for demolition. A look at the tenant list for the seven-storey industrial building on Singapore's Ayer Rajah Crescent helps explain why it is still standing: nearly 100 startups live there officially and perhaps as many again informally. Their often strange monikers are interspersed with the more conventional names of venture-capital firms, accelerators and the like.

It is the world's most tightly packed entrepreneurial ecosystem, and a perfect place to study the lengths to which a government can go to support startup colonies. "They essentially force-fed entrepreneurship to the young generation," says Bowei Gai, a Chinese-American entrepreneur who is working on a "World Startup Report" after visiting nearly three dozen ecosystems around the world, starting in New Delhi in January last year and ending in Singapore in September (see

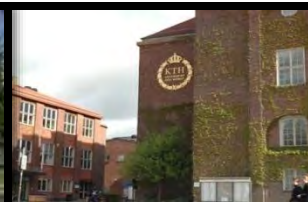
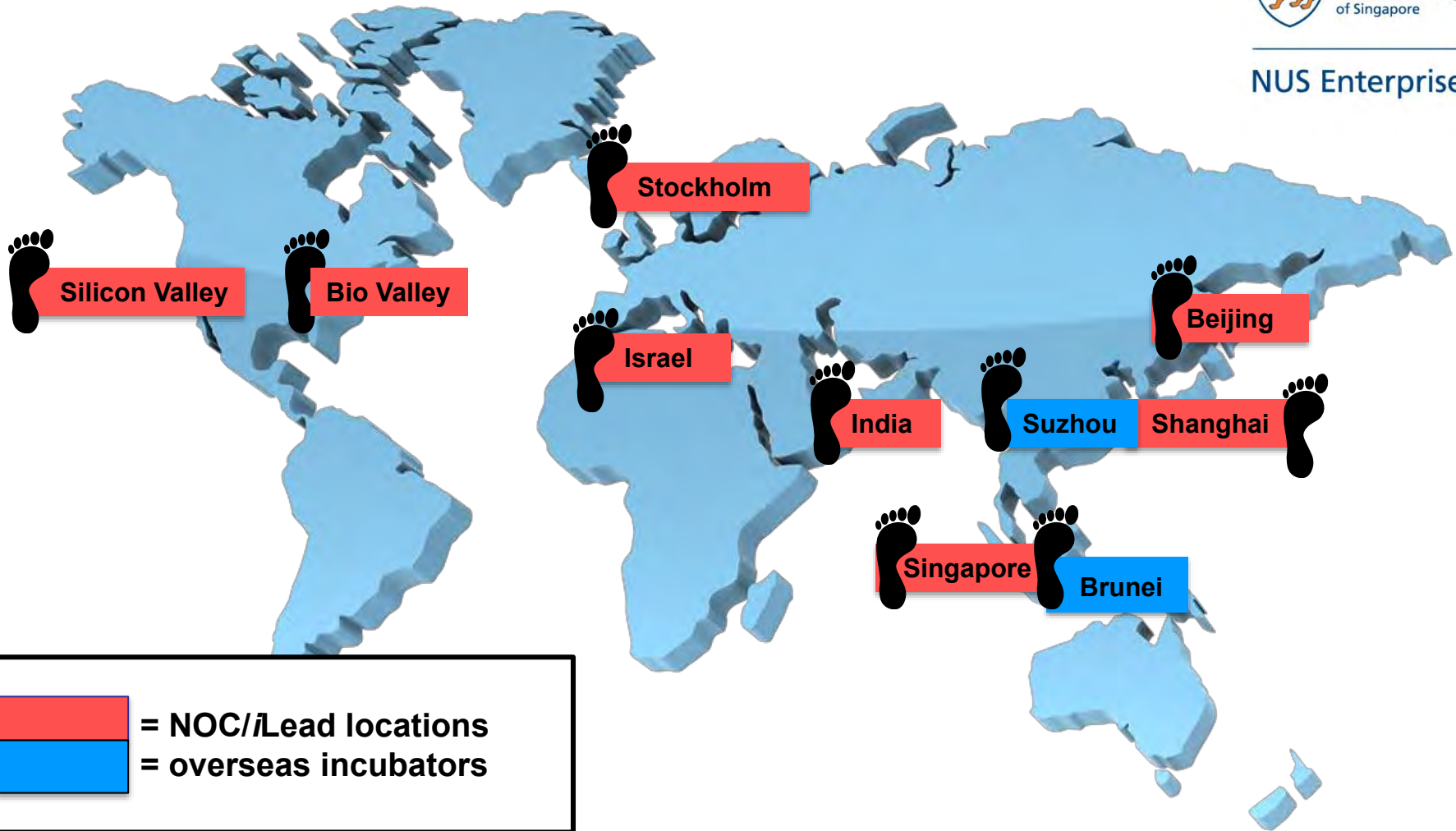


Matt Herring

NUS Enterprise Community



Making Footprints Around the World ...



NOC Startups...



Success Stories



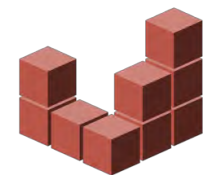
2005
Oliver attended NOC at Silicon Valley.

2006
Oliver and Wesley graduated from SOC (2006) and SDE (2008) respectively

2008
Peekspy was founded in 2008. Developed a prototype of an online 3D view of chosen seats in a venue at PGP incubator

2008
First commercial project secured with NUS Central Library

2012
March 2012 acquired by Stubhub, subsidiary of eBAY



tenCube

2003
Darius Cheong and Varun Chatterji graduate from NOC.

2005
Found tenCube in along with NUS alumni Rishi and Indradeep. Incubate at NEI.

2006
Group wins Start-Up@Singapore business plan competition. \$30,000 prize is used as seed funding.

2007
Launch WaveSecure technology.

2010
tenCube is acquired by McAfee



McAfee®
An Intel Company

McAfee (MFE) Announces Acquisition of tenCube

July 29, 2010 5:00 PM EDT
McAfee, Inc. (NYSE: MFE) today announced that it has entered into a definitive agreement to acquire privately owned tenCube, the provider of the WaveSecure mobile security service. Adding WaveSecure's locate, lock, back-up and wipe technology to Trust Digital's enterprise mobility management and McAfee's mobile security technology, gives McAfee the capabilities it needs to deliver the industry's most complete next generation mobility platform. McAfee will now have a single platform, from the consumer to the enterprise, to address the management and security of all device types, to all markets and with the most robust feature set.

People today are 15 times more likely to lose their phones than their laptop. Device loss is currently the most worrisome and likely security incident that consumer mobile users face today. Losing the device means losing personal data like pictures, contacts and personal financial information. It also means losing the ability to communicate and the value of the device. Through this acquisition, McAfee plans to offer users of all sizes the broadest platform available and the easiest and most

Success Stories



NUS Enterprise



2005

2005. Rex Huang sets up TechSailor as a design and development company

2006

2006. Rex attends NOC, where he meets Wayne Chia and Leon Leong. TechSailor is repositioned as a digital marketing solutions company; incubates under ETP in FOE.

2009

2009
Techsailor “graduates” from the incubator and expands to 40 staff located in Singapore, China and Malaysia

2013

July 2013. TechSailor is acquired by TO THE NEW, a new media conglomerate and India’s leading digital services company.



YOUNG ENTREPRENEURS IN ACTION

Silicon Valley job? No thanks!



Friday, 4 January 2013

Founders Quek Siu Rui, Marcus Tan, and Lucas Ngoo are all alumni from the NUS Overseas Programme in Silicon Valley. They received support from ETP, getting SGD7,000 (USD5,600) from the Innovation Practicum grant and are currently hot-desking at Plug-in@Blk71.



SUCCESS: (From left) Carousell co-founders Lucas Ngoo, Marcus Tan and Quek Siu Rui.

TNP PICTURE REBECCA MA

Former NUS student prefers to set up online sales app with two friends

REPORT: LHAVANYA DHARMALINGAM
ldhava@sph.com.sg

THREE former students of the National University of Singapore (NUS) have come up with an app that helps you sell second-hand items easily, by snapping a photo and uploading it.

Said Mr Quek Siu Rui, 25, its co-founder: "Carousell is different from other selling platforms out there. It's simple to use and visually appealing."

Right now it's troublesome to sell items online, he added.

"It takes you ages to take a photo and upload it. The interfaces tend to be text heavy."

With Carousell, you can take the photo with your iPhone and upload it to the app for sale in seconds. You can first beautify it with filters if you wish to.

The Carousell prototype was developed by Mr Quek, a Singaporean, and his friend, Mr Lucas Ngoo, 24, a Malaysian, at Startup Weekend, in March last year.

The event, organised by the NUS Overseas College programme's alumni, requires participants to submit product ideas. The 20 best ideas are worked on by the groups over the weekend and the prototypes are produced.

Carousell, known then as SnapSell, won the main prize, which included free office space, tickets to the Startup conference, Echelon, and a chance to pitch their idea on Season 2 of Angel's Gate, an Asian reality TV show featuring budding entrepreneurs who pitch ideas to some of the region's top investors.

Convinced of the app's potential, Mr Quek said he picked working on Carousell over a job offer at a Silicon

Valley company.

He had previously interned there as part of an NUS exchange programme.

Launch

Carousell was launched on Aug 13 last year.

But to move it from startup to product, Mr Quek had to rope in a third partner, an old friend from Ngee Ann Polytechnic, Mr Marcus Tan, 29.

Mr Tan, a Singaporean, was working for Oracle as a business development consultant but jumped at the opportunity.

He said: "I wanted to be adventurous and I knew if I got too comfortable with my job I would never leave. I've seen it happen to other friends."

The prospect of them taking up such a risky endeavour naturally did not appeal to their parents.

Said Mr Quek: "I chose the 'perfect' moment to tell my parents: at a family dinner. Everyone was shocked."

He said they all came around eventually.

Part of their funding came from the NUS Venture Ideation programme, which provided \$7,000.

They are also due to receive \$50,000 from Spring's Action Community for Entrepreneurship (ACE) movement which has given out 37 grants since last March.

Said Mr Sim Choon, the Chairperson of ACE Startups subcommittee: "ACE recognised that Carousell is different from other competitors. It has a user-friendly mobile marketplace with social elements targeting young smartphone users."

"The founders are also equipped with experience in both the business and technical aspects."

Mr Quek graduated in May last year and Mr Tan in May 2011. Both took the Bachelor of Business Administration degree.

Mr Ngoo graduated with a degree in computer engineering last month.

The trio have plans to continue the endeavour indefinitely.

Said Mr Tan: "We all have our own goals and visions of ourselves in the future but even then I expect we will be involved in Carousell in one way or another."



Snap, List, Sell. Create free listings to sell items you once loved in 30 seconds.

Finally, a simple way to sell the unused and under-used clutter in your life. Like you, we prefer more cash, and less clutter. Besides, you get to shop thousands of new and pre-loved items displayed in an endless stream of beautiful photos. Even sort them by 'nearest' to save time and money when you meet up with people near your home, school or workplace.



<http://thecarousell.com>



MANAGING MONEY THE FUN WAY

“It was at the height of the financial crisis in the US when everyone was shocked at how adults were not able to manage their finances. We thought, what about starting with the young? Teach the children to manage their money in a fun way.”

Ms Audrey Tan, 23, co-founder of start-up PlayMoolah

PlayMoolah may bring in serious money

BY SANDRA DAVIE
SENIOR WRITER

SETTING up an innovative new business is not exactly child's play.

But two National University of Singapore students have managed it – and their idea is now generating a buzz in the start-up community.

PlayMoolah uses online games to teach children how to manage their money.

The students, Ms Audrey Tan and Ms Lee Min Xuan, were roommates while on the NUS overseas college programme in California's Silicon Valley three years ago.

They discovered that they shared a passion for starting innovative businesses as well as educating children. Just two weeks into the programme, they came up with the idea.

Ms Tan, 23, a new media and communications student, explained: “Min Xuan and I love kids a lot and we thought we should come up with an idea involving kids. We looked at the games they were playing and figured that all the games are consumerist in nature.

“It was at the height of the fi-

nanacial crisis in the United States when everyone was shocked at how adults were not able to manage their finances.

“We thought, what about starting with the young? Teach the children to manage their money in a fun way.”

She and business student Ms Lee, 24, knew they had a winning idea when they showed it to Professor Tom Kosnik at Stanford University and he asked: “What do you need to get started?”

They kept refining their idea, and on returning to Singapore, started working on a prototype. Last year, barely two years after setting up, they received their first round of financing from investors here and in California's Bay Area. One of them was ten-Cube's co-founder Darius Cheung.

They did not reveal the amount, just that it was enough for them to take up office space, expand their team to eight people and start working on the final product.

By the end of this year, they hope to make PlayMoolah available to interested parents in the US and here for free, to test it further. Next year they hope to launch it in the US market.



Ms Audrey Tan (front) and Ms Lee Min Xuan, founders of start-up PlayMoolah, which uses online games to teach children how to manage their money. Both of them shared a passion for starting innovative businesses as well as educating children, and the idea for their enterprise grew from there. ST PHOTO: CHEW SENG KIM

TWO VENTURES THAT SHOW PROMISE

ZOPIM

START-UP business Zopim remained merely an idea – until two of its founders gatecrashed an event hosted by a venture capitalist.

NUS students Wu Wenxiang and Royston Tay pitched their vision to Mr Tim Draper, founder of Draper Fisher Jurvetson, at an event at Chijmes.

The 29-year-olds were stunned when he asked to see a prototype within two months – in his office in Silicon Valley.

Realising this was a rare opportunity, they worked feverishly on a prototype, then flew to California to show it to Mr Draper. Although he did not write them a cheque, he did tell them that the idea was workable.

Four years on, Zopim – which allows firms to communicate with their customers via instant messages – has won awards and accolades.

Last year, it was voted one of the top 10 apps in Asia in a competition held by SingTel. Just before that it was a finalist in Red Herring's top 100 Asia award. Technology news website TechCrunch said Zopim's main selling point is that it is so simple to set up.

The app has attracted an increasing number of customers, ranging from spas to online electronic stores.

Having garnered \$300,000 in funding from Spring Singapore and NUS Enterprise, the team hopes to launch a new version of the product for the latest mobile phones by the end of this year.

PATSNAP

PATSNAP is the brainchild of NUS student Jeffrey Tiong – who based the idea on his own frustrating experience of searching for patent information online. The 27-year-old, who spent a year in the NUS overseas college in Philadelphia in 2006, came up with the idea after an internship as a patent engineer for a medical device company.

He realised that many patent search engines were difficult to use.

So the biomedical engineering student created Patsnap, a Web-based search and analysis platform which allows users to track, analyse and download worldwide patent information.

When he graduated in 2007, he pitched it to NUS Enterprise and won a grant of \$55,000.

He gathered a multi-national team – including two NUS students from China and a Singaporean who attended NUS's overseas college in Sweden – to take advantage of their different backgrounds and experiences.

With a further \$1 million investment from venture capital fund Accel-X last year, he took the leap and set up an office in Suzhou Industrial Park in China.

Patsnap, which now has a team of 35 people, says it is generating healthy revenue. Its clients include the Agency for Science, Technology and Research and the National Library Board, Beijing University and the Massachusetts Institute of Technology.

Thank You



***Briefing on
Temasek Laboratories
at
National University of Singapore***

September 2014



MINDEF-University Collaborations in R&D

- Ministry of Defence (MINDEF) and National University of Singapore (NUS) have had fruitful collaborations in R&D since mid-1980s.
- MINDEF has also funded the establishment of research infrastructures in NUS, such as
 - » *Laboratory for Image and Signal Processing,*
(*Laboratory for Image and Signal Processing* later evolved into the *Centre for Remote Imaging, Sensing and Processing (CRISP)* with funding from A*STAR.)
 - » *Laboratory for Radar and Signal Processing,*
 - » *Centre for Protective Technology,*
 - » *Physical Oceanography Laboratory,*
 - » *Acoustic Research Laboratory, etc.*
- The collaborations have been on project basis. At the end of each project, the Principal Investigators may move on to other research topics, and the research teams would be dispersed.
- Temasek Laboratories are established in the universities to anchor core teams of researchers in selected technology areas of long-term interest, and to serve as a coordinator of NUS-MINDEF collaborations.

Mission of Temasek Laboratories@NUS



To conduct research in selected areas of science and technology critical to Singapore's defence and security

- **Develop a long term research programme**
- **Build up a strong research team to pursue high quality innovative research**
- **Train research scientists and engineers to undertake advanced defence R&D**
- **Coordinate all other R&D initiatives between the Ministry of Defence and NUS**
- **Collaborate with local and overseas research institutions and companies in defence research**

Complementary Roles of TL and DSO National Laboratories



- **DSO is the main defence research establishment of Singapore undertaking a wide range of defence projects, many of them highly confidential.**
- **Temasek Laboratories complements DSO by taking up mainly upstream, basic research to understand new phenomena and materials, to explore innovative applications, and to develop sophisticated research tools.**
- **TL@NUS serves as a channel to promote defence science research in NUS, train research students, recruit researchers from overseas, and to collaborate with international research establishments.**

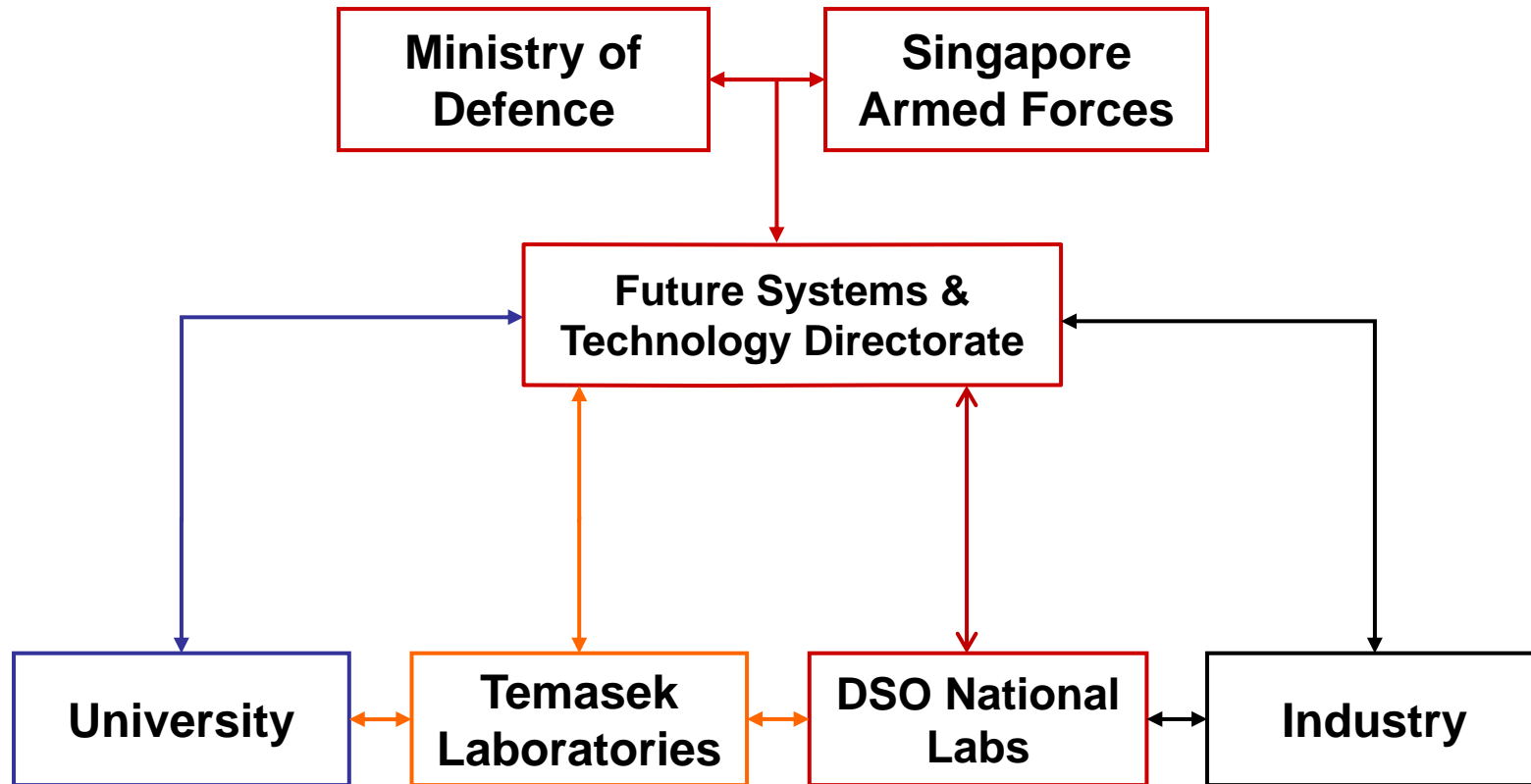
Launch of Temasek Laboratories@NUS 6 Sep 2000



- Officiated by Dr. Tony Tan, *then DPM and Minister for Defence*
- MOU on the establishment of Temasek Laboratories @ NUS signed by:
 - » Mr Peter Ho, *then PS for Defence and Chairman of DSTA*
 - » Prof Shih Choon Fong, *then NUS Vice Chancellor*
- DPM's speech:
 - » *Importance of research collaboration with international and local partners in building up a national capability.*
 - » *Temasek Laboratories to evolve into a "third pillar" of national defence infrastructure, complementing DSO and the local industry in harnessing the potential of science and technology to enhance the security and defence of Singapore.*

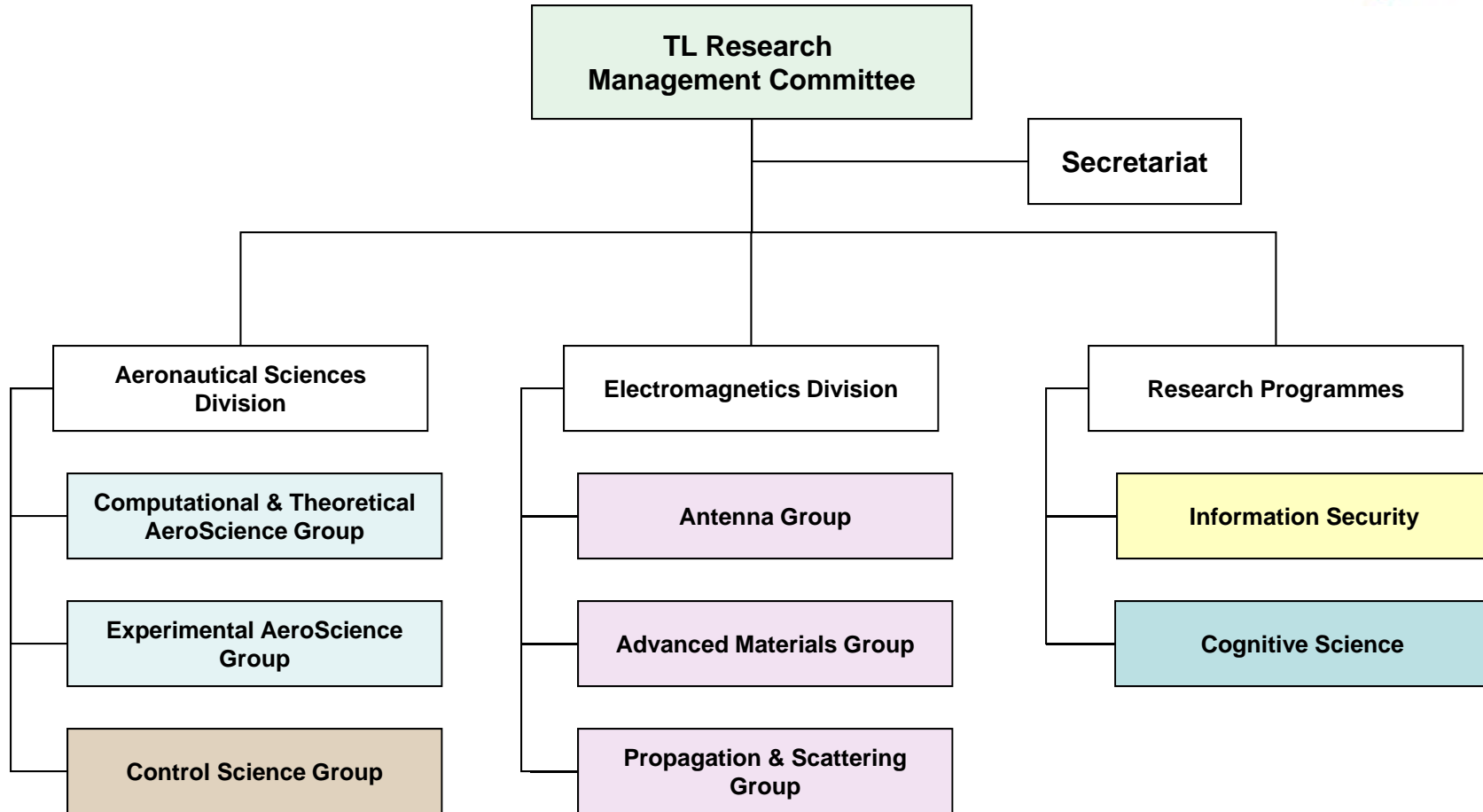


TL's Role in Defence R&D



Basic ← R&D → Mission-oriented

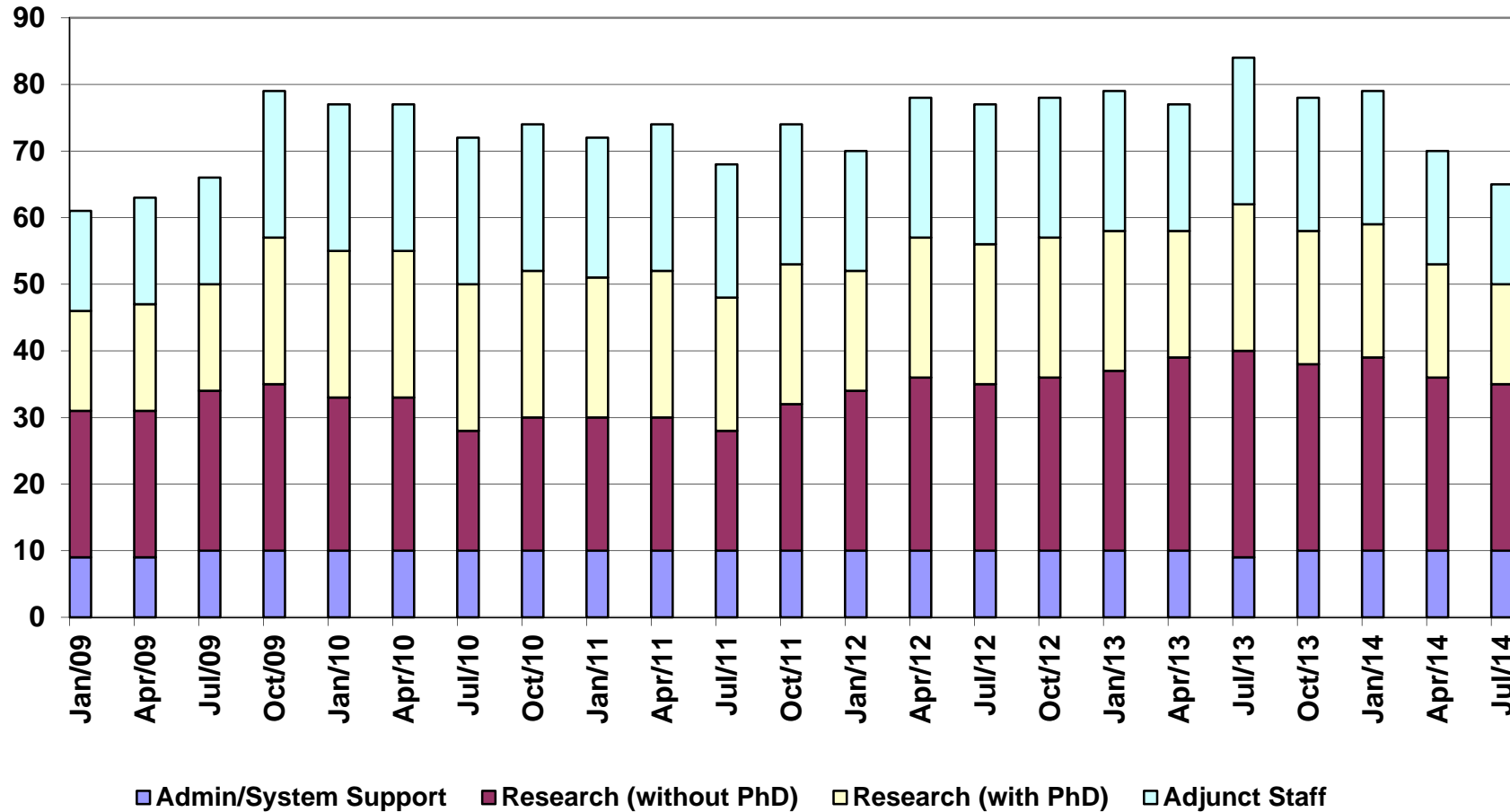
Organisation of Temasek Labs



Research Programmes

- ***Aeronautical Sciences***
 - » Computational fluid dynamics, aero/aeroservo-elasticity, design optimization.
 - » Pulsed Plasma, flapping MAV, pulse detonation engine.
 - » Robust & failure-tolerant control, multi-agent systems.
- ***Electromagnetics***
 - » Antenna design.
 - » Propagation and scattering of EM waves, computational EM.
 - » EM materials.
- ***Information Security***
 - » Coding theory, system security, cryptography.
- ***Cognitive Science***
 - » Cognitive computing, cognitive performance enhancement.

Temasek Laboratories Staff Strength



Local Collaborators — NUS

- **Department of Electrical and Computer Engineering**
 - » *Multi-agent systems: Coordination and control of multi-robot systems: hybrid system approaches; Collaborative tasking: search and exploration; Vision-based navigation;*
 - » *Neuromuscular response of spider by electrical stimulation*
 - » *Waveguide & Metamaterial Antennas*
 - » *High Agility Spacecraft Attitude Control Using CMGs*
- **Department of Mechanical Engineering**
 - » *Liquid-fuel Pulsed Detonation Engine*
 - » *EEG-Based Rapid Image Triage System*
 - » *Carbon Nanotube fibres*
 - » *Flapping wing micro-aerial vehicle*
 - » *Potential designs for station keeping of stratospheric balloon*

Local Collaborators — NUS

- **Department of Biological Sciences**
 - » *Neuromuscular response of spider by electrical stimulation*
- **Department of Bioengineering**
 - » *Neuromuscular response of spider by electrical stimulation*
 - » *Flapping wing micro-aerial vehicle*
- **Department of Chemical & Biomolecular Engineering and
Department of Biochemistry**
 - » *Synthetic Biology for Biomonitoring*

Local Collaborators — NUS

- **Department of Physics**
 - » *Laser processing of graphene microstructures*
- **Department of Computer Science**
 - » *Formal Verification of Systems Design & Implementation*

Local Collaborators — NTU & SIT

- **School of Electrical and Electronics Engineering**
 - » *Multi-agent system: Distributed Cooperative Information Processing and Control*
- **School of Computer Engineering**
 - » *Formal Verification of Systems Design & Implementation*
- **School of Mechanical & Aerospace Engineering**
 - » *Flapping wing micro-aerial vehicle*
- **School of Chemical and Biomedical Engineering**
 - » *Synthesis of Nanoenergetic Particles*
- **Singapore Institute of Technology (SIT)**
 - » *Liquid-Fuel PDE*

Overseas Collaborators

- **Ohio State University**
 - » *Computational Electromagnetics*
- **Delft University of Technology (TU Delft)**
 - » *Flapping wing micro-aerial vehicle*
- **Naval Postgraduate School**
 - » *Development of Diagnostic Sensors for Self-Sustained Pulse Detonation Engine*
- **Indian Institute of Technology Gandhinagar**
 - » *Effects of rain on the aerodynamics and performance of UAVs*
- **National Chi Nan University, Department of Electrical Engineering**
 - » *Nonlinear Reduced-Order Modeling and Adaptive Control Design for Aero-servo-elastic Systems*



Thank You