

**SPEECH BY DR TONY TAN KENG YAM, CHAIRMAN OF THE
NATIONAL RESEARCH FOUNDATION, AT THE SINGAPORE
VENTURE CAPITAL & PRIVATE EQUITY ASSOCIATION LUNCH
HELD ON TUESDAY, 27 NOVEMBER 2007, MARRIOTT HOTEL AT
11.30AM**

**INNOVATION AND ENTREPRENEURSHIP
IN A KNOWLEDGE-BASED ECONOMY**

**Mr Kelvin Chan
Chairman
Singapore Venture Capital & Private Equity Association**

Distinguished Guests

Ladies and Gentlemen

Good morning

**I would first like to thank the Singapore Venture Capital and Private
Equity Association for kindly inviting me to speak to all of you this
morning.**

**I will first make some remarks about the importance of innovation and
entrepreneurship (I&E for short) to Singapore, why it is important for
Singapore, and what we have done to set the stage for the development of
an entrepreneurial eco-system in Singapore under the Technopreneurship
21 initiative.**

I would also like to seek your views on what we can and should do further to bring I&E to the next level, to transit our economy to a globally competitive knowledge-based economy with a robust and vibrant technopreneurial sector.

Changing Economic Landscape: Large vs Small

Let me start by presenting the broad economic landscape.

We can think of the 20th century as the ‘Century of the Large’.

The economic landscape in the 20th century was dominated by big corporations in areas ranging from steel, automobile, aircraft, electronics, telecommunications, petrochemicals and pharmaceuticals.

These big corporations undertook much of their R&D in-house, to create breakthrough inventions and new products that would propel their growth and profitability.

The 21st century, in contrast, can be said to be the ‘Century of the Small’.

Businesses and even our lifestyles will be increasingly influenced by technology developments at the ‘micro’ level – bits and bytes, cells and molecules.

Increasingly, corporations, scientists and venture capitalists are talking about the 3 big ‘O’s that will dominate this century – biO (biotechnology), nanO (nanotechnology) and infO (information technology).

Biotechnology will revolutionise medical sciences, food production and industrial processes, while nanotechnology offers the promise of tiny devices for all sorts of applications from healthcare to surveillance.

Information technology is already pervasive and ubiquitous – through the Internet, we are now dealing increasingly more with bits than with ‘atoms’.

The most profound impact will be at the convergence of these 3 ‘O’s.

We are therefore seeing great interest in inter-disciplinary research across these areas all over the world.

The same ‘smallness’ is seen in the businesses environment.

Although big firms still aspire to make breakthrough inventions in-house, more are now leaving the inventing to others.

Indeed, for most of the industrial history, small technology-based enterprises have been responsible for the bulk of breakthrough innovations.

For example, the pacemaker, the Personal Computer, the Polaroid camera and pre-stressed concrete, did not come from big corporations, but from small entrepreneurial outfits.

In the Internet industry, this has clearly been the case as the examples of venture capital-backed firms such as Google, Skype, YouTube and Facebook famously illustrate.

Thus, I believe that innovation in this century, much more than in the past, will be coming from small companies – particularly VC-backed high-tech start-ups with good intellectual property derived from cutting edge research.

Why I&E is important for Singapore

Singapore has always based its economic development on high value-add knowledge-based industries.

We will need to find such opportunities in the ‘Century of the Small’, characterised by the convergence of the big 3 ‘O’s.

The new wave of technology advances in the three Big ‘O’s is proceeding at an unprecedented pace and carries with it wide-ranging implications.

Advances in infocomm technology have reached a level where anyone in the world can communicate with anyone else anytime, any place and at ever lower prices (or even free, if you use Skype).

This is facilitating the widespread diffusion of knowledge, which in turn enables the creation of new products and services at a frenetic pace.

The innovative capability and intellectual assets that help to generate new ideas plus the entrepreneurial abilities to bring these ideas to market are the new building blocks of competitiveness.

The value and potential market returns generated by innovation and creative applications of new ideas have been significantly enhanced by the development of Intellectual Property Rights (IPR) regulations.

Douglass North, an economic historian and a 1993 Nobel laureate, said that the development of IPR was chiefly responsible for modern economic growth, as IPR gave individuals the incentive to innovate and create new ideas and products, because of the prospects of potentially large returns via the marketplace.

Technopreneurship 21 (T21)

Knowledge activities that involve creative and entrepreneurial sparks, however, do not occur in a vacuum.

The infrastructure and environment must be present.

Education, rules and regulations, facilities and financing – must be geared to motivate individuals and organisations to invest in the creation and exploitation of intellectual assets for economic and societal benefits.

These are the elements that make up an entrepreneurial eco-system of enterprises, big and small, local and foreign.

The extent to which we are able to create such an eco-system will determine the level of our success in driving innovation and entrepreneurship.

Recognising the need for Singapore to have a strong and vibrant technopreneurial sector, I launched the Technopreneurship 21 initiative (or T21 for short) 8 years ago in 1999.

Through this initiative, we embarked on a systematic and comprehensive plan to develop the entire ecosystem for technopreneurship to flourish, focusing on four elements – Education, Facilities, Regulations and Financing.

Let me review briefly what has been achieved in the last eight years.

Education

For technopreneurship to take root and flourish in Singapore, we needed a paradigm shift at every level of society to create a conducive

environment where successful entrepreneurs are rewarded, success stories are celebrated and failures are accepted and tolerated as part of the learning process.

Students at all levels – from the schools to the universities – were encouraged to learn about entrepreneurship first-hand.

Both NUS and NTU started entrepreneurship education programmes that taught students the basics about starting up a business through an experiential learning process.

The NUS started an Overseas College programme for students to intern at start-ups in the US, India, China and Sweden, to experience first-hand the exhilaration and challenges of being in start-up companies.

I met with about 40 of these students recently in Silicon Valley and I was impressed by the energy and enthusiasm that these 20-year-old undergraduates radiated.

All of them were thinking about ideas for starting up companies when they return to Singapore.

NTU's Technopreneurship and Innovation Programme has received exuberant praise from Prof Charles M. Hampden-Turner, of Cambridge University's Judge Business School, who was invited to review the programme.

Prof Hampden-Turner said that the programme was remarkable in several ways: "The programme participants are themselves the 'champions' of the programme and behave like entrepreneurs in publicising it, inviting speakers, developing the network, recruiting new students, mentoring and generally assisting its take-off."

It was not surprising, therefore that a third of the students joined start-ups or started new businesses after completing the course.

Prof Turner had said that "...if teaching innovation is really possible and can be measured, then every nation is going to want this and Singapore is in the process of exercising leadership in this regard."

Facilities

The development of research facilities that allow researchers, technopreneurs and venture capitalists (or VCs) to interact with one another, would provide the environment conducive to knowledge generation, diffusion and use.

The One-North area is such a development.

Located at Buona Vista, it consists of several developments, including Biopolis, which has been completed and Fusionopolis, which is currently being built.

These facilities helped to attract companies to locate their R&D facilities in Singapore.

In Biopolis, there are now research labs from several major pharmaceutical companies, including Novartis, GlaxoSmithKline and Takeda, alongside government-funded research institutes (or RIs).

Incubators provide fledgling companies not only with the space needed for them to conduct their business at an affordable cost, but also the business networks and guidance they need for growth.

From 2004 to 2006, the number of incubators grew from 85 to 114, of which some 40 were from foreign countries.

Global Entrepolis, started some years ago, has been bringing together annually over 10,000 entrepreneurs, industry captains, VCs and other participants from 70 countries to Singapore.

This event provides opportunities for participants to access funding and markets, discuss partnerships, and allow startups from Singapore to showcase their latest technology, innovations and products to an international audience.

Rules and Regulations

The third element under the T21 initiative was for the government to develop a pro-enterprise environment supportive of young start-up companies.

No sacred cows in our rules and regulations were spared in our review.

Bankruptcy laws were relaxed to allow bankrupts with debts of less than S\$500,000 to be discharged after three years instead of five.

Start-ups could operate from subsidised HDB apartments as “garages in the air”.

Since 2003, the Technopreneurs Home Office Scheme had been expanded into the Home Office Scheme, which allows home owners to conduct a wide range of small-scale businesses in their homes.

To date, some 31,000 applications under the Home Office Scheme have been approved.

Capital loss from investments in approved start-ups can now be deducted from personal income tax.

Favourable tax treatment was given to stock option gains.

Immigration rules were also made more flexible for foreign entrepreneurs.

We now have a Pro-Enterprise Panel chaired by the Head of the Civil Service, which provides a channel for feedback on rules and regulations that could potentially hinder businesses and stifle entrepreneurship. The Panel has evaluated almost 1,700 suggestions since its inception in August 2000, and has accepted more than half of these for implementation.

Through these changes, we have steadily enhanced the environment for entrepreneurship so that entrepreneurs and investors will find it easy to locate and start up new businesses here.

As a result, in a review of 178 countries conducted by the World Bank¹ in 2007, Singapore was rated as the easiest place to do business.

Financing

Finance is arguably the most critical factor in all business ventures.

¹ *Doing Business 2008*

At the start-up stage when risks are highest, investment funds are the most scarce and the most difficult to access.

Uncollateralised bank loans and venture funds are generally not available and corporate investors eschew such investments.

However, there are private investors known as ‘Business Angels’, who are willing to risk their investments to reap potentially large gains.

In the US, such ‘angels’ form the backbone of small company start-up capital.

Locally, such individuals are also key investors for high-technology ventures at the seed stage.

The Start-up Enterprise Development Scheme (SEEDS) and Business Angels Scheme by the government were established to co-share the risks in ‘seed’ funding of start-ups.

Both schemes are based on the principle of Government matching the investments made by independent private sector third-party investors in early stage companies.

These investors are able to assess and value intellectual property, understand the risks involved and they have the network to help grow the start-ups.

As of June 2007, the government has invested some S\$40.7 million to support 151 companies through the SEEDS programme.

The biggest financial commitment by the government to T21 was the set-up of the US\$1 billion (approximately S\$1.7 billion) Technopreneurship Investment Fund (TIF) in 2000. Another S\$300,000 was added subsequently.

TIF Ventures Pte Ltd was established to manage this fund.

In order to develop the VC industry, TIF Ventures functioned as a fund-of-funds company, investing in other venture capital funds, both local and overseas.

Investing in overseas VC funds was done to draw them to base part of their operations in Singapore.

Investments in local funds, on the other hand, were made in order to develop our indigenous VC industry.

Some of these funds, such as Granite Global Ventures, DFJ ePlanet and Apex Venture Partners in the US; Baring Private Equity Asia in Hong Kong; and Venture TDF, Skyven Asset Management, Phillip Private Equity and SEAVI Advent Corporation in Singapore, have done very well.

Over the years, TIF Ventures helped to stimulate the VC industry in Singapore, linking us to the network of top-tier VCs established across the world, from the US to Europe to Japan, Israel, India and China.

When we started in 1999, there was only S\$10.2 billion in VC funds managed out of Singapore.

Today, this figure has almost doubled to S\$19 billion.

This rapid build-up of the VC industry would not have been possible without the investments made by TIF Ventures.

The number of local venture-backed companies increased from 375 in 1999 to 943 in 2006.

TIF Ventures also played a direct role in encouraging entrepreneurship in Singapore.

It invested in a number of high-tech start-ups directly.

Of course, not all these companies survived, but some did, and these have the potential to grow into large companies.

Biosensors is one such success, having listed in the local stock exchange.

Others included Savi Technology Asia and Soundbuzz.

Although TIF Ventures was set up with primarily a developmental goal in mind, and therefore might have been expected to lose money, to its credit, it was able to not only develop the venture capital industry in Singapore but also give a positive, although moderate, return on the Government's initial investment.

The Government recently decided that TIF Ventures had fulfilled the mission it was given to develop Singapore's venture capital industry.

TIF would not be making any further investments but the existing TIF portfolio will be managed until its end of fund life.

I am happy to note that many who worked in TIF Ventures have gone on to other VCs such as the Partners Group, or started new fund companies, such as Eagle Capital Partners and Raffles Venture Partners.

While TIF Ventures has contributed to the development of our venture capital industry, the industry must continue to grow for entrepreneurship to thrive.

As we move forward in our journey of innovation and entrepreneurship, it is essential that our local entrepreneurs continue to receive support from VCs and other sources of venture funds, especially in the early stages of their growth.

What we started eight years ago in 1999, the Russians have started to do today.

The government-backed Russian Venture Company (RVC) has set out to hand over US\$1.25 billion to top-tier VC firms.

The venture firms have to invest the money, along with some of their own money, into Russian start-ups, or start-ups based in Russia.

Under these deals, the VC firms create a new, separate fund with their own money (much like the TIF Fund-of-Funds) and money from the RVC.

Start-up activity is also picking up pace in the former Eastern bloc countries.

Cisco Systems, which had hitherto invested only in Silicon Valley companies, have announced that it will make both direct and indirect investments in tech start-ups in countries such as Bulgaria, Czech Republic, Croatia, Estonia, Hungary, Latvia, and Ukraine.

We are thus not alone in the desire to develop a vibrant and robust technopreneurial sector for our economy.

Beyond T21

While much have been done, it is still early days in our journey to bring about a pervasive technopreneurial culture in Singapore.

The National Research Foundation (NRF), in supporting the high-level Research, Innovation & Enterprise Council (RIEC) chaired by the Prime Minister, is looking at new initiatives to support innovation and enterprise, in addition to building up research excellence in our universities and other institutes in Singapore.

Over the past two years, NRF has allocated substantial funds to three strategic research programmes – namely environmental and water technologies (clean water and clean energy), biomedical sciences, and interactive and digital media.

In addition to selecting these areas from the top-down, NRF has also implemented other initiatives, such as the Competitive Research

Programme (CRP) Funding Scheme and the NRF Research Fellowships to support high impact quality research from the bottom-up.

Beyond these initiatives to create knowledge and intellectual property through R&D, we must also build up a higher level of I&E in Singapore so that the IP created can be exploited for economic and societal benefits.

As institutes of higher learning (IHLs) have the greatest capacity for knowledge creation, it is important to infuse a culture of academic entrepreneurship in our universities and polytechnics so that academics will carry out use-inspired research and play an active part in exploiting their research results for societal good.

NRF will be implementing initiatives to do this together with other government agencies in Singapore.

On my trip to the Silicon Valley last month, I was struck by the extent of academic entrepreneurship shown in top research universities, such as Stanford University and UC Berkeley.

My colleagues and I came back with the following observations:

i) Innovation and entrepreneurship do not detract from but actually enhance the mission of the university.

These activities give a purpose to the teaching and research mission by enriching the professional experiences of both faculty and students.

We met excellent faculty who believed strongly in use-inspired research – research that provides solutions to major societal and economic problems that impact all mankind.

ii) Use-inspired research does not compromise the quality of scientific research.

Researchers place large societal issues at the centre of their research problem formulation, and students, in their research training, are given ‘large societal canvases to paint on’.

Undertaking such research has not compromised the quality of Stanford’s and Berkeley’s research.

On the contrary, both universities continue to push the frontier of basic science and produce Nobel Prize laureates, such as Professors Steven Chu and Douglas Osherrof.

iii) Technology transfer and commercialisation are viewed as means to create value for the economy and society, and not to maximise licensing revenue for the university.

Top entrepreneurship universities, such as MIT and Stanford, told us that the licensing revenues they received each year make up only a small fraction of their research budgets.

Even returns from gigantic commercial successes such as Google, when spread over a number of years, constitute less than 10% of Stanford's annual budget.

iv) Industry awareness and interaction have great positive influence on university research.

Venture capitalists prowl the corridors of Stanford and UC Berkeley to uncover scientific research with potential commercial applications.

They also look to experienced faculty members to validate commercial prospects of certain technologies.

Through such exchanges, faculty have a better sense of what research areas and directions are relevant to societal problems and are then able to act on them.

v) A strong sense of “paying back to society” fuels the entrepreneurial culture.

The Silicon Valley has a supportive and encouraging entrepreneurial ecosystem, highly tolerant of failures.

Successful people are willing to take time to coach and mentor young entrepreneurs, despite their busy schedules.

Many also contribute financially to research and entrepreneurial causes.

In fact, in talking to them, making money seems to be secondary to creating an impact on society.

They have done very well in seeking to do good.

Conclusion

In conclusion, I think we have come a long way since we launched T21 in 1999.

When we first started, many were hesitant about the role of the government in driving entrepreneurship.

Now, looking back over the past eight years, we see that the T21 initiative has prepared us well to deal with the challenges in the future.

Moving forward, we will continue to encourage the creation of new high-tech firms.

While it is not possible to replicate Silicon Valley in Singapore, there are many lessons we can learn from Silicon Valley and elsewhere that can be adapted to our local environment.

I believe it is time for a new push to further develop innovation and entrepreneurship in Singapore.

In the book *Good Capitalism, Bad Capitalism*², Carl Schramm said that

“...the most successful economies are those that have a mix of innovative entrepreneurs and larger, more established firms... that refine and mass-produce the innovations that entrepreneurs... bring to market.”

The larger firms, with their systematic approach to constantly refining existing products and services and their economies of scale, are well-suited to commercialise products and services on a mass scale to bring down the price and improve the quality of the early innovations.

These corporations and firms already exist in Singapore.

However, we lack the small, innovative, high-tech start-ups needed to complete the mix.

This is what we now need to do.

² *Good Capitalism, Bad Capitalism* by William Baumol, Robert Litan and Carl Schramm

Our IHLs and RIs need to embark on more use-inspired but nonetheless cutting-edge research, the results of which would provide business opportunities for entrepreneurs and investors.

Successful innovation requires that research results be effectively translated into economic and societal benefits.

Hence, we need to deepen and broaden the nexus between academia and the technopreneurial community of start-ups and VCs.

We want to encourage the formation of small and nimble high-tech start-ups built upon technologies created at the IHLs.

NRF is going through a consultative process with key stakeholders, to get their views on how we can raise innovation and entrepreneurship in Singapore to a new level and thereby help to build up a resilient economy for the future.

You are part of the community in Singapore that will play a very important role in this process.

As this is intended as a dialogue session, let me conclude my speech so that

I will have time to hear your views and suggestions.

Thank you.
