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ASSESSMENT AND VALUATION OF INVENTIONS AND RESEARCH RESULTS

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It is not the purpose of this presentation to be technical or provide textbook answers to how the evaluation process of intellectual work is done. This is rather a sharing of the experiences of a technology transfer and management office from a university in this region. This presentation begins with a quick overview of National University of Singapore's vision. This will provide the framework of understanding for which we will share our experiences in the process of evaluation and assessing the worth and viability of an invention. This is followed by an explanation of the process of assessment of NUS intellectual property and the value chain. In this presentation, the term intellectual property is used to include copyrights, trademarks, patents, inventions, and other technology and know-how.

THE NATIONAL UNIVERSITY OF SINGAPORE

Mandate: Teaching and R&D

Strategic Thrusts and Strategies

- Education
- Knowledge & technology
- Continuing education
- Core capabilities & infrastructure
- Partnership with private & public sectors
- Community service

The National University of Singapore, or NUS, has its roots dating back to 1905. NUS itself was incorporated on 8 August 1980. The NUS has outlined its missions and strategies that can be summarized in this slide. This slide summarizes the mandate of NUS and the strategies taken to achieve these mandates. In summary, the NUS focuses on education and the accumulation of knowledge and technology. Education is an on-going process that goes on even after entering the workforce. The building up of knowledge, technology and other capabilities require both hard work and interaction with other experts who are in the industry, both in the private and public sectors. A social conscience provides the balance to the institution that may otherwise seem to concentrate only on hard skills.

Industry & Technology Relations Office

The Industry & Technology Relations Office, or INTRO was set up in response to the increasing need to collaborate with industry and manage NUS's intellectual property as more of our work links directly with industry. Set up in August 1992, INTRO's primary goal is to act as a one-stop information and service center to advise staff members on research collaboration and technology transfer.

THE PROCESS OF ASSESSMENT

Peer Review (local & overseas)

International Benchmarking (e.g. patents)

Industry Interactions and Market Testing
- Industrial Collaboration (basic & applied)
- Consultancy
- Licensing
- Spin off companies

Results of Benchmarking
- Direct Industry's Evaluation
- Market Testing & Acceptance

NUS, on an international level, is new to the playing field of intellectual property and technology transfer. In addition, our work is still primarily focused on academic research. We thus start the process of assessment at the point when our academic staff carry out basic research and are critiqued by their peers both locally and overseas. If it is warranted, an invention can be patented in Singapore or elsewhere.

No central or formal planning is involved as the breadth of R&D in NUS is very wide. From the viewpoint NUS, the main test of the viability of an invention can only be proven when it is used by the industry that manufactures products or provides services to the market. NUS's first point of interaction is through collaboration with industry. Our staff also provide consulting services as individuals in small projects. We also license our technology and know-how to our partners. Through direct interaction with the industry, the capabilities and technical skills of the University and its staff are tested for their viability in the market. In some cases, the University has invested with its staff to set up a spin off company to bring NUS technology to the market. We have had successes as well as failures.

As it has been mentioned, NUS does not directly test or evaluate its technology. One reason is the lack of resources within INTRO for such an activity. Instead, we leverage upon the close interaction between staff members and industry, our patent agent and our own limited experience or interactions with industry. The processes of assessment and evaluating an invention, in our case, takes on a "practice approach" in which we allow our inventions to be tested first by industrialists, and then by the market. With government support, this is the process by which we build the capabilities of INTRO.

THE VALUE CHAIN

In summary, this chart presents the process by which INTRO and the NUS take in bringing NUS technology and know-how into the marketplace. NUS endeavors to add value to Singapore's industries by providing relevant technology and know-how through its R&D

activities. Thus NUS forms research and technology groups that build their core capabilities around a specific area of interest. From this group, a process of evaluation of the technology and know-how takes place through interaction with peers, industry and other experts. A process of technology disclosure allows INTRO to bring this technology to experts for evaluation. In some cases, a patent is filed for these technologies, but not in every case. When ready for industrial applications, we either participate directly or indirectly in commercialization of the product or service through collaborative research or, in some cases, through co-investing with the inventor in the technology.

Nus Technology Associates, Research Sponsors and Licensees
a sample

- Asahi Glass Co., Japan
- BP International Limited, UK
- Cerebos Pacific Limited
- Chartered Semiconductor Manufacturing
- Citibank, N.A.
- Fisher-Rosemont Systems
- Gemplus Technologies
- Hewlett-Packard Singapore
- ICI Polyurathanes
- Mobil Oil Singapore
- Motorola Electronics
- Nestle R&D Centre
- Nokia (SEA) Pte Ltd
- Novell Singapore Pte Ltd
- Reuters Singapore Pte Ltd
- Shell Eastern Research
- SmithKline Beechem Pharmaceuticals
- Sony Corporation
- Ssangyong Cement
- Yokogawa Electric

This list is by no means a comprehensive presentation of the technology partners of NUS. However, it presents the breadth of the industries that work with NUS.

Nus Technology Holdings and Spin-Off Companies

NUS Technology Holdings Pte Ltd

Investment Committee Members

Spin-off Companies

Biotreat International Pte Ltd
Allegro Science Pte Ltd
CE Resources Pte Ltd
Microfine Materials Technologies Pte Ltd
Osteo-Med International Pte Ltd
PrivyLink Pte Ltd

Biotreat's main focus is on biological treatment of wastewater. It offers state-of-the-art technologies for the treatment of both industrial and domestic wastewaters to protect water resources in support of the region's industrialization effort.

- Technology: core competencies in aerobic/anaerobic sequencing technology

Allegro produces and markets recombinant enzymes from genetically engineered micro-organisms. The enzyme is widely used in DNA synthesis in gene cloning, gene manipulation, identification of new genes or other related research.

- Technology: cloning of *Bacillus stearothermophilus* for high yield and improved quality of Bst enzyme

CE Resources develops specialized equipment for capillary electrophoresis (CE) and offers expertise in chromatographic methods. CE and chromatography are techniques for chemical analysis, and have in recent years, generated tremendous interest in industrial laboratories due to their high sensitivity, high separation efficiency and rapid rate of analysis in many industrial applications.

- Technology: equipment for capillary electrophoresis and expertise in chromatographic methods

Microfine develops advanced joining technologies, grows crystals and fabricates technical ceramic components. Its business covers the growth and processing of precious industrial garnet crystals, refurbishment of expensive engineering components and other areas such as the fabrication of high-performance tool inserts and electronic ceramics.

- Technology: advanced materials, crystal growth and processing

Osteo-Med develops and produces accurately sized implants to better fit the Asian morphology. Products include total joint replacements for the hip, knee, elbow and ankle, ligament and tendon replacement prostheses, trauma implants, spinal implants, fillers for bone defects and equipment used in orthopedic surgery.

- Technology: design and development of implants and prosthesis for Asians

PrivyLink develops and markets IT security products and/or services for the financial industry. The security infrastructure will facilitate the design, development and deployment of IT applications with high security requirements, for example, the provision of payment mechanisms in electronic commerce.

- Technology: security infrastructure software

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