

The **Asian and Pacific Centre for Transfer of Technology** (APCTT), a subsidiary body of ESCAP, was established on 16 July 1977 with the objectives to: assist the members and associate members of ESCAP through strengthening their capabilities to develop and manage national innovation systems; develop, transfer, adapt and apply technology; improve the terms of transfer of technology; and identify and promote the development and transfer of technologies relevant to the region.

The Centre will achieve the above objectives by undertaking such functions as:

- Research and analysis of trends, conditions and opportunities;
- Advisory services;
- Dissemination of information and good practices;
- Networking and partnership with international organizations and key stakeholders; and
- Training of national personnel, particularly national scientists and policy analysts.



The shaded areas of the map indicate ESCAP members and associate members

Asia-Pacific Tech Monitor

Vol. 35 No. 3 ❖ Jul - Sep 2018

The **Asia-Pacific Tech Monitor** is a quarterly periodical of the Asian and Pacific Centre for Transfer of Technology (APCTT) that brings you up-to-date information on trends in technology transfer and development, technology policies, and new products and processes. The Yellow Pages feature the Business Coach for innovative firms, as well as technology offers and requests.

Web: www.techmonitor.net

Editorial Board

Ms. Michiko Enomoto

Dr. Satyabrata Sahu

Dr. Krishnan Srinivasaraghavan

ASIAN AND PACIFIC CENTRE FOR TRANSFER OF TECHNOLOGY

C-2, Qutab Institutional Area
Post Box No. 4575

New Delhi 110 016, India

Tel: +91-11-3097 3700

Fax: +91-11-2685 6274

E-mail: postmaster.apctt@un.org

Website: <http://www.apctt.org>

Opinions expressed by the authors are not necessarily those of APCTT.

The designation employed and the presentation of material in the publication do not imply the endorsement of any product, process or manufacturer by APCTT.

*The contents of the **Tech Monitor** may be reproduced in part or whole without change, provided that the **Tech Monitor** and the authors concerned are credited as the source and a voucher copy of the publication that contains the quoted material is sent to APCTT.*

This publication has been issued without formal editing.

ISSN: 0256-9957



CONTENTS

Introductory Note	2
Technology Market Scan	3
Technology Scan: Renewable Energy Technologies	8
Special Theme: Financing innovation in Asia and the Pacific	
• Financing innovation in the Asia-Pacific Challenges and enabling mechanisms	13
<i>KyungJin Hyung</i>	
• Bridging the 'Gap' – Funding solutions for the future	17
A Malaysia perspective	
<i>Rofina Yasmin Othman, Nurzatil Sharleeza Jalaluddin</i>	
• Selected Innovation programmes and funds in Asia and the Pacific	21
Tech Events	23
Tech Ventures & Opportunities	24
Business Coach	
• Start-up Venture Creation	25
• Technology Transfer	28
• Venture Financing	31
• Managing Innovation	35
• Green Productivity	38
Tech Opportunities	
• Technology Offers	42
• Technology Requests	46



Introductory note

Finance plays a critical role in developing and harnessing technological innovations. Adequate level of finance allows researchers, startups and small and medium enterprises (SMEs) to conduct research, early stage commercialization, and scaling up their innovations. Based on specific financing needs, several financing stages are distinguished, such as research & development (R&D), early stage commercialization (seed, startup), and expansion & scale up.

The problems of accessing finance at diverse stages of innovation and technology commercialization vary as per their specific characteristics. The R&D stage involves uncertainties associated with research outputs, and most of R&D spending going as wages and salaries of skilled workforce. At early commercialization stage, traditional financial institutions like banks exercise caution to lend startups and SMEs due to the higher level of risk involved. Moreover, these financial institutions usually lack the capacity to understand and appreciate the potential of new and innovative technologies. At the expansion stage, the enterprises may face operational issues for scaling up, diversifying product portfolio, and improving cost-effectiveness as the scale increases over time.

In view of these constraints, the startups and SMEs would require innovative types of financing tools to meet their needs as they progress from early commercialization to the expansion phases. While public finance is considered crucial for the R&D stage, business angels play a vital role at the early commercialization and startup phases. With venture capital firms increasingly focusing on later-stage enterprises, this source of funding is critical for expansion and scaling-up of innovative businesses. At the expansion stage, Intellectual Property(IP)-based financing (i.e. pledging IPs as collateral for bank lending) is emerging as an innovative funding instrument.

Technologically advanced countries in Asia and the Pacific have adopted innovative tools and instruments to provide finance at various stages of innovation and commercialization. These include innovative public funding schemes, soft loans, risk capital, venture capital, private equity, and angel investment. It is imperative for the developing and least developed countries of the region to explore innovative financing approaches to accelerate the growth of their innovative startups and SMEs.

This issue of *Asia-Pacific Tech Monitor* discusses the challenges, opportunities, strategies and best practices on financing mechanisms and tools for developing and commercializing innovations in the Asia-Pacific countries.

Michiko Enomoto
Head, APCTT-ESCAP

Technology Market Scan

ASIA-PACIFIC

Asian companies drive growth in global R&D budgets

Asian companies outside Japan have more than quadrupled their research and development budgets in the last decade with investments in artificial intelligence and information technologies, spearheading a move into a new industrial era. South Korea's Samsung Electronics ranked third in the world for R&D spending, quadrupling its budget since 2007. China's Alibaba said in October that it will invest \$15 billion over the next three years to build research hubs in China, the U.S., Russia, Singapore and Israel. The spending, which for a single year would be double what it spent in 2017, is aimed at accelerating research in AI and the "internet of things."

U.S. companies increased R&D spending by 86% and are still leaders in AI and IT investment. But the ranks of the biggest U.S. spenders on innovation has changed as technology brands displace automakers like General Motors and drugmakers like Pfizer. Amazon.com had the world's largest R&D budget at \$22.6 billion, a 28-fold jump from 10 years earlier. It expanded its AI development team to 5,000 people last year from 1,000 in 2016 as it conducts experimental research on smart speakers

and unmanned convenience stores. Apple ranked seventh in the world at \$11.5 billion, a 15-fold increase over the same stretch. It opened a research facility in Japan last year.

Corporate Japan's R&D spending, meanwhile, rose just 12%. Only 17 companies represented the nation in the top 100 budgets last year, down from 24 in 2007. Toyota slid to tenth from third after increasing investment only 26%. Japanese electronics makers have actually curbed investment, with Panasonic falling to 36 from 15 in the rankings and Sony to 35 from 18. Electronics makers have retreated from fields that require significant R&D costs like mobile phones and semiconductors while concentrating on the internet of things instead to narrow their budgets.

<https://asia.nikkei.com>

CHINA

Inclusive finance innovation

Favorable policies and technological advancement have been great accelerators for innovation in China's inclusive finance sector during the past few years, according to a recent industry report. The country's inclusive finance industry has seen increasingly rich products and services, more diversified participants, rapid development of digital financing and innovative and sus-

tainable business models. The report was jointly released by the National Institution for Finance and Development, the National Public Information Platform for Party Media and WeBank, China's first online-only lender.

Back in 2016, the State Council rolled out plans to promote the country's financial inclusion development and, in 2017, the top banking regulator released guidelines to boost large and medium-sized banks to set up inclusive finance divisions. To better cater to the financial needs of customers like blue-collar workers, self-employed business and people living in remote and undeveloped areas, industry players like Shenzhen-based private commercial lender WeBank have introduced various targeted products like "micro loans."

The amount of small loan products is set between 20,000 yuan (US\$2,925) and 200,000 yuan, which does not require guarantees or collateral and can be repaid at any time. By relying on technologies such as big data, blockchain and cloud computing, WeBank is able to control default risks by gathering users' information for credit assessment, making it a reality for the masses to benefit from inclusive finance.

Li Nanqing, president of WeBank, said that inclusive finance has extensive and profound connotations, with "equitable access" being its essence. Last November, the bank unveiled its first product aimed at helping small and micro businesses in Shenzhen. Ping An Puhui, a consumer finance arm of the Chinese insurance giant Ping An Group, is another front-runner in offering innovative services for financial inclusion. The company exports credit auditing and consulting services to credit providers and funders and provides diversified loan service solutions for borrowers, the report said.

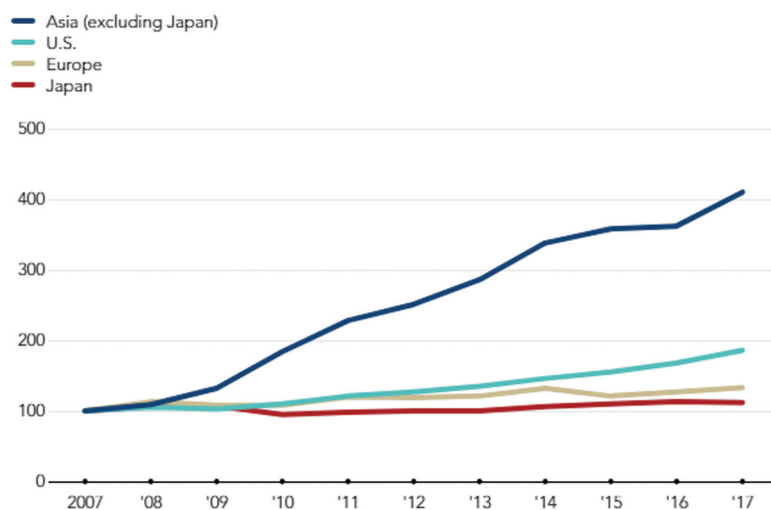
<http://www.ecns.cn>

Technology drives economic growth

According to Xinhua news agency, key economic indicators for this year's January to May period showed that the Chinese economy has been expanding in a steady manner with new impetus for so-called "high-quality development". Latest economic data from the National Bureau of Statistics (NBS) of

Asian companies' R&D spending is growing sharply

(index with base year 2007 set at 100)



Total R&D outlays by companies in each region.

Source: Compiled using data from QUICK-Factset

China showed that China's industrial output has expanded 6.8% year-on-year in May, 0.3% points higher than the same period last year, while the figure for the first five months came in at 6.9%, also faster than 2017.

The sector-by-sector breakdown of the NBS figures also serves to indicate changes in the country's economic structure and points to emerging industries. According to Mr Wen Jianwu, Head of NBS's department of Industrial Statistics, industrial output of high-tech and equipment manufacturing sectors grew 12% and 9.3% respectively in the first five months of 2018.

NBS data also showed that the information communication, software and information technology services sectors registered growth above 30%. At the same time, according to Mr Zhang Liqun, researcher with the State Council's Development Research Centre, production of new energy vehicles, integrated circuits, and robots grew by 56.7%, 17.2%, and 35.1% respectively in May alone. He said that these figures are a testimony to the effectiveness of China's ongoing supply-side structural reform.

According to *Xinhua*, "high-quality development means the Chinese economy will focus on quality and efficiency rather than pace, and medium-to-high growth will feature an improved economic structure and new growth engines". Fuelled by rapidly expanding internet and big data industries, the Chinese server market has become the main driving force behind a strong global recovery, with sales up 67.4% year on year in the first quarter.

Emerging service industries, led by internet-related sectors, contributed 56.8% to the growth in service sector production last month, 17.9% points higher than the same period last year, according to Mr Xu Jianyi, Head of the NBS Service Industry Department.

<https://www.opengovasia.com>

10.6 patents per 10,000 citizens

Some 1.47 million patents have been registered in the Chinese mainland, or 10.6 patents for every 10,000 citizens, the State Intellectual Property Office said. In the first

half of this year, the applications for invention patents reached 751,000, of which 217,000 have been granted, the office said.

Strengthened intellectual property right (IPR) protection led to a 29.5 percent year on year increase in IPR administrative cases in the same period.

Domestic enterprises made up the majority of patent granted and owned, at 63.8 percent and 67.2 percent respectively. However, China still lags behind developed countries in the number of patents in fields such as optics, electrical apparatus, audio and video, medical technology, transportation and computers, according to Bi Nan, an official with the office.

<http://www.xinhuanet.com>

INDIA

WIPO internet treaties approved

On July 4, India's cabinet approved the country's accession to the WIPO Copyright Treaty and the WIPO Performances and Phonograms Treaty (the WIPO internet treaties). By doing so, India will be able to provide international copyright protections to local creative content-makers and distributors in the internet and digital realm, granting them exclusive economic and publishing rights. Beneficiaries include the audiovisual, film, music, and literary industries. Accession to the WIPO internet treaties also levels the playing field for Indian creative rights-holders in other countries as it harmonizes India's intellectual property (IP) regime with international standards. Since India already protects the rights of foreign content creators, the absence of reciprocal protections was hurting domestic artists.

India's creative industry is currently projected to earn revenues worth US\$25.4 billion by the end of 2018. A stronger IP regime will boost industry growth and safeguard local artists and content makers and distributors from losses due copyright infringement and piracy.

The WIPO Copyright Treaty is a special agreement under the Berne Convention (for protection of literary and artistic works). Its provisions recognize specific copyrights

protections for the digital environment. So far, 96 countries have adopted the treaty; it came into force on March 6, 2002. The WIPO Performances and Phonograms Treaty came into force on May 20, 2002 with 96 contracting parties as its members.

WPPT provisions identify the rights of two kinds of beneficiaries in the digital environment:

- Performers (actors, singers, and musicians, among others); and
- Producers of Phonograms (sound recordings).

WPPT recognizes the copyrights of performers of original content and their exclusive economic rights.

<https://www.india-briefing.com>

Royalty payments for technology transfer

The government is considering restrictions on royalty payments for technology transfer in view of excessive outflow of such funds to overseas companies, sources said. The commerce and industry ministry has proposed limits on royalty payments in case of technology transfer or collaboration involving foreign entities either directly or indirectly through any firm in India. The proposal will be circulated for inter-ministerial views, the sources said.

As per the proposal, such payments should be capped at 4 per cent of domestic sales and 7 per cent of exports for the first four years; and for the next three years the limits should be 3 per cent of local sales and 6 per cent of exports. For further three years, these payments should be capped at 2 per cent of domestic sales and 4 per cent of exports and thereafter at 1 per cent of local sales and 2 per cent of exports. With regard to use of trade mark and brand names, the ministry has proposed to cap royalty payments at 1 per cent of sales and 2 per cent of exports of an entity. The increase in outflow of these payments started after the government liberalised the FDI policy in 2009. It had removed the cap and permitted Indian companies to pay royalty to their technical collaborators without seeking prior government approval.

Royalty is paid to a foreign collaborator for transfer of technology, usage of brand or trademarks. In April last year, a surge in royalty outflow prompted the government to set up an inter-ministerial group to analyse payment norms and see whether there is excessive payout by Indian companies to foreign collaborators. Proposing these restrictions, the ministry had argued that the curbs would help increase the profits of domestic companies, mainly in the automobile sector, prevent depletion of foreign exchange reserves, protect interest of minority shareholders and increase revenue for the government.

Before 2009, royalty payments were regulated by the government and capped at 8 per cent of exports and 5 per cent domestic sales in the case of technology transfer collaborations. They were fixed at 2 per cent of exports and 1 per cent of domestic sales for use of trademark or brand name. Telecom companies too pay \$15 royalty for every mobile line. A single line ideally supports a single call at a given point of time. Similarly, Auto major Maruti Suzuki pays an average royalty of around 5.5 per cent of its net sales to its parent Suzuki.

<https://www.business-standard.com>

Upcoming cloud computing policy

A panel working on the Indian government's cloud computing policy wants data generated in India to be stored within the country, according to its draft report seen by *Reuters*, a proposal that could deal a blow to global technology giants such as Amazon and Microsoft who offer such services. It could not only raise their costs because they will need to ramp up the number and size of data storage centers in India, where power costs remain high, but at least some of those increases are likely to be passed onto customers who include everyone from small start-ups to large Indian corporations.

The policy will be the latest in a series of proposals that seek to spur data localization in India, as the government finalizes an overarching data protection law. Local data storage requirements for digital payments and e-commerce sectors are also being planned. The authorities want the information stored

locally so that they can more easily get access to it when conducting investigations.

India's push for localization comes at a time of heightened global scrutiny of how companies store user data. In July, India said its federal police had begun probing Cambridge Analytica's misuse of Facebook user data, which New Delhi suspects included information on Indian users. The draft report of the cloud policy panel, which is headed by the co-founder of Indian tech giant Infosys, Kris Gopalakrishnan, said a "forward looking" data protection regime was needed as India's IT laws framework was "not sufficient" for cloud computing.

The Indian public cloud services market is set to more than double to \$7 billion by 2022, the draft report said. Enterprise spending on data center infrastructure software will rise 10 percent to \$3.6 billion in 2018, research firm Gartner estimates.

<https://www.firstpost.com>

R&D spending in automobile sector

Automobile companies' spending on research and development (R&D) grew 6.28 per cent in 2017-18. While this is better than the -0.34 per cent seen in FY17, it is still a far cry from the double-digit growth in the three previous years. This moderation is despite record sales, and changing regulations which require more research and development spends. New advanced emission, fuel efficiency and safety rules are to take effect over the next three to four years which will require companies to develop the technology to meet these norms. Automobile sales in India are up 14 per cent to 2,49,72,788 in 2017-18, the highest in six years. The analysis is based on figures gleaned from the financials of Tata Motors, Mahindra and Mahindra, SML Isuzu, Ashok Leyland, Hero Motocorp, Bajaj Auto, Maruti Suzuki India, TVS Motor Company and Eicher Motors.

Tata Motors (excluding its UK subsidiary, Jaguar Land Rover Automotive) leads in this spending. The maker of the Tiago and Hexa models spent almost Rs 24 bn in FY18, up 14 per cent over a year and its highest in at least five years. This was part of the company's effort to turn around in passen-

ger vehicles and strengthen its position in the commercial vehicle segment. Mahindra and Mahindra, the second largest in this order, has been spending in excess of Rs 10 bn a year. However, its R&D expense dropped to Rs 19.9 bn in FY18, from Rs 20.8 bn a year before. The maker of the Scorpio and XUV 500 has a busy product pipeline ahead, as it seeks to protect its share in its core SUV segment and shore up investment in electric vehicle technology. An e-mail sent to Mahindra remained unanswered till the time of this report.

Hero MotoCorp also saw its R&D expense fall, to Rs 4.9 bn in FY18 from a little over Rs 7 bn in FY17, lower than any of the previous three years. A company spokesperson said this was because of an unusually high level of investment in FY16 and FY17 in setting up a Centre of Innovation and Technology (CIT) in Jaipur. "With the CIT now fully operational, our R&D spend in FY18 (came down)," he said. Hero now boasts of a state-of-the-art R&D facility and a global team of engineers that is working on developing a new range of products for customers around the globe, he added.

<https://www.business-standard.com>

JAPAN

Patent arbitration hub

Japan will open an international arbitration body specializing in intellectual property here in September, the first one in Asia designed to facilitate resolution of a growing number of patent disputes. The spread of the "internet of things" has led to more clashes between companies over patents. With patents for essential communications technology now being used by a wider range of industries, the number of cases that cannot be settled through dialogue is rising, according to Japan's Patent Office. The organization will feature a roster of a dozen or so arbitrators from inside and outside Japan, including a former chief judge of a U.S. court that hears patent cases. It will be led by Katsuya Tamai, a University of Tokyo professor specializing in intellectual property law.

Dealing with allegations of patent infringement requires a deep understanding of the value and scope of the intellectual property

in question. Such cases can be time-consuming for a court or an arbitration organization set up to handle business disputes more generally. The new center will seek to resolve cases within a year. Though patents are registered separately in different countries, decisions made by arbitrators are binding across the 150-plus signatories to a United Nations agreement on arbitral awards, making it easier for companies to recover damages overseas. Japan's new institution will be able to hear even disagreements between non-Japanese companies, if all parties agree.

Japan's government has backed the creation of a specialized center to take on international arbitration hubs such as Singapore and Hong Kong. The organization likely will not only help protect Japanese intellectual property, but also bolster trust in the country's systems among foreign companies, furthering Tokyo's ambitions of making Japan a global heavyweight in intellectual property.

<https://asia.nikkei.com>

REPUBLIC OF KOREA

R&D spending in innovative industries

The Republic of Korea will jack up investment in research and development (R&D) for innovative industries to help local companies lead the fast-changing technology trends and create quality jobs, the government said. The Ministry of Trade, Industry and Energy said it will expand support for five promising new industries – autonomous vehicles, home appliances using Internet-of-Things technology, bio health, semiconductors and displays, and renewable energy – by increasing the percentage of R&D investment spent on these industries from the current 30 percent to 50 percent by 2022.

The ministry set aside 3.16 trillion won (US\$2.96 billion) for this year's R&D projects. The government said it will put concerted efforts with related industries to develop emerging technologies and make use of them in various areas. The Republic of Korea plans to put self-driving cars on its highways by 2020 and increase the number of electric vehicles to 350,000 by 2022. It also seeks to expand investment in establishing decentralized energy infrastructure to raise

the ratio of renewable energy resources, such as solar, wind and steam power plants.

<http://english.yonhapnews.co.kr>

SINGAPORE

Digital innovation

In line with Singapore's efforts to encourage innovation and digital transformation, Singtel has opened its FutureNow Innovation Centre (FIC). The centre has been designed to advance the Singapore government's industry transformation maps (ITMs) that focus on six key industry clusters, namely manufacturing, built environment, trade and connectivity, essential domestic services, modern services, lifestyle.

The centre will showcase some of the latest technology trends such as cloud, software-defined networks, data analytics, artificial intelligence (AI), cyber security, Internet of Things (IoT), robotics and 5G telecommunications technology. Set up to foster innovation and digital transformation around Singapore's \$4.5 billion ITM initiative, 23 industries are set to benefit under this initiative. Specifically, this is through providing services and solutions to spur innovation and assist enterprises to transform business models, unlock additional growth opportunities, redefine customer experiences and improve productivity.

The FIC will also showcase smart home technologies, including voice-controlled home systems and IoT for the consumer, which can be all managed through a single platform. Furthermore, the centre will also serve as a centre for collaboration between technology partners from small and medium enterprises as well as global technology leaders with Singtel and its customers, leveraging on the 650 million consumers across Australia, India, Indonesia, the Philippines, Singapore and Thailand.

To boost the research capability of the centre, it will also link up with Singtel's R&D labs with the National University of Singapore, Nanyang Technological University, Advanced Remanufacturing and Training Centre as well as Agency for Science, Technology and Research. In an effort to enhance skills and advance research in key areas, Singtel has made recent strategic investments with

various corporate R&D labs and institutes of higher learning and the national research foundation to develop deep technology capabilities and intellectual property in cyber security, AI, advanced data analytics, smart computing applications, building automation systems, robotics and industrial IoT.

<https://sg.channelasia.tech>

Industry digital plan

Small and medium-sized logistics businesses will find opportunities to take part in projects that could benefit the entire industry through a newly revealed Industry Digital Plan (IDP), the Infocomm Media Development Authority (IMDA) said. The online plan will guide logistics SMEs towards participating in projects and national initiatives that aim to "uplift the whole sector". These include in-mall distribution, federated lockers and the National Trade Platform, the IMDA said.

Logistics SMEs will receive step-by-step advice on the digital solutions required at each stage of their business growth in the digital economy. A new self-assessment checklist will also be made available on SME Portal to help SMEs identify their digital readiness and the digitalisation opportunities based on their needs. The IMDA will also continue to put up digital solutions it has pre-approved – such as in customer management or data analytics – on Tech Depot, a one-stop platform for tech solutions on the SME Portal website.

Among the first projects that will be highlighted under the IDP is a tripartite partnership between the IMDA and VCargo Cloud, together with Bolllore Logistics (Singapore), Dimerco Express Singapore and LCH Lockton, to make use of digital technology to improve efficiency. The TechSkills Accelerator (TeSA) programme – a SkillsFuture initiative launched in April 2016 to train information communications technologies professionals – will support the IDP. The IMDA, with support from the Singapore Economic Development Board and Spring Singapore, launched the Logistics IDP as part of the SMEs Go Digital Programme, and in support of the Logistics Industry Transformation Map.

<https://www.businesstimes.com.sg>

VIET NAM

Registration of technology transfer now mandatory

According to the new Law on Technology Transfer dated 19 June 2017 and Decree No. 76/2018/ND-CP which was issued on 15 May 2018, registration of technology transfer has been made mandatory from July 1, 2018, in Vietnam. Earlier, registration was only mandatory for technology transfers which were restricted. Except for restricted technology transfers which require specific permits, following are the types of technology transfer that needs to be registered with the state management agencies of science and technology.

- Technology transfer from a foreign county to Vietnam;
- Technology transfer from Vietnam to a foreign country; and
- A domestic transfer which uses State capital/budget, excluding ones that have already received the Certificate of Registration of Science and Technology Task Outcomes.

Technology is defined as a solution, process, or know-how that may or may not be supported by instruments and facilities to convert resources into products. Technology transfer is the transfer of the right to own or use (part or whole) of a technology from a party which has the right to transfer.

If the transferred technology involves intellectual property rights protection, the transfer will be carried out according to the Law on Intellectual Property. Involved parties need to register for intellectual property rights and technology transfer separately.

The Vietnamese party is solely responsible for the registration process.

- Transfer from a foreign country to Vietnam – the transferee;
- Transfer from Vietnam to a foreign country – transferor; and
- Domestic transfer using State capital/budget – transferee.

- In case of a domestic technology transfer, the provincial Department of Science and Technology is the registration authority. In case it's between a Vietnamese firm and a foreign country entity, the authority is the Department of Technology Appraisal, Examination, and Assessment under the Ministry of Science and Technology.

To examine the technology transfer agreement, the government has set the fee equivalent to 0.1 percent of the total value of the agreement. However, it should not be less than VND 5 million (US\$ 214) and not more than VND 10 million (US\$428).

Involved parties need to submit their registration application within 90 days of the agreement signing date. In addition to the registration agreement, other supporting documents required are:

- Original or certified copy of the technology transfer contract;
- Notarized or authenticated translated copies of the technology transfer agreement in Vietnamese;
- Investment Registration Certificate copies of both parties;
- Documents confirming the legal status of the representatives of the parties to the contract; and
- Power of Attorney, in case a third party has been authorized to carry out the procedures.

Contracts signed before July 1, 2018, but renewed after July 1, must follow the new regulations. Once the application has been filed, the competent authority has five working days in which it must either issue the registration certificate or provide reasons for refusal. In case an agreement is incomplete, the government authority needs to inform the applicant within three working days. If an agreement is being amended/supplemented, the competent authority needs to inform the transferor within five working days.

The new regulations will enable the government authorities to keep track of technology transfers into Vietnam and assist tax authorities during audits and inspections

in evaluating deductible expenses as the contracts will be registered.

<http://www.vietnam-briefing.com>

Innovation network programme

The Programme of Connecting Vietnam Innovation Network 2018, which gathered hundreds of talented Vietnamese in the fields of science and technology, was launched in Hanoi on August 19. The event was jointly held by the Ministry of Planning and Investment, the Ministry of Science and Technology, the Ministry of Foreign Affairs, and the Ministry of Education and Training. It saw the attendance of by Prime Minister Nguyen Xuan Phuc.

Minister of Planning and Investment Nguyen Chi Dung said that in an earlier meeting with overseas Vietnamese talents in science and technology the same day, Prime Minister Phuc lauded their return, especially in the era of industry 4.0 which poses both opportunities and challenges to the nation.

Currently, the ministry is working with relevant ministries and sectors to build a national strategy on industry 4.0, which comprises the establishment of innovation centres, and mobilisation of experts and scientists, he said, adding that the innovation network initiative has lured the participation of more than 100 overseas Vietnamese scientists so far.

The programme will gather overseas Vietnamese and domestic scientists who will meet to exchange and share visions as well as strategies for scientific and technological development in the sectors that Vietnam needs to accelerate in the coming time, Minister Dung said.

Meanwhile, Minister of Science and Technology Chu Ngoc Anh laid stress on human resource issue, seeing it as a competitive factor to promote the country's growth quality. The launching ceremony was followed by a dialogue on connection of science and technology community, and policies on innovation network connection in Vietnam.

<http://en.nhandan.org.vn>

Technology Scan

Focus: Renewable Energy Technologies

ASIA-PACIFIC

AUSTRALIA

New wave energy technology

New technology to measure ocean waves and currents with greater accuracy than ever before is being deployed off the Albany coast this week, as part of the new Wave Energy Research Centre, an initiative led by The University of Western Australia. In partnership with the State Government, this project will place WA at the forefront of marine renewable energy research and technology and increase knowledge and understanding of ocean processes. Two buoys will collect data on wave height, direction, period and surface current speed, then transmit this data via satellite to the Wave Energy Research Centre, where scientists will analyse it.

UWA Wave Energy Research Centre Chief Investigator Dr Jeff Hansen said it would be the first time detailed wave measurements in the near-shore area out of Albany would be collected using such superior instruments. "With swell and wind conditions looking favourable this week, the research team will deploy the instruments and use them to observe the marine environment in far more detail than ever before," Dr Hansen said.

The researchers have collaborated with industry partner Carnegie Clean Energy as part of the State Government funded Albany Wave Energy Project. Their data and ocean models will improve the placement, survivability and performance of Carnegie's CETO6 wave energy converter device. The new home for one of the wave buoys is approximately 45 kilometres offshore from the Albany wind farm at Sandpatch, where water depth is around 350 metres. The second wave buoy will bob closer to shore at a depth of 30 metres, at the same location as Carnegie Clean Energy's wave energy converter device when it is installed.

<http://www.news.uwa.edu.au>

CHINA

Power generating windows

Chinese scientists developed a window material with thin, see-through solar

cells that could turn window into miniature electricity generators. The window-compatible material reported in a study published on Tuesday in the journal *Joule* could potentially double the energy efficiency of an average household.

"Building-integrated photovoltaics are a great example of a market where silicon photovoltaics, despite their cheapness and performance, are not the most appropriate due to their dull appearance and heaviness," said the paper's senior author Yip Hin-Lap, a professor of materials science and engineering at the South China University of Technology. "Instead, we can make organic photovoltaics into semi-transparent, lightweight, and colorful films that are perfect for turning windows into electricity generators and heat insulators."

To construct a prototype capable of simultaneously outputting electricity and preventing excessive heating, the researchers needed to perform a three-way balancing act between harvesting light for electricity generation, blocking it for heat insulation, and transmitting it as a window normally would. They put together a device that let the familiar visible portions of sunlight through, turned back the infrared light, and converted the near-infrared region in-between into an electric current.

In theory, installing windows outfitted with dual electricity-generating and heat-insulating properties could cut an average household's reliance on external electric sources by over 50 percent. These dual-function materials are still very much in their infancy, but the authors expect them to pave the way to new beneficial technologies.

<http://www.xinhuanet.com>

Synthesis of liquid solar fuel

Chinese researchers have successfully increased the scale of synthesizing liquid solar fuel, taking a step forward to boost the use and output of renewable energy in the country. Researchers with the Dalian Institute of Chemical Physics under the Chinese Academy of Sciences divided the synthesis process of the liquid solar fuel into two steps: generating hydrogen

decomposed from water by solar energy and making liquid fuel via carbon dioxide hydrogenation.

A 1,000-tonne industrialization of liquid solar fuel synthesis project has been launched in Lanzhou, capital city of north-west China's Gansu Province.

Liquid solar fuel is transformed and synthesised from carbon dioxide and water, using solar energy as the sole energy supply. The synthesis process provides clean fuel, as well as utilizing greenhouse gases.

<http://www.xinhuanet.com>

INDIA

Concentrated solar energy to produce hydrogen fuel

Researchers from the Indian Institute of Technology Bombay have begun a new study that is focused on determining the economic feasibility of solar-driven electrolysis used to produce hydrogen fuel. The study is meant to provide a framework for how solar hydrogen production could be used in an economically viable manner. Hydrogen has gained some popularity in India in recent years, but still has significantly less support than other forms of clean power and conventional fossil-fuels.

The research team has conducted an economic analysis of an electrolyzer, which is powered by a concentrated solar energy system. This concentrated solar energy system allows for high-temperature steam electrolysis. Researchers also calculated the levelized cost of hydrogen fuel. Researchers discovered that the high-temperature steam electrolysis process is 3% more efficient than typical photovoltaic electrolysis. There was also a drop of approximately \$4 in the overall cost of hydrogen fuel.

Finding more efficient ways to produce hydrogen fuel has become a major priority. Researchers throughout the world have begun experimenting with renewable energy in order to make hydrogen a more viable form of clean power. Solar has, thus far, proven to be the most promising option. By using renewable energy, such as concentrated solar energy, researchers believe that hydrogen production will no

longer be reliant on fossil-fuels or conventional steam reformation.

India is home to a robust solar market, where many promising projects have taken form over the years. The Indian government is eager to replace fossil-fuels with clean power and hydrogen may go a long way in making the country's transportation space more environmentally friendly. Fuel cell vehicles have begun to gain traction in China and other parts of Asia, and they will soon begin to establish a presence in India. In order to ensure that these vehicles are successful, India has been working to bolster its hydrogen production capabilities.

<http://www.hydrogenfuelnews.com>

Solar powered system to convert plastic into fuel

Scientists from Indian Institute of Technology (IIT) Madras have developed a solar powered system to convert non-recyclable plastic into fuel that can substitute diesel used in generators, furnaces and engines. The technology - which consists of a mobile unit that can collect and process waste - currently yields around 0.7 litres of fuel oil per kilogramme of plastic, researchers said.

"India produces approximately 15,000 tonnes of plastic waste in a day. Centralised systems for plastic waste management cannot work to effectively deal with this much plastic waste on a daily basis," said Ramya Selvaraj, a research student at the IIT Madras in Tamil Nadu. "We thought that if the plastic can't come to the industry, let the industry come to the plastic," Selvaraj said.

The conversion of plastic to fuel involves a process called pyrolysis - a thermochemical treatment that exposes the material to high temperature in the absence of oxygen, leading it to go through physical and chemical changes. This creates a low density fuel oil by breaking down the polymer chain of plastic at the temperature of 350- 500 degrees Celsius. This oil can be used as a substitute for diesel to power generators, furnaces and engines.

"Our major proposition was instead of taking technology to waste, taking all the waste to a decentralised technology

which is a very complex model in solid waste management," said Aravind E S, a research student at IIT Madras. "We found that the current plastic waste management systems were not working because of the logistics involved; there were cost and space requirements that could not be met," Selvaraj added.

The team was led by Divya Priya, assisted by technical guide Professor Indumathi Nambi of IIT Madras, and industrial mentor Sriram Narasimhan of Samridhi Foundation, a Chennai based NGO.

<https://energy.economictimes.indiatimes.com>

Clean energy from Sunn Hemp

Researchers at the Indian Institute of Technology (IIT) Kharagpur have tapped microwave radiation to create clean energy for large-scale use from nitrogen-rich non-food Sunn Hemp plants. The IIT Kharagpur Bioenergy Lab team was led by Prof. Saikat Chakraborty, faculty at the Department of Chemical Engineering and P K Sinha Center for Bioenergy and researcher Souvik Kumar Paul, an IIT Kharagpur student said. High-energy non-edible plant sources such as Sunn Hemp have the potential of making available biofuel on a large scale, as a replacement of fossil fuel.

The team successfully converted the non-edible lignocellulosic fibres (plant dry matter) of Sunn Hemp to biofuel precursors, an alternative to land-based crops for biofuels, the statement said. The entire conversion, which otherwise takes 8-10 hours, took 46 minutes to be completed by using the microwave reactors in the lab, the statement said. Sunn Hemp is widely grown in the sub-tropical regions of Bangladesh, Brazil, India, Pakistan, Russia, Sri Lanka, the US and Uganda.

The scientists have filed for a patent and their findings have appeared in the globally renowned journal *Bioresource Technology* published by *Elsevier*.

<https://www.financialexpress.com>

REPUBLIC OF KOREA

Energy storage device

A research team at the Korean Advanced Institute of Science and Technology

(KAIST) has developed an energy storage device that can operate after only 30 seconds of charging. The new hybrid energy storage device utilises aqueous electrolytes instead of flammable organic solvents making it environmentally friendly and safe. It can also be used with portable electronic devices as it facilitates a boosting charge with high energy density.

The device was developed by Professor Jeung Ku Kang and a team of scientists from KAIST's Graduate School of Energy, Environment, Water, and Sustainability. The team assembled fibre-like polymer chain anodes and sub-nanoscale metal oxide cathodes on graphene to develop a hybrid energy storage with high energy and power densities. Conventional aqueous electrolyte-based energy storage devices have a limitation for boosting charges and high energy density due to low driving voltage and a shortage of anode materials. The research team came up with new structures and materials to facilitate rapid speed in energy exchange on the surfaces of the electrodes and minimise the energy loss between the two electrodes. Anodes were made with graphene-based polymer chain materials, graphene having a web-like structure that produces a high surface area, thereby allowing higher capacitance.

With regard to cathodes, the team used metal oxide in sub-nanoscale structures to elevate atom-by-ion redox reactions. This method realized higher energy density and faster energy exchange while minimizing energy loss. The device can be charged within 20 to 30 seconds using a low-power charging system, such as a USB switching charger or a flexible photovoltaic cell. The developed aqueous hybrid energy device shows more than 100-fold higher power density compared to conventional aqueous batteries and can be rapidly recharged. Further, the device showed high stability with its capacity maintained at 100 percent at a high charge/discharge current.

The research, led by a PhD candidate Il Woo Ock, was published in *Advanced Energy Materials* on January 15th.

<https://www.renewableenergymagazine.com>

SINGAPORE

Cheaper technique for biofuel production

A team of engineers from the National University of Singapore (NUS) recently discovered that a naturally occurring bacterium, *Thermoanaerobacterium thermosaccharolyticum* TG57, isolated from waste generated after harvesting mushrooms, is capable of directly converting cellulose, a plant-based material, to biobutanol. A research team led by Associate Professor He Jianzhong from the Department of Civil and Environmental Engineering at NUS Faculty of Engineering first discovered the novel TG57 strain in 2015. They went on to culture the strain to examine its properties.

Assoc Prof He explained, "The production of biofuels using non-food feedstocks can improve sustainability and reduce costs greatly. In our study, we demonstrated a novel method of directly converting cellulose to biobutanol using the novel TG57 strain. This is a major breakthrough in metabolic engineering and exhibits a foundational milestone in sustainable and cost-effective production of renewable biofuels and chemicals."

Traditional biofuels are produced from food crops. This approach is highly costly and competes with food production in the use of land, water, energy and other environmental resources. Biofuels produced from unprocessed cellulosic materials such as plant biomass, as well as agriculture, horticultural and organic waste, are expected to meet growing energy demands without increasing greenhouse gas emissions resulting from the burning of fossil fuels. These cellulosic materials are in great abundance, environmentally friendly, and economically sustainable.

Among various types of biofuels, biobutanol offers a great promise as petrol substitute because of its high energy density and superior properties. It can directly replace gasoline in car engines without any modification. However, commercial production of biobutanol has been hampered by the lack of potent microbes capable of converting cellulosic biomass into

biofuels. The current technique is costly and also requires complicated chemical pre-treatment.

The novel technique developed by the NUS team could potentially be a game-changing technology for cost effective and sustainable biofuel production. Spent mushroom compost, typically composed of wheat straw and saw dust, is the residual compost waste generated by mushroom farming. The microorganisms in the waste are left to evolve naturally for more than two years to obtain the unique TG57 strain.

The fermentation process is simple, and no complicated pre-treatment or genetic modification of the microorganisms is required. When cellulose is added, the bacterium simply digests it to produce butanol as the main product. Moving forward, the research team will continue to optimise the performance of the TG57 strain, and further engineer it to enhance biobutanol ratio and yield using molecular genetic tools.

<https://phys.org>

EUROPE

FINLAND

Biofuel breakthrough

A research group from the University of Turku, Finland, has discovered an efficient way for transforming solar energy into the chemical energy of biohydrogen through the photosynthesis of green algae that function as cell factories. Molecular hydrogen is regarded as one of the most promising energy carriers due to its high energy density and clean, carbon-free use.

The leader of the research group, Yagut Allahverdiyeva-Rinne, Associate Professor of Molecular Plant Biology at the University of Turku said, "When algal cells are first incubated under anaerobic conditions in the dark and then exposed to light, they start producing hydrogen efficiently, but unfortunately only for a few seconds."

The researchers at the University of Turku decided to apply the knowledge retrieved from the basic research on the photosynthesis of algae and established a new method for producing hydrogen that does

not expose green algae to additional nutritional starvation and, thus, without applying any significant stress to the cells. The team's research paper has been published in the journal *Energy & Environmental Science*. The researchers showed that the production of hydrogen could be significantly extended by simply exposing the anaerobic algal cultures to a train of strong yet short light pulses, which are interrupted by longer dark periods.

"Under these conditions, algal cultures exposed to sunlight do not accumulate oxygen in the medium. In addition, algae steer the electrons resulting from the decomposition of water and charged by sunlight into hydrogen production instead of biomass accumulation. The process lasts for, at least, several days and the maximum rate of the production of hydrogen occurs during the first eight hours," Kosourov said. The research indicated clearly that a major obstacle to efficient hydrogen production is not oxygen but a strong competition between two metabolic pathways: carbon dioxide fixation leading to the biomass accumulation and the hydrogenase enzyme catalyzing photoproduction of hydrogen.

The new method developed by the researchers is valuable both for the basic research of the photosynthesis of algae and for the research and development work of the industrial sector when producing new technologies for the large-scale production of carbon neutral biofuels.

<https://oilprice.com>

UK

Technique for more efficient solar energy

Scientists from the University of Exeter have developed a method that has the potential to harvest three times more photovoltaic (PV) energy compared with traditional systems by funnelling the energy more efficiently, the university said. The technique "funnels" the sun's energy directly into power cells, such as solar panels or batteries. "The idea is similar to pouring a liquid into a container, as we all know it is much more efficient if we use a funnel," said Adolfo De Sanctis, lead au-

thor of the paper. "However, such charge funnels cannot be realised with conventional semiconductors and only the recent discovery of atomically thin materials has enabled this discovery," De Sanctis added.

According to the researchers, the innovation could lead to solar panels that have the size of a book and can power a family-sized house. The announcement says that the new technique has the potential to convert around 60% of the sun's energy into electricity, compared to around 20% for the current solar cells.

The scientists devised a method to "funnel" electrical charge onto a chip. They used the atomically thin semiconductor hafnium disulphide (HfS₂), oxidized with a high-intensity UV laser, to engineer an electric field that funnels electrical charges to a specific area of the chip, where they can be more easily extracted.

<https://renewablesnow.com>

NORTH AMERICA

CANADA

Better fuel from biowaste

Researchers have found a way to produce a higher quality, more stable fuel from biowaste, such as sewage, that is simpler and cleaner than existing methods. "This puts biofuel closer to being a good substitute for fossil fuels," said Hua Song, an associate professor of chemical and petroleum engineering at the University of Calgary.

Song and his research team recently published the results of their research conducted at the Canadian Light Source in the journal *Fuel*. "The world energy market is currently dominated by fossil fuels. With increasing concern surrounding climate change and dwindling resources that are associated with the use of fossil fuels, renewable energy sources are becoming increasingly desirable and are currently the fast growing energy source," wrote Song in the research paper.

Currently, biowaste is converted into biofuel in a complex two-step process.

The biomass is first converted into a biocrude oil using a chemical and thermal process. Crude oil, in general, is oil that

has not yet been refined and still contains impurities. The second stage is a form of refining in which hydrogen is added under high pressure and heat, and serves to remove contaminants such as sulfur, nitrogen and oxygen. However, hydrogen is expensive, the two stages are energy intensive, and carbon waste is left in the form of char and CO₂ emissions.

A process to reduce reliance on fossil fuels that still produces the harmful greenhouse gas is counterproductive. Song and his team set out to simplify the conversion process in a way that is sustainable, cost-effective, and clean. "In our work, we've developed a process which simultaneously produces and upgrades bio-oil in one step and without the need for high pressures," says Song.

The researchers used methane instead of hydrogen for the purification process and they used it directly in the crude stage, but they had to chemically remove the hydrogen from the methane during the purification process since hydrogen is still needed to remove impurities. Using the CLS, they developed a novel catalyst that reacted with methane to trigger it to release hydrogen. They were faced with a challenge because methane is a very stable compound that doesn't react with many other compounds.

The researchers call the catalyst they developed HZSM-5. To improve its ability to react with methane, they coated the surface of several samples of HZSM-5 with different materials. They then analyzed the samples and studied the surface features using the bright light of the synchrotron.

Initial studies using the catalyst in this new approach for producing biofuels show it is more efficient and has lower potential production costs than the current method. As well, carbon remains in the oil in liquid form which leads to a better quality biofuel that is more stable with significantly less greenhouse gas emissions.

<http://biomassmagazine.com>

Methanation technology

Researchers at the University of Waterloo are developing technology to produce renewable natural gas (RNG) from manure

so it can be added to the existing energy supply system for heating homes and powering industries. That would eliminate particularly harmful gases released by naturally decomposing manure when it is spread on farm fields as fertilizer and partially replace fossil natural gas, a significant contributor to global warming.

"There are multiple ways we can benefit from this single approach," said David Simakov, a professor of chemical engineering at Waterloo. "The potential is huge." Simakov said the technology could be viable with several kinds of manure, particularly cow and pig manure, as well as at landfill sites.

To test the concept, researchers built a computer model of an actual 2,000-head dairy farm in Ontario that collects manure and converts it into biogas in an anaerobic digesters. Some of that biogas is already used to produce electricity by burning it in generators, reducing the environmental impact of manure while also yielding about 30 to 40 percent of its energy potential.

Researchers want to take those benefits a significant step further by upgrading, or converting, biogas from manure into renewable natural gas. That would involve mixing it with hydrogen, then running it through a catalytic converter. A chemical reaction in the converter would produce methane from carbon dioxide in the biogas.

Known as methanation, the process would require electricity to produce hydrogen, but that power could be generated on-site by renewable wind or solar systems, or taken from the electrical grid at times of low demand. The net result would be renewable natural gas that yields almost all of manure's energy potential and also efficiently stores electricity, but has only a fraction of the greenhouse gas impact of manure used as fertilizer.

The modelling study showed that a \$5-million investment in a methanation system at the Ontario farm would, with government price subsidies for renewable natural gas, have about a five-year payback period. A paper on modelling of a renewable natural gas generation facility at the Ontario farm, which also involved a

involved a post-doctoral researcher and several Waterloo students, was recently published in the *International Journal of Energy Research*.

<http://biomassmagazine.com>

Bacteria-powered solar cell

Researchers at the University of British Columbia (UBC) have developed a solar cell that uses bacteria to convert light to energy, generating electricity efficiently even in dimmed light conditions. These 'biogenic' solar cells could become just as efficient as synthetic cells used in conventional solar panels, with further development that is.

"Our solution to a uniquely B.C. problem is a significant step toward making solar energy more economical" said Vikramaditya Yadav, lead researcher on the project and a professor in UBC's department of chemical and biological engineering. "These hybrid materials that we are developing can be manufactured economically and sustainably, and, with sufficient optimisation, could perform at comparable efficiencies as conventional solar cells."

Previous attempts to develop biogenic solar cells have focused on the extraction of a natural dye that bacteria use for photosynthesis. However, this is a costly and complex process that involves the use of toxic solvents and which can also cause the dye to degrade. The UBC researchers have instead chosen to use the bacteria directly, genetically engineering *e.coli* to produce lycopene, a substance that produces the red-orange colour in tomatoes and which is particularly effective at harvesting light for energy conversion.

The researchers coated the bacteria with a mineral that could potentially be used as a semi-conductor. The mixture was then applied to a glass surface, which then acts as an anode. The solar cell subsequently generated a current density of 0.686 milliamps per square centimetre - an improvement on the 0.362 achieved by others in the field.

The researchers are hoping they can find a way in which the dye can be produced indefinitely, without killing the bacteria.

The research has been published in the most recent edition of the journal *Small*.

<https://www.renewableenergymagazine.com>

USA

Water-based battery

Researchers at the Stanford University have developed a water-based battery that could provide a cheap way to store wind or solar energy generated when the sun is shining and the wind is blowing so it can be fed back into the electric grid and be redistributed when the demand is high. The battery uses a cheap industrial salt—manganese sulphate—to go through the chemical process which stores the excess energy in form of hydrogen gas.

"What we've done is thrown a special salt into water, dropped in an electrode, and created a reversible chemical reaction that stores electrons in the form of hydrogen gas," Yi Cui, professor of materials science at Stanford and senior author on the research paper, [explained](#) the project. He added that manganese-hydrogen battery technology could be one of the missing pieces in the energy puzzle – a way to store unpredictable wind or solar energy so as to lessen the need to burn reliable but carbon-emitting fossil fuels when the renewable sources aren't available.

The team which developed the prototype of the device attached a power source to the battery to mimic power fed by solar or wind energy. The electrons flowing in reacted with the manganese sulphate dissolved in the water to leave particles of manganese dioxide clinging to the electrodes. Excess electrons bubbled off as hydrogen gas, thus storing that energy for future use.

The researchers re-attached device's power source to the depleted prototype, this time with the goal of inducing the manganese dioxide particles clinging to the electrode to combine with water, replenishing the manganese sulfate salt. Once this salt was restored, incoming electrons became surplus, and excess power could bubble off as hydrogen gas, in a process that can be repeated again and again.

Though, currently, the prototype is just three inches tall and generates a mere 20 milliwatt-hours of electricity, around the same as LED flashlights that hang on a key ring, the researchers said that it can be easily scaled to an industrial-grade system that could charge and recharge up to 10,000 times, creating a grid-scale battery with a useful lifespan in excess of a decade. Cui estimated that, given the water-based battery's expected lifespan, it would cost a penny to store enough electricity to power a 100-watt lightbulb for twelve hours. The device is specifically developed to tap the variability of renewable energy sources—sunlight and wind—and, can also form as a backup against demand surge our outages.

<https://www.moneycontrol.com>

Graphene-enhanced biophotovoltaic technology

Researchers at UC Riverside are attempting to integrate biological components with photovoltaic cells to deliver fully sustainable solar energy. The team's biophotovoltaic device is built from renewable carbon by integrating graphene hybrids and the phototropic protein bacteriorhodopsin.

A biophotovoltaic cell integrates biological materials as functional elements in the solar cell. Instead of silicon, the researchers use the protein bacteriorhodopsin, found in halobacteria from salty lakes, as the component that captures sunlight in the device. Halobacteria are an ancient group of microbes that live in water too salty to sustain most other forms of life. They produce a purple protein called bacteriorhodopsin that absorbs energy from sunlight and uses it to transport protons, along with their electrical charge, as an energy source that sustains the organism's biological functions.

Bacteriorhodopsin offers a potentially more environmentally friendly and effective alternative to silicon because it naturally converts solar radiation into electricity and can be produced with very little environmental impact.

<https://www.graphene-info.com>

FINANCING INNOVATION IN THE ASIA-PACIFIC

CHALLENGES AND ENABLING MECHANISMS

KyungJin Hyung

Deputy Director
Korea Technology Finance Corporation,
B-901, Gongjak APT Yeoidaero 6 Gil 17
Youngdungpogu, Seoul, Republic of Korea (07336)
Tel: +82-10-5608-8500, 82-70-4110-8700
E-mail: dukehyung@gmail.com

Abstract

Many Asia-Pacific economies have adopted policy initiatives and programmes to facilitate financing for firm-level innovations. The impact of such policies and programmes, however, varies from country to country which can be attributed to many factors. The policy makers need to understand that different type of innovations need to be aligned with different types of financing mechanisms. The policy makers need to be aware of their national context and set up clear directions before adopting financing schemes that have been successful in the developed economies. This paper provides insights into some of the enabling mechanisms and practices for financing innovation, particularly in the context of Asia-Pacific countries.

Introduction

It is a globally shared view that fostering environment that enables firm-level innovation, especially for Small and Medium sized Enterprises (SMEs) and startups is crucial in the current and emerging knowledge-based as well as Intellectual Property (IP) based economy.

In order to create such enabling circumstances, governments in the Asia-Pacific region are putting lot of efforts mimicking policies and programmes which have been proved to be successful in different countries, leading to policy convergence. For example, we could easily see accelerators in almost every country in the region now. Every government emphasizes on enhancing venture capital in the country as a critical element to facilitate financing for innovation. The impact of such policies and programs, however, varies from country to country.

With this paper, the author intends to offer some observatory remarks and opinions as a person who has worked in

the domain of innovation financing for the last 16 years in the Republic of Korea and have extensively participated in helping developing countries in the region such as Viet Nam and Thailand in creating enabling mechanisms for financing innovation through Knowledge Sharing Program (KSP) between 2013 and 2016. The author's view does not necessarily represent the perspective of the organization that he belongs to.

Different types of innovation require different financing mechanisms

Differences in the types of innovations often fail to get enough policy attention, leading to a failure in aligning proper financing scheme for each different type of innovation.

Financing innovation is known to be different from financing other types of business activities due to its inherent difficulty from financiers' perspective in understanding the uncertainty that is dif-

ferent from typical financial risk, which can be tackled in large part through sufficient market discipline followed by a systemic know-how of standardized evaluation. Thus, many policy makers are tempted to jump into the conclusion that venture capital (VC) is the most suitable enabling financial mechanism for financing innovation in general.

This belief is further enhanced through the theory of Death Valley, in which firms generate negative cash flow while growing rapidly and cannot bear the burden of paying back bank interest, in addition to cash outflow. Therefore, equity financing is best suited for the task (or for the job).

Bank lending, on the other hand, is often regarded inappropriate in financing innovation because the pay-off structure of loan is not adequate; composing high risk portfolio is inherently difficult because of the maximum revenue that is limited to principal and interest even in the case of big success of borrowers.

However, this is a good supporting argument only when we deal with disruptive innovation. There are several different types of innovation that deserve attention with equal importance.

The types of innovation that the author understood¹ out of the dynamic learning from financing more than 300 innovative ventures in the Republic of Korea with both debt guarantee and equity are as follows:

- **Experimental innovation:** An exploration research and development (R&D) that is often conducted by universities and research institutes or some small startups testing the new idea of doing it differently from status quo.
- **Sustaining innovation:** An incremental innovation to make existing products or services improved with higher value added, functions, up-

¹ Theoretical Basis of Author's understanding in different types of innovation came from a series of Harvard Business Review articles written by Clayton Christensen

dates and additional features mostly executed by already established firms or entrepreneurs who are former employees, often in the R&D division, of the well-established firms tend to be a little more aggressive and risk taking than when he was with the previous firm.

- **Efficiency improving innovation:** Innovation that is mostly established by firms that leads to the improvement of the existing process often regarded as enabling and doing more with less resources.
- **Market-creating innovation:** Radical and disruptive technology or a business model innovation that aims to create a new market. This type of innovation is mostly new to the world, rather than new to the firm.

Experimental innovation is important and deserves the quantitative support because it sets basis, direction and a tone for the entire innovation ecosystem. Countries can choose the direction by priority area depending on their own strategy. For example, a country may choose to pursue a staged advancement in a certain prioritized technology sector with the goal of eventually having a solid ground for the field in the nation in which it can be time-consuming. However, it will probably be more fruitful in the long run. The other country may choose not to build from scratch, but promote R&D that can be readily commercialized, centering on creative applications.

This type of innovation goes well with grants and concessionary loans by public financial institutions that finance projects in policy-prioritized sectors with potential above zero net present value (NPV). This requires appropriate policy framework for tolerating failure and rewarding long term success. Some of the outcomes later would become attractive investment objects when uncertainty at the early stage is cleared and concept is proved successful. Before such a stage, ushering and pushing VCs and banks to those innovations to invest or lend would not work.

Important element in this type of innovation domain is to have a highly dedicat-

ed public financial institution that not only renders public financial resources, but also translates the knowledge and information earned out of evaluating such projects to financiers in the language of financiers at a stage where promising business potential is demonstrated.

Incremental innovation that includes sustaining innovation and efficiency-improving innovation should be addressed with bank lending because cash flow out of such innovation is relatively predictable. VCs may not feel attracted with this type of innovation because most of the incremental ones carried out by SMEs are not scalable while it allows SMEs to survive and thrive to a certain degree.

Big firms may leverage internal source of capital or direct financing from capital market for this type of innovation. Government policy therefore should be directed towards making banks to adapt to the practice and get familiarized. Developing countries in the Asia-Pacific region, however, may lack in the necessary skill set for the practice of lending based on cash flow projection. Also, many commercial banks are not capable of differentiating between experimental innovation and incremental innovation.

In this case, the government should establish or appoint a specialized institution to interpret the bankability of the innovation, characteristics and a potential cash flow projection. This valuable communication mechanism often in the form of certificate should go together with a strong policy drive and active risk mitigation mechanisms such as partial credit enhancement.

Intellectual Property (IP) financing, pledging IPs as collateral for bank lending, also go well with this type of innovation. To foster IP-backed banking, enabling mechanisms should be prepared in a more multidimensional manner. First of all, there needs to be *inter alia* a specialized institution that can effectively translate the commercialization value of IPs in terms of banking at reasonable cost, not just patent specialists who tell only how solidly the IP is written and how well the IP will protect the invention down the road. IP financing for SMEs

are more in the nature of cashflow-based lending rather than collateral-based lending. Therefore, the same risk mitigation mechanism as credit enhancement is necessary.

Although IPs can be taken as collateral, we cannot expect them to have the same liquidation potential as tangible assets at the point of borrowers' default. Most of the countries in the Asia-Pacific region lack in the capacity of secondary market for IPs. The creation of IP recollection mechanism which ensures purchasing of collateralized IPs from banks in case of borrowers' default can be another form of enabling mechanism. However, from the perspective of disciplining bankers to be familiarized with the practice, risk sharing mechanism in terms of both reducing information asymmetry and partial credit enhancement upfront would be a better solution rather than practicing guaranteed purchase of IPs with the accrued loan amount in case of default.

Despite the degree of development in terms of IP infrastructure and whether or not the country has a critical mass of qualified IPs for commercialization, it is important to get banks disciplined to prepare for ongoing IP based economy. Placing policy favors on IP financing will also lead innovators to habitually think of registering their ideas into the legitimate form of properties, which contributes to the increase of good IPs in the country. During the due course of nurturing the environment, we should not expect that the mechanism would work exactly the same as in a few advanced economies where bankable IPs are relatively abundant with the long history of facilitating IP generations.

Especially at the early stage of developing IP financing, without the right set of support mechanisms, it will be next to impossible to convince bankers to adapt themselves to the practice of IP financing even in a highly selective and gradual manner.

When aiming for big disruptive innovations that may lead to the birth of unicorns, often times neither the innovator nor the financier knows the true potential of such projects although innovators

may still know a little more about it.² The only way to learn about the true potential of such projects may be to invest in it. In addition, such big innovations tend to not have a foreseeable distribution in return generation.

With these reasons, venture capitals and financial entities known to have a specialized risk appetite for high risk and high return, are the pertinent entities to finance such innovations.

Venture capitals are important entities in fostering scalable innovative business ventures. However, relaxing regulations and providing fund of funds scheme for VCs are not enough. Before considering the fostering of VCs with government resources, policy makers should ask whether the country has or can connect to a well-developed capital market. Without existence of well-developed capital market, VCs may find it extremely difficult in finding a room for exit. Israel's Yozma fund scheme was successful because it considered, from the beginning, connecting their successful ventures to the capital market and M&A opportunities in the United States.

Most the countries in the Asian and Pacific region lack in the capacity of capital market backing innovation. If the governments in such countries target the cultivation of big innovations and unicorns by supporting VCs, equipping them with capital source is not sufficient. It has to consider building pipelines to the advanced country capital market, such as Singapore, Hong Kong, and Tokyo. Recently, KOSDAQ market in Republic of Korea has been quite keen in inviting promising foreign firms.

The process of doing so requires a great deal of cross-border program coordination including borrowing the capacity of experienced foreign investment and investor relations (IR) professionals. Although such capability can be well imported with the right incentive alignment, having a specialized institution which can select and communicate promising technology ventures, would still be necessary. VCs are generally good at identifying great entrepreneurs and innovative business models, capability of which can be

earned relatively quickly; however, VCs in developing economies are often so nascent in identifying potentially disruptive technologies.

Precautions in the art of benchmarking

Benchmarking is an important part of strategy. Examining successful practices elsewhere enables us to quickly catch up with the new concept and to gain vivid impetus to the policy initiatives.

Nevertheless, benchmarking is a mid-point not the endpoint. Meticulous ex ante analysis considering different contexts and surrounding should be conducted before bringing in new concept originated from foreign countries first of all because what was successful in one economy can be manifested into different outcomes.

For advanced economies, innovation policies involve analyzing plenty of existing information. They can draw on prior experience on multiple fronts. In contrast, emerging economies cannot afford to engage in extensive research in their context.

Even in such situation, the introduction of a new concept in a timely manner is imperative; however, without thorough examination of the current condition, sensible planning on execution time span in staged manner and pertinent resource allocation to each stage, it will lead to significant resource waste, which may not be discovered in the short run.

In many cases, it takes a while to realize whether a benchmarked program was set up to fail because it tends to keep going so long as resource is funneled into it. To make matters worse, once a system is established on poor design, the undesired impact would silently persist, growing its own path dependence only to be noticed after some time passes.

Secondly, new concept should be piloted in a small scale. Piloting is learning by testing that enables elaborate design of the mechanism that actually works. There is no easy and safe path to pursue in the building of enabling mechanism. Before experimenting in small scale, we can hardly see how the effect of one action would

be interconnected with other elements in the whole mechanism. It is tempting for the policy makers to come up with grand program that pushes for a new concept in large scale; however, change is not an event, but a process. Successful policy requires the ability to abandon or amend poorly performing pilots, but also capitalize on successful ones. The programs can be scaled up by drawing lessons from export examination of pilot experimentation.

Beware of agency cost

When considering complementation of the capacity of financiers in terms of reducing uncertainties, it is easy for policy makers to entrust third party experts in the market to act on its behalf especially in this era in which private sector is blindly believed to be more efficient than the public sector institution.

However, policy makers should firstly ensure whether the agency will be always acting in their best interests. Especially when hiring small size private sector experts who are often driven by short term revenue maximization rather than sustainable profit by preserving reputation on reliability, performance assessment and incentive mechanism should be carefully designed considering all possible scenarios. If they are deemed as uncontrollable or prohibitively expensive to hire, establishing a specialty public institution under the direct control of the government may be a better choice in spite of the burden associated with it.

In most of the developing economies, public sector institutions can mobilize qualified talents with non-monetary incentives such as honor, social prestige, great learning opportunities, and other sort of intrinsic motivation. Thus, creating capable public institution may be more cost effective in some cases.

Conclusion

Facilitating firm-level innovation is important for decent job creation, business competitiveness and economic growth. Fostering financing of innovation plays a pivotal role in such initiatives.

² William R. Kerr & Ramana Nanda, Financing Innovation, Working Paper 15-034, Nov 5, 2014

When it comes to financing innovation, policy makers should firstly understand that there are different types of innovation, each of which is suited with different forms of financing. This means that they need to precisely know the nature of innovation they are pushing for. Misaligning primary financing scheme with targeted sort of innovation would lead to resource waste with only a fraction of the desired outcome at best. It is also important to understand that VCs are not cure-all.

Also, seemingly attractive schemes that proved to be successful in other countries would probably be manifested into a different extent due to different condition and context. For a policy to be far-reaching,

policy makers need to be aware that their hot spot can be different from sweet spot known in the different economies with different context. Rather than pursuing à la carte combination of policy choices benchmarked from here and there, policy makers need to set a clear direction with well-defined sort of targeted innovation first and then consider various options in comprehensive and harmonious manner.

Lastly, financial resource allocation to promote schemes and programs that enable effective financing of innovation should go contemporaneously with the right set of capacity supplementation for the major financing entities. Simply pushing by pouring money with poorly designed

supplementary mechanism would not lead to the desired action of the financiers.

Luckily, we are living in a world where knowledge and skills can easily be transferred to be adaptable in the local context through various sharing and assistance mechanisms. The Knowledge Sharing Program (KSP) of Republic of Korea and capacity building programs of International organizations, including those of UNESCAP Asian and Pacific Center for Transfer of Technology, are there to help build such needed capacity in shorter period of time than when trying to build from scratch on your own. Information becomes knowledge only at the point of active seeking and learning. ■

WIPO GREEN

The Marketplace for Sustainable Technology

WIPO GREEN is an interactive marketplace that promotes innovation and diffusion of green technologies. It does this by connecting technology and service providers with those seeking innovative solutions. WIPO GREEN consists of an online database and network that brings together a wide range of players in the green technology innovation value chain, and connects owners of new technologies with individuals or companies who might be looking to commercialize, license or otherwise distribute a green technology. In this way, the database helps not only to accelerate innovation and diffusion of green technologies, but also contribute to the efforts of developing countries in addressing climate change.

WIPO GREEN contributes to green technology innovation and transfer by bringing together a wide range of technologies and players in the green technology innovation value chain. It connects owners of new technologies with individuals or companies looking to commercialize, license or otherwise access or distribute a green technology.

WIPO GREEN's database assembles in one place technologies at all stages of development, from upstream research to marketable products (and everything in between). These technologies are available for license, collaboration, joint ventures and sale. It therefore adds greater transparency to the market for green technology.

In addition to matchmaking via the database and Partner initiatives, from time to time WIPO GREEN organizes regional matchmaking projects focused on specific fields of technology. Through these matchmaking events, WIPO GREEN brings together providers and seekers of technologies and/or services as well as other facilitators and experts from the WIPO GREEN network and beyond. The WIPO GREEN Network facilitates commercial relationships and transactions by connecting green technology providers and seekers.

For more information, access:

<https://www3.wipo.int/wipogreen/en/>

BRIDGING THE 'GAP' – FUNDING SOLUTIONS FOR THE FUTURE

A MALAYSIA PERSPECTIVE

Rofina Yasmin Othman, Nurzatil Sharleeza Jalaluddin

Prof Dr Rofina Yasmin Othman
Associate Vice Chancellor (Industry and Community Networks)
Director, University Malaya Centre for Innovation & Commercialisation (UMCIC)
Level 5, Research Management Complex, University of Malaya 50603 Kuala Lumpur
Malaysia
Tel: +6037967 7352
E-mail: yasmin@um.edu.my

Dr. Nurzatil Sharleeza Mat Jalaluddin
Postdoctoral Research Fellow
University of Malaya Centre of Innovation & Commercialization (UMCIC) /Centre for
Research in Biotechnology for Agriculture (CEBAR), Malaysia
Tel: +603-7967 6990
E-mail: nurzatil@um.edu.my

Abstract

Financial support and market access are vital components of a nurturing innovation ecosystem. In Malaysia, local universities and research institutes are the champions of innovative ideas but their commercialization efforts are often hampered by both financial constraints for developing technology readiness and confined market access. This article reviews some of the efforts targeting pre-seed and seed funding, the majority of which are deployed by government venture agencies and ministries, and further describes existing programs offered to startups to connect these nascent ventures with strategic business partners. We also discuss the importance of the “incubator” model to shield these vulnerable ventures from market forces and present the emerging “accelerator” model that focuses on platforms for high potential technology entrepreneurs to develop their research into market-ready products.

Introduction

Small and medium enterprises (SMEs) have been globally acknowledged as the catalyst for economic growth and for providing much needed dynamic job creation. SMEs also play a significant role in shaping the trajectory of future technologies and the emergence of new industries. These SMEs, in particular the new technology-based firms and niche-strategy firms need technological innovations to stay competitive in their target markets. In Malaysia a recent report on the State of Household 2018 (Khazanah Research Institute, 2018) laments the lack of innovativeness of many new businesses, lagging behind similar entities in more developed economies with the survey revealing that from 2011 to 2017, only 16% of new businesses introduce new products amounting roughly half of those reported for

advanced countries such as the United States and the United Kingdom. At the startup phase in particular, SMEs have to overcome several challenges particularly if it does not have the necessary resources and expertise to develop, adopt or even adapt technological innovations. Hence, they have to build their technological competencies either through internal capabilities or by working with R&D partners such as universities or research institutes. For the latter new innovations are more often than not held up not by their lack of novelty but more on their technology state of commercial readiness. In general large-sized enterprises usually have a wider access to a range of financing options to finance their technological development. However, this is not always the case for small firms that typically have a more limited range of funding. The perennial problem for these new ventures is finding

investors who are risk-takers and willing to put their bets on nascent innovations that the expected return derived from an innovation is uncertain. On the other end of the spectrum universities and research institutes are often frustrated by their inability to move their technologies and innovations on to such firms as more often than not they still require funding to develop the technological readiness. Unfortunately the majority of professional investors seek to invest in a proven business model, or in ready to scale products, and this group of people often find new ventures commercially unattractive as deal flows hence the proverbial “gap”. The challenge in raising sufficient funds to develop new products or services led to the genesis of the dreaded sounding “Valley of Death”, a long standing almost clichéd metaphor that describes the divide between early stage R&D and market entry. The chasm exists due to insufficient funds being raised to bring a working prototype for a product or service to subsequent stages along the commercialization pipeline. Therefore a technology able to get through the chasm, would provide elements necessary to help small firms reduce the impact of the ‘valley of death’ and accelerate product development.

Bridging the gap: Malaysia's innovation ecosystem

Given the importance to lift the hurdles to overcome the gap, there is an urgent need to deploy different mechanisms targeting the very volatile pre-commercialization stage. The key elements in nurturing active innovation and entrepreneurship ecosystem in Malaysia have included the availability of pre-seed and seed funding, corporate and private sector involvement in the startup community, and facilitative programs, for example incubators and more recently accelerator programmes. These initiatives have enabled some technology transfer from universities and research institutions effectively moving their technologies up the value chain. And at the same time

complement internal innovations and scientific discoveries by early-stage ventures, thus helping the firms to grow and become more competitive in the market.

Pre-seed and seed funding

To establish the foundation of pre-seed and seed capital, nascent ventures typically secure funding support from various sources, such as donations, and personal loans from family, friends and banks. In addition, these firms also seek financial assistance from private and government supported venture capital firms, business angels as well as publicly funded research and commercialization grants. In Malaysia the majority of these grants have been provided to firms allied to universities and public research institutes, through mainly government backed funding, from institutions such as the Ministry of Finance, the Ministry of Education and the Ministry of Energy, Science, Technology, Environment and Climate Change (formerly known as the Ministry of Science, Technology and Innovation). One success story is the government venture agency Cradle Fund Sdn. Bhd. with a strong portfolio in Malaysia's entrepreneurial and commercialization ecosystem. It has helped fund more than 700 Malaysian high-tech start-ups, and recorded the highest commercialization rate amongst government grants. The agency currently offers Cradle Investment Programme (CIP) to assist seed stage entrepreneurs developing and commercializing their products (Cradle, 2018). Benefits of the grant goes beyond the financial support to include coaching and mentoring program, match making with potential investors and Cradle partners, and networking support. The program is specifically designed for ventures developing new technology-based products at the pre-seed stage with a conditional grant and value added assistance. The Malaysian Technology Development Corporation (MTDC) a government venture fund which last year celebrated its 25th year has also been active in technology ventures particularly since 2014, when it started focusing on investing in areas such as computing, robotics and automation. MTDC offers a full suite of facilitation services including seed stage funding through two matching grant

schemes namely its Commercialisation of Research & Development Fund (CRDF) and Technology Acquisition Fund (TAF) (MTDC, 2018). Another more recent player, Platcom Ventures manages an SME targeted fund, the high impact programme 2 (HIP2) specifically focusing on intergration and collaboration with Universities. In addition, the Ministry of Education, through its Department of Higher Education provides some early stage funding such as the MyLAB grant (MASTIC, 2017). The grant is open to scientists working in the public/private universities and research institutes, and who have successfully completed highly promising research findings or solutions in niche areas. The ultimate objective of the grant is to produce a completed and industry attractive product ready for commercialisation. An innovative programme known as the 'Demand-driven innovation project' by the Public Private Research Network or PPRN was also introduced by the Ministry in 2015 to facilitate and fund technology solutions by universities to small industry (PPRN, 2016). SMEs would pose their problem statements while universities would bid to solve them. The funds although restricted to small-scale funding for simple technological solutions, succeeded in creating the much needed bridge between the two, opening up new conversations for industry academia cooperation and closing some of the technology gaps between institutions of higher learning and small industry. Another ministry that has provided grants for commercialization of new products/technologies is the Ministry of Energy, Science, Technology, Environment and Climate Change with several grants offered such as the SMART Fund, Facilitation Fund and Inno Fund (MESTECC, 2018). The SMART fund, also known as SMART Challenge Fund, was offered to eligible SMEs and government organizations with a maximum amount of funding capped to RM 3 million for a duration of 24 months. In addition, SMEs may also apply for Facilitation Fund. The Fund aims at assisting SMEs to improve its product readiness, thus increasing the probability of surviving the Valley of Death. The quantum and duration of funding for Facilitation Fund was for RM500,000 and for 18 months.

While these examples are not exhaustive of the funding landscape in Malaysia, it gives an idea of the ecosystem that has been building up in the country. Nonetheless the amount of funding available still falls short of the ideal. R&D spend in Malaysia stands at only around 1.1% of GDP in 2015 (Khazanah Research Institute, 2018) with much of research spending by businesses carried out by bigger firms.

Connecting startups with the business world

Financial assistance aside, another crucial factor to help new ventures cross the gap is the need to boost their market presence and connect them with strategic business partners often a critical constraint for new startups with no track record. One initiative to address the need was an open innovation challenge platform, hosted by the Malaysian Global Innovation & Creativity Centre known as the Magic Activate Program (MaGIC ACTIVATE, 2017). This initiative provided support for startups/entrepreneurs to build their network, and further, to help firms refine their innovative product or solution by soliciting feedback from corporate innovators. The winners of this innovation challenge would receive the privilege to gain market access through the corporate sponsors and to increase their brand presence via media promotions. More such programmes offering proof of concept contracts would be a welcome form of facilitation for early stage companies needing to build their profiles. Another model for partnerships has been created through an initiative by the Collaborative Research in Engineering, Science & Technology or commonly known as CREST, a non-for-profit government-linked company focusing specifically on driving the growth of Malaysia's E&E industry (CREST, 2018). Besides facilitating collaborative market-driven research between industry and academia, CREST also nurtures future talents that are industry-ready, and initiates efforts that support commercialization of research outputs.

Shielding nascent ventures from market forces

Incubator programs are set up to shelter vulnerable nascent ventures from market

forces, and to nurture young businesses to grow stronger and become independent. Startup incubators provide necessary resources, such as physical spaces available on flexible terms and durations, advisory services and access to network. The business model adopted for incubators is typically by charging rental or membership fees to startup residents. This business model is perfectly suited for businesses that are not expected to scale rapidly. Additionally, the firms are entitled to receive financial support through various sources, either from government budget, or from venture capitals or angels. In some cases, the firms can use facilities in technology labs, which were set up to assist in undertaking further work relating to the early-stage prototype development.

In Malaysia, the government has largely championed the establishment of seed-stage technology incubators. The 'first' generation of startups in Malaysia were mainly involved in the ICT industry and these firms enjoyed great benefits in terms of basic facilities and business support. In later years, the incubator model was expanded from an earlier emphasis on supporting ICT firms to technology and non-technology ventures, operating in various sectors including advanced engineering and biotechnology. Several technology incubator programs have been established, in collaboration between government agencies and public universities, or by the universities themselves (Table 1).

Accelerating technology development

Accelerator programmes are dedicated to bridge the gap that leads to innovative ideas being stuck in the early stage of commercialization pipeline. Historically, accelerator programs were funded primarily by venture capitalists but the landscape has now changed with more large corporates and the public sector involved in supporting this type of program. Accelerators are seen as an ideal model to accelerate technological commercialization for research institutions and universities. These entities produce a growing number of commercially attractive research discoveries, but they

Table 1: *University-linked technology incubators in Malaysia

Technology incubators	Year set up	Number of firms	Technology focus
UPM-MTDC Technology Centre	1996	46	IT, multimedia
UKM-MTDC Smart Technology Centre	1999	17	Biotechnology, pharmaceuticals
UTM-MTDC Technology Innovation Centre One	2001	15	Advanced engineering, life sciences
UTM Technovation Park Incubator	2012	18	ICT, Oil & Gas, Engineering, Architecture
UMXcellerate/UM Innovation Incubator	2016	40	Nanotech, Oil & Gas, Physical Engineering, Life Science, ICT, IoT
UPM-Innohub	2013	36	Agriculture, Biotech, Foodtech, ICT, Engineering

*The list includes public universities only

Table 2: Similarities and differences between incubators and accelerators

Programs	Incubators	Accelerators
<i>Similarities</i>		
Mentoring, Business support.		
<i>Differences</i>		
Duration of program	Continuous, lack of fixed terms	Fixed, short-terms normally 3 months
Cohorts	No	Yes
Business model	Rental / fee-based	Equity investment, seed funding
Venture stage	Early	Early, or late
Support system	Human resource, legal support, technical facilities, physical space	Seminars, technical facilities

face difficulties to bring the technology forward. This is partly because of the lack of necessary skills, experiences and resources among academics and researchers. Other contributing factors include the absence of interest expressed by potential investors as well as the inadequate funding dedicated to fund the validation work.

Accelerator program works by cohorts of nascent entrepreneurs. In the beginning of every cycle, the program will sort

and select highly promising applications. The program will provide services to selected nascent entrepreneurs, helping them to define and build their products or services, identifying promising target markets, speeding up market interactions, and securing necessary capital and human resources. In particular, services often include prototype development, initial market testing, the business plan development, and investor pitch deck. In contrast with incubators, seed ac-

celerators more often adopt business model based on equity investments in startups. This approach means that, the primary focus of accelerators is businesses that will scale rapidly or fail quickly, thus maximizing resource efficiency. The output of accelerators is projected to be the fundable deal flows that many investors lament when looking at the technology pipeline of new innovations. Potential benefits received by accelerator applicants are similar to those offered by incubator programs. During the program, accelerators are given access to networking, training and mentorship opportunities to grow their businesses. For those working in technology-based fields, they will receive support in terms of lab spaces and specialized equipment to validate their work. The similarities and differences between incubators and accelerators are summarized in Table 2. One new programme in Malaysia will see the University of Malaya, Malaysia's premier higher education institution broadening its TTO (UMCIC 2018) mission to better integrate the university into the innovation ecosystem with the launching of its own accelerator programme UMXcelerate (UMX). UMX launchpads, wet and dry labs, innovation grants, and mentorship all aim to foster innovation transfer in a wide range of fields, along with of space available for start-ups in its incubator/accelerator in addition to providing access to the University's broad technical expertise and excellent core facilities.

In the final analysis, early stage technology innovations are no doubt considered as high risk for investors. Nevertheless facing up to the challenges of financing the technology gap or valley of death is both the obstacle as well as the goal shared by nascent ventures including startups, promising businesses and new entrepreneurs. In reality, the 'valley' tests the determination, commitment, courage and hard work of every innovator and entrepreneur. This is perhaps, the biggest differentiator between the real entrepreneurs and the wannabes. The typical observation in Malaysia and across the world is that many promising innovations and scientific discoveries die on its way from the ideation to the commercialization stage. Hence, providing a supportive ecosystem by all stakeholders, for these promising startups is vital to help them transition along the commercialization pipeline, thus increasing survival odds. While Malaysia has been very proactive in setting up the supporting ecosystem more needs to be done to unlock private investment into the innovation pipeline. Understanding the barriers to investment, creating new initiatives to set up funds for last mile development of innovations in niche technology areas and opening the market for these new innovations with good deal flows, will be part of this strategy. This will create the platform for opportunity-driven entrepreneurs who will be able to weather the cyclical uncertainties of the fast changing technological landscape and really help to shape the common future.

References

- ✓ Byrd, J., Herskowitz, O., Aloise, J., Nye, A., Rao, S., Reuther, K. (2017). University Technology Accelerators: Design Considerations and Emerging Best Practices. *Technology and Innovation*, 19, pp. 349 – 362.
- ✓ Cohen S.G., Hochberg, Y.V. (2014). Accelerating Startups: The Seed Accelerator Phenomenon. *SSRN Journal*, pp. 1 – 16.
- ✓ Cradle (2018). "<https://www.cradle.com.my/>"
- ✓ CREST (2018). "<http://crest.my/v2/>"
- ✓ MASTIC (2017), "<https://mastic.mestec.gov.my/en/sti-incentives-fund/malaysia-laboratories-academia-business-collaboration-mylab>
- ✓ Khazanah Research Institute (2018). Ng et al., 'The State of Households 2018: Different Realities'. https://www.krinstitute.org/publications-@-The_state_of_Households_2018_-_Different_realities.aspx
- ✓ MaGIC ACTIVATE (2017). <https://magi-cactivate.com/>
- ✓ MESTECC (2018). <http://www.mestec.gov.my/web/en/corporate-profile/about-us/>
- ✓ MTDC (2018) <https://www.mtdc.com.my/business-funding/>
- ✓ PPRN (2016) <http://www.pprn.moe.gov.my/portal/>
- ✓ UMCIC (2018) <http://umcic.um.edu.my> ■

ASEAN Activate

Malaysian Global Innovation & Creativity Centre (MaGIC) has forged a strategic partnership with 17 Southeast Asian entrepreneurship community builders; together with MaGIC these partners will form ASEAN Activate, an extension of the MaGIC Activate platform at a regional level.

ASEAN Activate is a new initiative from MaGIC's Corporate Entrepreneurship Responsibility (CER) arm that aims to create a concerted effort in helping Southeast Asia drive its innovation agenda forward. It aims to do so in four key ways: establishing a regional CER network; facilitating cross-border partnerships and deals; providing a regional market access for entrepreneurs and startups; and fostering a united ASEAN innovation ecosystem. Through ASEAN Activate, local activate partners will collaborate with MaGIC to run the Startup Corporate Innovation Challenge in their respective countries.

For more information, contact:

*Malaysian Global Innovation & Creativity Centre
Block 3730, Persiaran APEC,
63000 Cyberjaya, Malaysia.
Tel: +60 3 8324 4800
E-mail: enquiries@mymagic.my
Web: <https://mymagic.my/>*

Selected Innovation programmes and funds in Asia and the Pacific

ASIA-PACIFIC

UNDP Asia-Pacific Innovation Fund

<http://www.asia-pacific.undp.org/content/rbap/en/home/ourwork/development-impact/innovation/about-innovation-fund.html>

UNDP Asia-Pacific Innovation Fund was launched in early 2014 with the support of UNDP Innovation Facility. By signaling UNDP's strong commitment to innovation, the Fund has supported prototyping of new approaches to address various development challenges across the region. This has included new ways of looking at development problems, solutions outside of traditional project cycles, partnerships with non-traditional partners, and inclusive and collaborative engagement with citizens that enhances the reach and impact of our projects.

Through an iterative prototyping process, the Innovation Fund allows for rapid testing and improvement of proposed solutions through feedback loops, which raise the possibility for a fit solution and the impact thereof. It also encourages an inclusive and collaborative approach to project/program design and implementation, as the solutions are co-created with beneficiaries and stakeholders. Solutions that prove effective are given the support to be scaled up, in tandem with support for monitoring and communicating progress throughout.

ASEAN

ASEAN Science and Technology Innovation Fund

<http://astnet.asean.org/astif/>

The ASEAN Science and Technology Innovation Fund finances proposals that support the ASEAN Plan of Action on Science, Technology and Innovation (APASTI) 2016-2025. The APASTI 2016-2025 Vision is a science, technology and innovation-enabled ASEAN, which is innovative, competitive, vibrant, sustainable and economically integrated. The proposals should address the challenges and development gaps in the following areas:

1. Energy and water
2. Food and biotechnology
3. Biomedical and healthcare
4. Climate change adaptation and mitigation
5. ICT applications
6. Relevant enabling innovation for science and technology

INDIA

Atal Innovation Mission

<http://niti.gov.in/content/atal-innovation-mission-aim>

Atal Innovation Mission (AIM) including Self-Employment and Talent Utilization (SETU) is Government of India's endeavour to promote a culture of innovation and entrepreneurship. Its objective is to serve as a platform for promotion of world-class Innovation Hubs, Grand Challenges, Start-up businesses and other self-employment activities, particularly in technology driven areas.

The Atal Innovation Mission shall have two core functions:

- Entrepreneurship promotion through Self-Employment and Talent Utilization, wherein innovators would be supported and mentored to become successful entrepreneurs
- Innovation promotion: to provide a platform where innovative ideas are generated

Technology Incubation and Development of Entrepreneurs (TIDE)

<http://meity.gov.in/content/innovation-promotion>

The Department of Electronics and Information Technology (DeitY) is implementing a scheme titled "Technology Incubation and Development of Entrepreneurs (TIDE)". Initially launched in 2008 the scheme has been revised and extended till March 2017. As per the scheme provision, 27 centres are being supported at academic institutions across India. TIDE has a multipronged approach in diverse areas of Electronics, ICT and Management.

It aims to assist institutions of higher learning to strengthen their Technology Incubation Centers and enable young entrepreneurs to initiate technology startup companies for commercial exploitation of technologies developed by them. DeitY is providing financial and policy support for strengthening technology incubation activities on the premise that this would in the long run result in indigenous development of products and packages in the ICT sector.

Multiplier Grant Scheme (MGS)

<http://meity.gov.in/content/innovation-promotion>

The Department of Electronics and Information Technology (DeitY) is implementing Multiplier Grants Scheme (MGS). MGS aims to encourage collaborative R&D between industry and academics/ R&D institutions for development of products and packages. Under the scheme, if industry supports R&D for development of products that can be commercialized at institution level, then government will also provide financial support that is up to twice the amount provided by industry.

Aspire Fund

https://sidbi.in/Aspire_Fund.php

The Aspire fund provides support to various Angel / Venture Capital Funds (VCFs) for investing in start-ups / early stage enterprises in the areas of innovation, entrepreneurship, forward backward linkage with multiple value chain of manufacturing and service delivery, accelerator support in the agro-based Industry verticals and sectors which would galvanize the rural economy.

TIFAC-SRIJAN Scheme

https://sidbi.in/TIFAC_SIDBI_Revolving_Fund_for_Technology_Innovation_SRIJAN_Scheme.php

This programme aims at facilitating development, demonstration and commercialization of technology innovation projects pertaining to new product or process de-

velopment to encourage and promote development of capabilities in MSMEs to innovate and to bring high-risk innovations to the market for opening up opportunities for business linked with innovations. The programme supports MSMEs towards development, up-scaling, demonstration and commercialization of innovative technology based projects by providing developmental loans at flexible terms & interest rate to encourage / promote development / innovation of new technology / process / product and its commercialization.

MALAYSIA

Enterprise Innovation Fund (EIF)

<http://www.mprc.gov.my/finance/enterprise-innofund-eif>

Enterprise Innovation Fund is a grant scheme which funds the development or improvement of new or existing products, processes or services with elements of innovation. The project must have economic value and improves the societal well-being of the community. The Fund aims at increasing the participation of micro-businesses, individuals in innovative activities and encourage technological innovation of new or existing products, process or services for commercialization.

MOSTI Social Innovation (MSI)

<https://www.yim.my/mosti-social-innovation-msi-fund/>

The MOSTI Social Innovation (MSI) project was launched with the objective of improving the well-being of the society through the implementation of project, services, capacity and skill building or innovation output using the existing technology that can be implemented sustainably. As a start, the implementation of MSI involves outreach programmes to the grassroots level and scaling up innovative ideas from the outreach programme with the objective of "humanising innovation". Innovators can submit their project ideas to the Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC) for the MSI grant. MESTECC functions as a one-stop centre for innovators to submit their innovations with proof-of-concept. The innovation projects will be matched with its agencies and collaborators to facilitate and monitor the projects.

PHILIPPINES

Innovation System Support Fund (ISSF)

<http://region6.dost.gov.ph/innovation-system-support-fund-issf/>

The Innovation System Support Fund (ISSF) is a major technology transfer and commercialization program under Department of Science and Technology (DOST) Small Enterprise Technology Upgrading Program (SETUP) which provides assistance for the upgrading of existing production facilities

of MSMEs/organizations as well as acquisition of other critical requirements in the production line. Primarily, it aims to improve product quality and productivity in order to ensure market competitiveness. Under this modality, the beneficiaries refund the total cost of the assistance to the government for three years without interest. The SETUP focuses on key sectors such as food processing, furniture, gifts, decors and housewares, agriculture/aquaculture and marine, metals and engineering, Information and Communications Technology (ICT), and pharmaceuticals and health products.

VIET NAM

National Technology Innovation Fund

<http://natif.vn/en.html>

The National Technology Innovation Fund (NATIF) is affiliated with the Ministry of Science and Technology (MOST) of Viet Nam. The Fund functions in granting and lending capital to implement scientific and technological projects proposed by organizations or individuals. NATIF mainly supports enterprises, organizations and individuals whose conduct activities to innovative technology applications, commercializing the results of scientific research and technological development to bring to the market new products and services that have high technological content and high added value. ■

Technology Bank for Least Developed Countries

A Technology Bank for least developed countries (LDCs) was launched in Gebze, Turkey on 4 June 2018 – a major milestone in helping LDCs to use science, technology and innovation. The call for the bank to be established originates with the Istanbul Programme of Action, which began at the Fourth UN Conference on the LDCs in 2011. The Technology Bank is tasked with strengthening the knowledge capacity of the world's LDCs so that they can foster development of their innovation ecosystems to attract outside technology, generate homegrown research, and promote their integration into the global knowledge-based economy.

The Technology Bank is starting its work by conducting science, technology and innovation reviews in Guinea, Haiti, Sudan, Timor-Leste and Uganda. It is also facilitating digital access to research in Bangladesh, Bhutan, Burkina Faso, Liberia, Madagascar, Malawi, Mozambique, Nepal, Rwanda, Senegal, Uganda, and Tanzania.

For more information, access:

<http://unohrlls.org/technologybank/>

Tech Events

2018

**31 Oct-2 Nov
Singapore**

Asia Clean Energy Summit (ACES)

Contact: Charissa Tay (Ms)
ACES Secretariat
Tel: +65 6880 8665
Web: <https://www.asiacleanenergysummit.com>

**31 Oct-2 Nov
Hangzhou,
China**

The 9th International Conference on Innovation and Knowledge Management in Asia Pacific (IKMAP2018)

Contact: Dr. Peng Tao
School of Mechanical Engineering, Zhejiang University
Tel: +86-571-87952523
E-mail: tao_peng@zju.edu.cn
Web: <http://icme.zju.edu.cn/ikmap>

**2-4 Nov
Singapore**

2018 3rd Asia Conference on Environment and Sustainable Development (ACESD 2018)

Contact: Nancy Liu
Conference Secretary
Tel: +86-28-86512185
E-mail: acesd@iacsitp.com
Web: <http://www.acesd.org>

**26-27 Nov
Bangkok,
Thailand**

Solar and Off Grid Renewables South East Asia

Contact: Ms. Lola Zafra
Solar Media Ltd.
Tel: +44 (0) 207 871 0122
E-mail: lzafra@solarmedia.co.uk
Web: <https://seasia.solarenergyevents.com>

**14-15 Nov
Manila,
Philippines**

ASEAN Solar + Energy Storage Congress & Expo 2018

Contact: Leader Associates
Suit 209, Building A4, 925 Yecheng Road
Jiading District, Shanghai, China
Tel: +86 21 3102 1580
Fax: +86 21 3102 1581
E-mail: info@leader-xtet.com

**15 Nov
Kuala Lumpur,
Malaysia**

The Sustainability Summit Asia 2018

Contact: The Economist
Tel: +852 2585 3312
E-mail: asiaevents@economist.com

**12-14 Dec
Bangkok,
Thailand**

Future Energy Asia Exhibition & Conference 2018

Contact: Christopher Hudson
Global Head of Energy
E-mail: ChristopherHudson@futureenergyasia.com
Web: <http://www.futureenergyasia.com>

**11-13 Dec
Bangalore,
India**

Intersolar India 2018

Contact: Brijesh Nair
Project Director, India
Tel: +91 22 4255-4707
Fax: +91 22 4255-4719
Web: <https://www.intersolar.in>
Project Director, India
Tel: +91 22 4255-4707
Fax: +91 22 4255-4719
Web: <https://www.intersolar.in>

**13-14 Dec
Delhi, India**

Asia-Pacific Innovation Conference 2018

Contact: Mr. Surjeet Singh
Department of Economics,
Delhi School of Economics
University of Delhi
Delhi 110007, India
Tel: +91-11-27667005, 27008100
Fax: +91-11-27667159
E-mail: surjeet@econodse.org
Web: <http://ap-ic.org>

2019

**22-23 Jan
Singapore**

EmTech Asia

Contact: Daria La Valle
Tel: +(65) 6500 6719
E-mail: d.valle@koelnmesse.com.sg
Web: <https://emtechasia.com>

**26-29 Jan
Republic of
Korea**

The 5th International Conference on Renewable Energy Technologies (ICRET 2019) Seoul

Contact: Ms. Eva Long, Conference Secretary
Tel: +86-28-8777-7577
E-mail: icret@young.ac.cn
Web: <http://www.icret.org>

**29-31 Jan
New Delhi, India**

3rd IoT India expo 2019

Contact: Exhibitions India Group
C-103, Okhla Industrial Estate Phase III,
New Delhi - 110 020, India
Tel: +91 11 4279 5000
Fax: +91 11 4279 5098
E-mail: rahulrishi@eigroup.in
Web: <http://www.iotindiaexpo.com>

**11-13 Feb
New Delhi, India**

World Sustainable Development Summit (WSDS)

Contact: WSDS SECRETARIAT
The Energy & Resources Institute
6C, Darbari Seth Block, India Habitat Centre
Lodhi Road, New Delhi - 110 003, India
Tel: 91-11-24682100
E-mail: wdsd@teri.res.in
Web: <http://wdsd.teri.in.org>

**19-21 Mar
Kuala Lumpur,
Malaysia**

GREEN ENERGY Expo & Forum 2019

Contact: Mr Ridzuan
Tel: +6013 223 4881
E-mail: Ridzuan.husin@ubm.com
Web: <https://www.greenenergy.org.my>

**28-31 Mar
Hangzhou,
China**

International Conference on Renewable Energy and Smart Grid (ICRESG 2019)

Contact: Ms. Suzy Shih
Tel: 852-30697937 (HK)
E-mail: icresg@smehk.org
Web: <http://www.icresg.org>

**03-05 Apr
Daegu,
Republic of
Korea**

International Green Energy Business Expo Korea 2019

Contact: EXCO Korea Energy News
90, Yutongdanji-ro, Buk-gu
Daegu, Republic of Korea
Tel: +82 (053) 601-5375
Fax: +82 (053) 601-5372
E-mail: energy@excodaegu.co.kr

21-24 May

9th International Conference on Innovative Smart Grid Technologies (ISGT Asia 2019) Chengdu, China

Contact: Prof. Zhenyuan Zhang
Secretary, ISGT 2018 Conference Organizing Committee
E-mail: isgtasia2019@hotmail.com
Web: <http://sites.ieee.org/isgt-asia-2019>

**5-8 Jun
Bangkok,
Thailand**

ASEAN Sustainable Energy Week (ASE)

Contact: Ms. Jidakarn Jarhatchaititikhun
UBM Asia (Thailand) Co., Ltd.
Ari Hill 18th Floor, 428 Phahonyothin Road. Samsen Nai,
Phayathai Bangkok 10400, Thailand
Tel: +66 2 036 0500
Fax: +66 2 036 0588
Mobile: +66 91 874 6776
E-mail: Jidakarn.j@ubm.com
Web: <http://www.asew-expo.com>

Tech Ventures & Opportunities

Business Coach

Start-up Venture Creation

25

- Startup recognition and tax exemptions in India
- Growing businesses in Malaysia – Certification

Technology transfer

28

- Patent rights in Viet Nam
- IP assignment and licensing in Thailand

Venture Financing

31

- Modes of financing for startups
- Starting a business: source of funds

Managing Innovation

35

- Innovation promotion in India
- Catalyzing digital innovation ecosystems in Malaysia

Green Productivity

38

- Green ratings in India
- Eco-innovation

Tech Opportunities

Technology Offers

42

- Fogger sprayer and high-range sprayer
- Carrier materials for mosquito-larvae killing pesticides
- Continuous room-temperature biodiesel production
- Tea catechins as anti-aging compounds
- Solvent tolerant bacterial lipase
- A novel compound with leishmanicidal activity
- Biofertilizers using industrial waste materials
- Neem based biopesticides
- Health care wheat flour
- Oral care products
- Kitozan biofertilizer

Technology Requests

46

- Ethanol production plant
- Manufacture of bio-fertilizers
- Tocopherol production technology
- Biotechnology for wastewater treatment system
- Process to remove/extract proteins and polyphenols from plant materials

Startup recognition and tax exemptions in India

Startup India, Department of Industrial Policy & Promotion(DIPP), Ministry of Commerce, Government of India

<https://www.startupindia.gov.in>

Startup India is a flagship initiative of the Government of India, intended to build a strong ecosystem that is conducive for the growth of startup businesses, to drive sustainable economic growth and generate large scale employment opportunities. The Government through this initiative aims to empower startups to grow through innovation and design.

Several programs have been undertaken since the launch of the initiative on 16th of January, 2016, to transform India into a country of job creators instead of job seekers. These programs have catalyzed the startup culture, with startups getting recognized through the Startup India initiative and many entrepreneurs availing the benefits of starting their own business in India.

The 19-Point Startup India Action Plan envisages several incubation centres, easier patent filing, tax exemptions, ease of setting-up of business, a INR 10,000 Crore corpus fund, and a faster exit mechanism, among others.

Startup recognition

Under the Startup India Action Plan, startups that meet the definition as prescribed under the G.S.R. notification 501 (E) are eligible to apply for recognition under the program. The Startups have to provide support documents, at the time of application.

Eligibility Criteria for Startup Recognition:

- The Startup should be incorporated as a private limited company or registered as a partnership firm or a limited liability partnership
- Turnover should be less than INR 25 Crores in any of the previous financial years
- An entity shall be considered as a startup up to 7 years from the date of its incorporate or 10 years in case of Startups in the Bio Technology sector
- The Startup should be working towards innovation/ improvement of existing products, services and processes and should have the potential to generate employment/ create wealth

Startup India: 80 IAC Tax exemption

Post getting recognition a Startup may apply for Tax exemption under section 80 IAC of the Income Tax Act. Post getting clearance for Tax exemption, the Startup can avail tax holiday for 3 consecutive financial years out of its first seven years since incorporation.

Eligibility Criteria for applying to Income Tax exemption (80IAC):

- The entity should be a recognized Startup
- Only Private limited or a Limited Liability Partnership is eligible for Tax exemption under Section 80IAC
- The Startup should have been incorporated after 1st April, 2016

Startup India: Tax Exemption under Section 56 of the Income Tax Act (Angel Tax)

Post getting recognition a Startup may apply for Angel Tax Exemption.

Eligibility Criteria for Tax Exemption under Section 56 of the Income Tax Act:

- The entity should be a DIPP recognized Startup
- Only a private limited company may apply for Tax Exemption under section 56 of the Income Tax Act
- The investor's net worth should be more than INR 2 Crore as on the last date of the preceding financial year or the average income should be more than INR 25 lacs per annum for the preceding three financial years

Disclaimer

- Department of Industrial Policy and Promotion, Ministry of Commerce and Industry has not appointed any Agency/Representative/ Franchise for DIPP Certificate of Recognition for Startups.
- Application for Startup India Certificate of Recognition should be filed by the Startup on its own, using own details/ mobile No./ email.
- Ministry of Commerce and Industry does not charge any fee for DIPP Certificate of Recognition for Startups.
- Any charging of fees for Recognition for Startups is illegal and will invite appropriate legal action.

Growing businesses in Malaysia – Certification

SME Corp. Malaysia

<http://www.smecorp.gov.my>

How certification benefits us

Reference to certification such as Malaysian Standards brings immense benefits to all stakeholders in achieving:

1) Consumer protection and public welfare

- Standards provide a basis for legislation for controlling quality, protecting consumers and ensuring health and safety
- Standards ensure the fitness for the intended purpose of products and services
- Standards specify the minimum requirements of quality, health and safety including areas involving the environment and occupational safety and health
- Conformance to standards provides an assurance of safety, reliability and quality to consumers
- Standards ensure compatibility, interchangeability and interoperability to benefit consumers
- As consensus documents, standards reflect the requirements at national and international levels

2) Industrial efficiency and development

- Terminology and symbol standards help in better understanding
- Product standards help in ensuring good design and improvement in quality of product
- Product standards encourage economic efficiency through variety rationalization and interchangeability of components, materials and practices
- Process standards provide the means for improving manufacturing processes
- Codes of practice establish good practices in all fields of installation, construction, etc.
- Testing standards set recognized levels of repeatability and reproducibility
- Standards being a rich source of current technologies can act as vehicles for technology transfer
- Standards promote better understanding between the purchaser and seller and provide solutions to recurring problems
- Standards facilitate communications
- Use of standards provide the essential key to organizing industrial development
- Use of standards lead to direct and indirect economic benefits
- Standards help in import substitution and export promotion

The adoption of certification such as Malaysian Standards assures consumers that their safety is taken care of, and ensures that the quality of products and services is worth their money. To industries, it contributes to the reduction of operational costs thereby assuring a rise in profits.

Product certification scheme

Product Certification Scheme Product Certification is offered to manufacturer who wishes to have its product certified to the requirements of a Malaysian or International Standard. Participation in this scheme is voluntary for most products. However, government regulatory authorities may require mandatory certification for certain products. After successful application, the applicant is given a license to mark the certified product with the “MS” certification mark. However for most regulated products, it is mandatory to affix the SIRIM labels on the products. The presence of the Label attests that the product meets quality requirements of the specified standard or specification. It also provides consumer an assurance of performance, safety and reliability as well as it demonstrates an effective system for production processes.

Other product certification category

Chain-of-Custody

The Chain-of-Custody Certification is an independent third party verification that the wood products purchased are actually derived from forests which have been certified to have met the requirements of an agree forest management standard. The standard used is the PEFC International Chain-of-Custody standard, Annex 4 of the PEFC Council Technical Document: Chain-of-Custody of Forest Based Products – Requirements. A wood product which has been certified under this scheme is eligible to use the MTCC as well as the PEFC logos which are recognized in the member countries of the PEFC.

Product Listing Scheme

This scheme is operated along similar lines to the Product Certification Scheme. However it offers a cost-effective in the absence of a national or international standard for the product. In this case, the product can be certified to association or industry standards as well as acceptable customer specifications. Pre Application fee of RM200 is payable upon application to Product Listing Scheme. Acceptance into this scheme has to be approved by SIRIM QAS International’s Certification Panel.

Modular Coordination Verification Scheme

This is a concept of coordination of dimension and space, in which, buildings and components are dimensioned and positioned in terms of basic unit or module, known as '1M' which is equivalent to 100 mm. It is internationally accepted by the International Organization for Standardization (ISO) and many other countries including Malaysia.

Batch Certification Scheme

This Scheme provides third party certification of products and is based on the ISO certification system no. 7, where a batch of product is sample tested and a certificate of conformity and/or labels are issued to the batch. The certification is based on a Malaysian Standard, an International Standard, an International Standard or a foreign standard of a national standards organisation.

IECEE CB Scheme

The electrical and electronic is Malaysian largest export revenue earner netting more than half of total export. As goods and services flow across borders, business partners and government agencies may require assurance that they measure up to standard, regulations and other requirements.

IECEE CB scheme is one of the multilateral recognition agreement schemes that reassure industrial users and consumer that the product they buy conform to the criteria of an IEC international standards and require no further testing or evaluation. SIRIM QAS International Sdn. Bhd. is now an Issuing and Recognizing National Certification Body (NCB) of the CB Scheme. The Product Certification Section is designated as the NCB and the Electrotechnical Testing Section as the Certification Body Testing Laboratory (CBTL).

The aim of the CB Scheme is to provide manufacturers seeking worldwide third party certification marks, the most economic and cost effective procedures within the best certification time frame.

Fire Listing Scheme

Currently, certification on several passive fire protection products such as fire resistant door sets and roller shutters is being carried out by SIRIM QAS International Sdn. Bhd. These products are certified as a system which includes components such as the door leaves, frames and ironmongeries. Due to this "system" certification, the products certified must be sold with the exact same components or of equivalent or better grade than those used during testing.

Electromagnetic Compatibility Certification Scheme

Ensuring that electrical and electronic products/equipment are safe and do not interfere with the normal operation of other equipment is the basis of the emc Scheme. With the Scheme, which can be best demonstrated through independent third-party certification, manufacturers will be able to apply the emc-mark.

Sirim Eco-Labeling Scheme

Eco-labeling is a means of communicating product's environment information to consumers and business. This

information provides consumers and business the associated environmental benefit and enables purchaser to make decision based on environmental attributes. Under SIRIM QAS International Eco-Labeling Scheme, a product will be independently tested and verified against preset criteria before the organisation is allowed to use SIRIM QAS International's Eco-Labeling mark on its product, packaging and promotional materials.

SIRIM QAS International's Eco-Labeling mark is an effective marketing tool which will enable a company to position its product as an environmentally-friendly product. This, in turn, will give the product a competitive edge over other similar products in a consumer market that is increasingly becoming more environmentally conscious.

Product certification process

1. Enquiry

- The applicant should complete the Questionnaire in the Application Package and submit to SIRIM Qas International Sdn. Bhd. Based on the Questionnaire, a question will be prepared and sent to applicant for consideration. The quotation should provide an estimate of the total cost for certification.

2. Application

- Upon agreeing to the quotation, the applicant is required to submit the application form (PCS/FOR/01-2), Declaration for Approval from Relevant Authority (for Malaysian manufacturers only), Declaration for Approval for Trade Mark Registration/ Brand Name (PCS/FOR/01-3-1), accompanying product information + fees + test report (if available)

3. Document evaluation

- SIRIM QAS International will conduct standard/product design Evaluation

4. Factory audit

- Inspection conducted to examine Quality Control plan adequacy, test equipment and calibration and record keeping system.

5. Sample selection & testing

- Sample of product will be randomly selected and sent to accredited testing laboratory for testing

6. Recommendation and approval process

- The Certification Panel reviews and approves the recommendation for certification under the authority of the Certification Advisory Committee

7. Surveillance

- Planned inspection and re-tests conducted to monitor continuing compliance. Samples selected from production or open market will be retested.

8. Renewal

- Approval for renewal on satisfactory inspection reports and payment of fees.

Patent rights in Viet Nam

ASEAN Intellectual Property Association (ASEAN IPA)

<http://www.aseanipa.org>

The patent rights as mentioned above shall be limited by prior user's rights, compulsory license, and other acts.

Prior user's rights

The exercise of the prior user's right to invention or industrial design shall not be considered as an infringement of rights of the owner of the patented invention or industrial design. Where a person who, before the filing date or priority date (if any) of an invention or industrial design application, was using or had made substantial preparation toward the using of an invention or industrial design independently created but identical with the invention or industrial design claimed in the application, the said prior user shall be entitled to continue the use after the patent is granted, within the extent and volume of use or substantial preparation toward the using already made. The prior user shall not be entitled to enlarge the extent and volume of use unless it is so permitted by the owner of the patented invention or industrial design. The prior user's right shall not be allowed to be transferred except for the case it is transferred together with the business establishment where the prior user's right is exercised.

Compulsory license

The right to use an invention shall, without permission of the patentee, be granted to another entity or individual upon decision of the State competent authority if (i) the use of the invention is intended for the public interest, non-commercial purposes, national defense, security, prevention and treatment of disease, for people's nutrition, or meeting other urgent needs of society; (ii) the patentee fails to fulfill the obligation of using the invention after the expiration of four years from the date of filing of the patent application and three years from the granting date of the patent for invention; (iii) the person who wants to use the invention fails, within a reasonable period of time for negotiation on reasonable considerations and commercial conditions, to reach an agreement with the patentee on a license to use such an invention; or (iv) the patentee is regarded as performing an act of anti-competition prohibited under the competition law and regulations.

The right to use the invention under the compulsory license granted by a decision of a State competent authority shall meet the following conditions:

- a. The right to use shall be non-exclusive;
- b. The right to use shall only be limited to such a scope and duration sufficient to attain the purpose for which the compulsory license was granted, and predominantly for the supply of the domestic market;

- c. The licensee of the compulsory license shall not assign the right to use the patented invention to another person, except where the assignment is made together with his/her business establishment and sub-license others to use the patented invention;
- d. The licensee of the compulsory license shall pay the patentee/licensor adequate remuneration, taking into account the economic value of the allowed use, in compliance with the remuneration frame provided for by the Government;
- e. The patentee of the dominant invention shall also be entitled to grant a license to use the dependent invention on reasonable terms and conditions; and
- f. The licensee of compulsory license to use the dominant invention shall not be entitled to assign such right, except with the assignment of the entire right to the dependent invention.

Other cases

The following shall be exempted from patent infringement:

1. Use of the invention or industrial design for personal needs or non-commercial purposes, or for the purposes of evaluations, analysis, research, teaching, testing, pilot production or for collecting data to carry out procedures to obtain a production license, import or product marketing permit;
2. Use of the invention or industrial design only for the purpose of maintaining the operation of a foreign vehicle in transit or only temporarily entering into the territory of Vietnam;

Who may file and where to file patent applications

The right to file a patent application for invention or industrial design generally belongs to inventors who have created the invention or industrial design by his/her own efforts and expenses. In case an invention or industrial design is created by the inventors during the course of employment or hire, the entitlement to file patent applications for such invention or design shall belong to the entities or individuals who have invested finance and material facilities to the inventors through employing or hiring, unless otherwise agreed by the parties (the employee invention). In this case, the employees shall enjoy some moral rights over the invented technology in addition to some remuneration. Moral rights of employee-inventor(s) are to be named as inventor in relevant patent letters as well as in any documents in which the invented technology is published or introduced. The remuneration for the employees is stipulated as 10% of benefits obtained from using the invention, and 15% of the sum amounted from each royalty for granting a license to use the invention, unless otherwise agreed by the parties.

IP assignment and licensing in Thailand

ASEAN IPA

<http://www.aseanipa.org>

The assignment, or license agreements, of IP objects must be made in writing, contain minimum requirements, and not be contrary to specific prescriptions in regard to the related rules. Most types of IP objects shall be registered with the related authorities in order to make them valid and enforceable in Thailand. The important rules and regulations in relation to the three main IP objects, i.e. 1) trademark, 2) patent, and 3) copyright, are as follows:

Trademark

Trademark Assignment – the assignment must be made in writing and registered with the Trademark Office, in order to make it valid and enforceable. The Trademark Office accepts the registration assignment for any pending and registered trademarks, and there is no specific deadline for registering the assignment in Thailand. An important rule relating to trademark assignment is prescribed under Section 50 of the Trademark Act, whereby all associated trademarks shall be transferred, or inherited, only as a whole. The assignment cannot be registered only for some associated trademarks, and partial assignment is not allowed. In addition, the cancellation of filed/registered license agreements relating to assigned trademarks is always a prerequisite, before the assignment is granted in Thailand.

Trademark Licensing – the license agreement and any sub-license agreement must be made in writing and registered with the Trademark Office, in order to make it valid and enforceable. To register a sub-license agreement, the main license agreement must also be registered. If the license agreement is subject to a renewal, such renewal must be re-registered in order to maintain its validity.

A registrable license agreement, according to Section 68 of the Trademark Act, shall at least provide the following: 1) conditions and terms of the agreement between the trademark proprietor and the person applying to be an authorized licensee, which must actually enable the former to control the quality of the goods manufactured by the latter; and 2) the goods on which the licensed trademark is to be used.

The license agreement can include all pending and registered trademarks in Thailand. However, the Trademark Office will only register the licenses of registered trademarks. The license agreement for pending trademarks can be registered, only after it is granted registration, and without the requirement to enter into a new license agreement. There is no deadline for registering a license agreement in Thailand. The main consequence of a non-registered license agreement is that it is non-enforceable under Thai law, and the use by a licensee

is not legitimate to defend against a non-use cancellation action.

Patent

Patent Assignment – the assignment must be made in writing and registered in compliance with the requirements, procedures and conditions as prescribed by the relevant Ministerial Regulations, in order to make it valid and enforceable. The Patent Office registers the assignment for any pending and registered patents, and there is no specific deadline for registering the patent assignment in Thailand. The application to register the assignment must be separately submitted with the Patent Office, together with the agreement which transfers the patent for each assigning patent.

Patent Licensing – the license agreement must be made in writing, and registered in compliance with the requirements, procedures and conditions as prescribed by the Ministerial Regulations, in order to make it valid and enforceable.

In granting a license, according to Section 39 of the Patent Act: 1) the patentee shall not impose upon the licensee any condition or restrictions, or any royalty term which unfairly limits competition. Conditions, restrictions or terms which tend to unfairly limit competition are prescribed in the Ministerial Regulation No. 25 (B.E. 2542), issued under the Patent Act B.E. 2522, and these include for example: a) prescribing the licensee to provide material, for use in the production, from the holder of the patent, or from the distributor, which the holder of the patent has prescribed or permitted, except where it can be proved that it has to be prescribed so that the product produced gives the result as stipulated under the patent, or it is a material which cannot be acquired from another source; b) prescribing conditions or restrictions of the licensee concerning the hire of persons for the production of the invention, except where it can be proved that such has to be prescribed, so that the product produced gives results which are in accordance with the patent; c) prescribing that the licensee sells, or distributes more than half of the product produced, to the holder of the patent; d) prescribing that the licensee limits the quantity of production, sale or distribution; e) prescribing that the licensee discloses the invention, which the licensee has improved, or to allow the patent holder to seek interest from the said invention without prescribing a suitable remuneration for the licensee; f) prescribing that the licensee exercise the rights under the patent to pay remuneration for the use of the invention according to the patent, after

the patent expires, etc.; and 2) the patentee shall not require the licensee to pay royalties for use of the patented invention after the patent has expired. Conditions, restrictions or terms concerning royalties, which are contrary to this provision, are null and void.

Copyright

Copyright Assignment – the copyright owner can assign the whole, or part, of his copyright to another person for a limited period of time, or for the entire term of copyright protection. An assignment of copyright, other than by inheritance, shall be made in writing and signed by the assignor and the assignee. There is no need to register such assignment with the Copyright Office. If the assignment contract does not specify a period of time, it shall be deemed that the assignment is for a period of 10 years.

The rights of a performer can also be assigned, wholly or in part, and can be assigned for a specified period of time, or for the duration of the term of protection. Where there is more than one performer, a performer is entitled to assign only that portion of the rights belonging to him. An assignment of a performance right, other than by inheritance, shall be made in writing, and signed by the assignor and the assignee. There is no need to register such assignment with the Copyright Office. Should there be no period of time specified in the assignment contract, it shall be deemed that the assignment is for a period of 3 years.

Copyright Licensing – the copyright owner can grant licenses to other persons to use the rights to reproduce or adapt, disseminate to the public, or rent the original or a copy of a computer program, audio-visual work, cinematographic work, and sound recording, with or without imposing any conditions, but any conditions specified shall not restrict fair competition.

The conditions which restrict fair competition are prescribed in the Ministerial Regulations (B.E. 2540), issued under the Copyright Act B.E. 2537, and include for example: a) prescribing that the licensee acquire materials for use in the production of a copied work so permitted, either wholly or partly, from the owner of the copyright, except where it is necessary to do so for the purpose of obtaining a copied work which is in accordance with the standards set by the owner of the copyright; b) prescribing conditions or restricting the rights of the licensee, in relation to the hiring of a person to produce a copied work, except where it is necessary to do so for the purpose of obtaining copied work which is in accordance with the standards prescribed by the owner of the copyright; c) prescribing considerations for the granting of permission to exercise the rights in a copyrighted work at an unfair rate, when compared to the rate prescribed by the owner of the copyright for other licensees who have been granted permission in the same period of time for the same copyrighted work; d) prescribing conditions or restricting the rights of the licensee in regard to research or study of the copyrighted work, for which permission has been granted; e) prescribing conditions which enable the licensor has the right to terminate the permission at will, and without reasonable cause, etc.

Fight Against Neglected Tropical Diseases, Malaria and TB

WIPO Re:Search catalyzes the development of new medicines and technologies in the fight against neglected tropical diseases (NTDs), malaria and tuberculosis. Through innovative research partnerships and R&D collaborations we make intellectual property (IP) available to researchers who need it.

WIPO Re:Search has launched a new five-year roadmap to guide its activities in the fight against neglected tropical diseases, malaria and tuberculosis. The World Intellectual Property Organization (WIPO) and its partner BIO Ventures for Global Health (BVGH) established the initiative in 2011 to boost the use of intellectual property in catalyzing innovation and product development for ailments affecting more than 1 billion people. WIPO Re:Search now includes 126 members in 35 countries and has established 112 collaborations across the globe. The new plan will guide the public-private consortium's activities through 2021 and includes new research, capacity building and outreach efforts.

WIPO Re:Search allows organizations to share their intellectual property, compounds, expertise, facilities and know-how royalty-free with qualified researchers worldwide. The new strategic plan seeks to ensure that WIPO Re:Search harnesses new research and development trends in global health, while contributing to the achievement of the United Nations Sustainable Development Goals. The IP, resources, and know-how available via WIPO Re:Search accelerate research into NTDs, malaria, and tuberculosis. In turn, this increases the chances of success and reduces development costs.

For more information, access:

<http://www.wipo.int/research/en/>

Modes of financing for startups

Smallb.in, An Initiative of Small Industries Development Bank of India

<https://smallb.sidbi.in>

Finance is required by a business enterprise at almost every stage of the business life cycle. MSMEs often find it difficult to arrange adequate finance for their operations as well as for expansion and growth. These enterprises can raise finance by various methods. Below are some of the ways to raise long term and short term capital.

Sources of long term capital

Reinvestment of profits

Profitable companies do not generally distribute the whole amount of profits as dividend but, transfer certain proportion to reserves. This may be regarded as reinvestment of profits or ploughing back of profits. As these retained profits actually belong to the shareholders of the company, these are treated as a part of ownership capital. Retention of profits is a sort of self financing of business. The reserves built up over the years by ploughing back of profits may be utilised by the company for the following purposes:

- Expansion of the undertaking
- Replacement of obsolete assets and modernisation
- Meeting permanent or special working capital requirement
- Redemption of old debts

The benefits of this source of finance to the company are:

- It reduces the dependence on external sources of finance
- It increases the credit worthiness of the company
- It enables the company to withstand difficult situations
- It enables the company to adopt a stable dividend policy
- It increases the debt raising capacity of the company

Loans from commercial banks / financial institutions

Medium and long term loans required for setting up projects can be obtained from banks and \or financial institutions for all viable projects. Similarly, funds required for modernisation and renovation schemes can be borrowed from them. Such loans are generally secured by mortgage of the Company's properties, pledge of shares, personal guarantees etc.

Public deposits

Companies often raise funds by inviting their shareholders, employees and the general public to deposit their savings with the company. The Companies Act permits such deposits to be received for a period up to 3 years at a time. Public deposits can be raised by companies to meet their medium-term as well as short-term financial needs. The increasing popularity of public deposits is due to:

- The rate of interest the companies have to pay on them is attractive.
- These are easier methods of mobilising funds than banks, especially during periods of credit squeeze
- They are unsecured

Risk capital

Risk capital denotes the provision of capital where the provider reduces the risk burden of the entrepreneur, and in turn bears some part of the overall risk involved in a productive activity. As per a definition widely used in India – The term 'risk capital' includes equity as well as mezzanine/ quasi equity financial products that have features of both debt and equity. Risk Capital is an important instrument for not only start-ups and innovative / fast growing companies but is also critical to those companies looking at growth. Risk capital substitutes promoter's contribution, thereby reducing the capital to be brought by the entrepreneurs. Under such cases, Risk capital is one of the most viable options for raising capital for MSMEs. Some of the major risk capital options available for MSMEs include Venture Capital, Angel Investment and Public Listing.

Issue of shares

It is the most important method. The liability of shareholders is limited to the face value of shares, and they are also easily transferable. A private company cannot invite the general public to subscribe for its share capital and its shares are also not freely transferable. But for public limited companies there are no such restrictions. There are two types of shares:

- Equity shares: the rate of dividend on these shares depends on the profits available and the discretion of directors. Hence, there is no fixed burden on the company. Each share carries one vote.
- Preference shares: dividend is payable on these shares at a fixed rate and is payable only if there are profits. Hence, there is no compulsory burden on the company's finances. Such shares do not give voting rights.

Issue of debentures

Companies generally have powers to borrow and raise loans by issuing debentures. The rate of interest payable on debentures is fixed at the time of issue and the debentures have a charge on the property or assets of the company, which provide the necessary security. The company is liable to pay interest even if there are no profits. Debentures are mostly issued to finance the long-term requirements of business and do not carry any voting rights.

Sources of short term capital

Trade credit

Companies buy raw materials, components, stores and spare parts on credit from different suppliers. Generally suppliers grant credit for a period of 3 to 6 months, and thus provide short-term finance to the company. Availability of this type of finance is connected with the volume of business. When the production and sale of goods increase, there is automatic increase in the volume of purchases, and more of trade credit is available.

Factoring

The amounts due to a company from customers, on account of credit sale generally remain outstanding during the period of credit allowed i.e. till the dues are collected from the debtors. The book debts may be assigned to a bank and cash realised in advance from the bank. Thus, the responsibility of collecting the debtors' balance is taken over by the bank on payment of specified charges by the company. book debts may be assigned by the seller to a FACTOR, who will provide about 80 - 85 % or more of the value of the book debt, as advance to the seller. The FACTOR will also undertake the task of collecting the amount representing the debt (credit sales) from the debtors. Factoring is an important avenue of raising short funds against the receivables for the MSME units. The charges payable to the FACTOR is treated as cost of raising the funds

Discounting bills of exchange

This method is widely used by companies for raising short-term finance. When the goods are sold on credit, bills of exchange are generally drawn for acceptance by the buyers of goods. Instead of holding the bills till the date of maturity, companies can discount them with commercial banks on payment of a charge known as bank discount. The rate of discount to be charged by banks is prescribed by the Reserve Bank of India from time to time. The amount of discount is deducted from the value of bills at the time of discounting. The cost of raising finance by this method is the discount charged by the bank.

Bank overdraft and cash credit

It is a common method adopted by companies for meeting short-term financial requirements. Cash credit refers to an arrangement whereby the commercial bank allows money to be drawn as advances from time to time within a specified limit. This facility is granted against the security of goods in stock, or promissory notes bearing a second signature, or other marketable instruments like Government bonds. Overdraft is a temporary arrangement with the bank which permits the company to overdraw from its current deposit account with the bank up to a certain limit. The overdraft facility is also granted against securities. The rate of interest charged on cash credit and overdraft is relatively much higher than the rate of interest on bank deposits.

Global SME Finance Facility

The Global SME Finance Facility is a blended-finance partnership focused on helping to close the financing gap faced by SMEs in emerging markets. Catalyzing access to finance for SMEs, the facility has a goal of generating one million new jobs in the SME sector. The facility dedicates its efforts toward the most underserved SME segments, such as SMEs in fragile countries, very small enterprises, and women-owned SMEs.

A global partnership, the facility responds to a G-20 call for expediting SME financing and growth. To support this growth, the facility provides funding, risk mitigation and advisory assistance to financial institutions. This helps institutions expand lending to SMEs in challenging markets and segments. In addition, the facility aids governments with improving their nations' financial infrastructure, enabling capital to flow more efficiently to SMEs.

In its first years, the facility has proven the power of its multi-pronged approach and partnership model. By 2016, the facility had supported 56 client financial institutions. These institutions lent more than \$6 billion through 67,000 new loans to SMEs. The facility's activities had helped generate 414,000 new jobs after four years. Joining forces with other organizations accomplishes more than any single one can. For this reason, the IFC-managed facility blends commercial financing from IFC and the European Investment Bank with donor funding from the UK Department for International Development (DFID) and the Netherlands Ministry of Foreign Affairs.

For more information, contact

Wendy J. Teleki
Principal Operations Officer
International Finance corporation
E-mail: wteleki@ifc.org
Web: <https://www.ifc.org>

Starting a business: source of funds

SME Corporation Malaysia

<http://www.smeCorp.gov.my>

How much money do you need?

It depends on your type of business and how quickly you plan to expand. You should sit down and write out how much your expected expenses will be for at least the next 24 months and how much you project to bring in as far as income on a monthly basis. There are several companies that can help you get started with funding your business. You can refer back to your business plan or start asking yourself what type of expenses do you need the money for? Generally, for a start-up business, there will be a few costs involve:

- **Cost of sales:** Product inventory, raw materials, manufacturing equipment, shipping, packaging, shipping insurance, warehousing
- **Professional fees:** Setting up a legal structure for your business, trademarks, copyrights, patents, drafting partnership and non-disclosure agreements, attorney fees for ongoing consultation, retaining an accountant
- **Technology costs:** Computer hardware, computer software, printers, cell phones, PDAs, website development and maintenance, high-speed internet access, servers, security measures, IT consulting
- **Administrative costs:** Various types of business insurance, office supplies, licenses and permits, express shipping and postage, product packaging, parking, rent, utilities, phones, copier, fax machine, desks, chairs, filing cabinets – anything else you need to have on a daily basis to operate a business
- **Sales and marketing costs:** Printing of stationery, marketing materials, advertising, public relations, event or trade show attendance or sponsorship, trade association or chamber of commerce membership fees, travel and entertainment for client meetings, mailing or lead lists
- **Wages and benefits:** Employee salaries, payroll taxes, benefits, workers compensation

No matter what your business type, take into account everything you will spend, from the moment you dig in to the startup process, through the time you're ready to sell a product or service.

Where to get the money?

All businesses require some form of financing. The most basic rule in financing a business is to commit yourself and your savings or other resources to the business. This will ensure your whole hearted commitment to its success. This is also a strong sign of good faith and commitment for other potential lenders/investors as, if you are not seen to be willing to risk your own funds why anyone else should! Further, for a start-up business, there may not

be a wide variety of sources of funds as it is still untested. Hence, you will have to come up with the capital, from personal savings or through selling off surplus assets you may have.

Personal saving

There's nothing like having your own money saved, to put into your startup. You have the satisfaction of having saved it on your own, and the knowledge that you don't owe anyone. When using your own money to finance a business, you will feel more personally invested in the project, because it is basically your money on the line. However, there is more flexibility in using your own money. For example, if your business is having a slow start, you do not need to worry about paying back a bank loan because you used your own money.

But the risk you may face is that - It's your money, and if you're not successful, the money is gone, and with it the opportunity to do anything else with it later. It can also create another financial burden. Most people have a savings account for general purposes. In other words, the money is not saved for any particular purpose and is used whenever it is needed for whatever reason. As such, draining such an account may negatively affect your financial situation if you need to dip into that savings account for an emergency. However, if the personal savings you use to finance a business was money saved for that particular purpose, you should not have any financial troubles as a result of the draining of that account. If your savings account was set up for the purpose of opening a business, this means that you planned ahead and reserved that savings account for that purpose only, and thus, will not feel the pinch in an emergency because you will have other funds available for that purpose.

Financing with debt

Financing a business with debt involves securing a loan. This can be in the form of either unsecured or secured debt. Unsecured debt refers to a loan taken without having to put up any specific form of security or collateral. This involves mainly borrowing from family or friends, a credit card, line of credit and other similar means.

Secured debt, on the other hand, refers to loans where you are required to put up some form of collateral in exchange for the loan, for example, mortgage on the house or refinancing your car, among others. For secured debts, you need to be able to assure the lender about your ability to meet your payments either through your business or other means. To secure such debt is some cases you will need to present a solid business plan, evidence of your experience and of your ability to repay.

Family and friends

Raising finance from family and friends can be rewarding for both parties: you get the finance to start or expand your business, while

your family and friends have the satisfaction of helping you while earning interest on their spare cash. Family and friends may accept more flexible terms and conditions that are better suited to your business than those offered by commercial banks.

Often arrangements with family and friends are informal and based purely on trust and verbal assurances. However, a formal written agreement is strongly advised in order to minimise disputes in the future. Preserving your relationships with friends and family is as important as pursuing your business opportunity.

Personal loan

Financing a business with personal loans means that you borrow the money personally to invest it in your business. This is typically used at start-up or early stages where the business has not established enough history or performance to be able to secure a loan on its own merit.

Mortgage loan

Another source for financing a business is a home mortgage loan. Some banks allow you to mortgage or refinance your house. This may be a risky move as if you are unable to make the scheduled payments, you risk losing your home. It is therefore crucial that you are confident on your continued ability to make all payments scheduled.

Insurance loan

Another source of loan could be from your insurance policy. If you have been paying for a life insurance policy that builds up a cash value you are entitled to take up a loan on the cash value amount. Many insurance companies will loan you money with the cash value as security. This is a rather expensive method of financing a business and also means reduced benefits if you are unable to clear the loan and interests accrued.

Credit cards

Credit cards can also be a source for financing a business when you are first getting started. However, this is another expensive method as the rates charged can be high and it could also affect your credit rating, required for other sources of financing.

Government small business loans

There are a variety of government small business loans and programs that can be used in financing a business, including those specifically for Bumiputeras and micro entrepreneurs. Most of these loans are administered by the Financial Institutions like the Development Financial Institutions (DFIs) and the commercial banks. While some are directly administered by the department/

agency involved. Funding from these sources may be relatively easier to secure as the government department/agency guarantees your loan, if you are approved.

Grants

There are often a variety of government grant programs for specific types of startup businesses. For more information, search online on government websites. Unless they're reputable, don't pay money to sites that tell you they'll give you a big list of where you can get grant money. The risk is that - While grants are rarely required to be paid back, accountability is higher, and you might have to work within a difficult deadline, to show your progress. If you do not achieve the progress you indicated in your proposal, there may be some sort of penalty.

Bank loans

Banks lend money to existing businesses but for a start-up, it may be very difficult to get a bank loan as they do not have a track record. Banks require a sound business plan and must be convinced of the viability of your business before they agree to lend you money. Banks also normally need collateral as security. If you have a solid business plan and the lender agrees, this can often be the cheapest (interest rate-wise) loan sources available. The risk is that besides the fact that it's often hard for a startup to qualify - since there's little evidence you'll be profitable - if you do get a loan, it can be like a ticking time bomb if your business isn't doing well.

Equity financing

Equity Financing is borrowing where the investor/financier becomes a part-owner of the business in the process. This could be through venture capital or issuing shares.

Venture capital

Venture capitalists do not want to remain in your business forever. Generally, they want to see an exit strategy that will see them out in about 5 years, with a high return on their investment as their reward. In terms of areas of interest, venture capitalists are interested in both high technology and various other industries. Normally they fund businesses which have already been launched and have probably reached profitability.

The angel investor, on the other hand, is a special type of venture capitalist. Usually an individual with substantial funds, the 'angel' provides capital to start-up companies and takes a personal stake in the venture. Depending on the individual 'angel', their requests for any form of control or a quick return on investment will differ. However, similar to regular venture capitalists, they seek high returns on their investment for the risks they take on.

Innovation promotion in India

National Institution for Transforming India, Government of India

<http://niti.gov.in>

Atal Innovation Mission (AIM) including Self-Employment and Talent Utilization (SETU) is Government of India's endeavour to promote a culture of innovation and entrepreneurship. Its objective is to serve as a platform for promotion of world-class Innovation Hubs, Grand Challenges, Start-up businesses and other self-employment activities, particularly in technology driven areas.

The Atal Innovation Mission shall have two core functions:

- Entrepreneurship promotion through Self-Employment and Talent Utilization, wherein innovators would be supported and mentored to become successful entrepreneurs
- Innovation promotion: to provide a platform where innovative ideas are generated

Atal grand challenge awards

The factors holding back rural and semi-urban India are lack of 24/7 electricity, roads that are usable round the year, clean water, suitable housing, access to basic healthcare, quality education, lack of farm mechanisation and employable skills. While state-of-the-art technology can address a number of these challenges, the existing solutions have been out of reach due to their excessive high costs.

Atal Grand Challenge (AGC) Awards, under the Atal Innovation Mission, has the objective of developing novel disruptive technologies that are ultra-low cost, low maintenance, durable and customised to the local conditions of India. AGC will award grand prizes to anyone who delivers in a timely manner the desired solution as per the challenge specific criteria. NITI Aayog has called on the national and the international community to join the initiative and in finding solutions to the most intractable problems.

Wide spread adoption and deployment of these disruptive solutions will result in economic transformation of the bottom 70% and beyond of the population and elimination of poverty. An additional objective is to further energize the local scientific and engineering community/academic institutions and engage them in innovative research and development towards finding novel solutions. Yet another objective is to make India a source of innovation and novel products to address similar problems faced by bottom 5 billion people of the world and in the process also accelerate our own economy.

Atal Tinkering Labs

With a vision to 'Cultivate one Million children in India as Neoteric Innovators', Atal Innovation Mission is establishing Atal Tinkering Laboratories (ATLs) in schools across India. The objective of this scheme is to foster curiosity, creativity and imagination in young minds; and inculcate skills such as design mindset, computational thinking, adaptive learning, physical computing etc.

ATL is a work space where young minds can give shape to their ideas through hands on do-it-yourself mode; and learn innovation skills. Young children will get a chance to work with tools and equipment to understand the concepts of STEM (Science,

Technology, Engineering and Math). ATL would contain educational and learning 'do it yourself' kits and equipment on – science, electronics, robotics, open source microcontroller boards, sensors and 3D printers and computers. Other desirable facilities include meeting rooms and video conferencing facility.

In order to foster inventiveness among students, ATL can conduct different activities ranging from regional and national level competitions, exhibitions, workshops on problem solving, designing and fabrication of products, lecture series etc. at periodic intervals.

AIM will provide grant-in-aid that includes a one-time establishment cost of Rs. 10 lakh and operational expenses of Rs. 10 lakh for a maximum period of 5 years to each ATL.

Atal Incubation Centers

AIM intends to establish 'new' incubation centres (Atal Incubation Centres) across India by providing them with financial support. AICs would further support and encourage start-ups to become successful enterprises. They would provide necessary and adequate infrastructure along with high quality assistance or services to start-ups in their early stages of growth.

AICs would be established in subject specific areas such as manufacturing, transport, energy, health, education, agriculture, water and sanitation etc. Each AIC would be required to choose at least one area for specialisation.

AICs can be established either in public/private/public-private partnership mode. These can be established in:

- Academia - This includes higher educational institutes and R&D Institutions.
- Non-academic - This includes Companies/ Corporates/ Technology parks / Industrial Parks/ any individual/ group of individuals.

AIM will provide a grant-in-aid of Rs. 10 Crore to each AIC for a maximum of 5 years to cover the capital and operational expenditure cost in running the centre. The applicant would have to provide a built up space of at least 10,000 sq. ft to qualify for the financial support.

Scale-up support to established Incubators

The scheme envisages to augment capacity of the Established Incubation Centres in the country. It will provide financial scale-up support to enable Established Incubation Centres. The scheme would radically transform the start-up ecosystem in the country by upgrading the Established Incubation Centres to world-class standards.

- Legal entity registered in India as public, private or public-private partnership.
- Legal entity must be in operation for a minimum of three years.

Grant-in-aid support of Rs. 10 crore will be provided in two annual instalments of Rs. 5 crore each.

Catalyzing digital innovation ecosystems in Malaysia

Malaysia Digital Economy Corporation Sdn Bhd, Malaysia

<https://www.mdec.my>

The future lies in innovation, and at Malaysia Digital Economy Corporation (MDEC), we believe that being ahead of the technology curve is the way to future-proof businesses. Big Data Analytics (BDA), the Internet of Things (IoT), E-Commerce, and Data Centre & Cloud are our key focus areas that have been identified as catalysts that will kickstart and sustain an ecosystem of digital innovation, keeping us at the forefront of technology.

Big Data Analytics (BDA)

Malaysia is one of the few countries with a structured Big Data Analytics (BDA) roadmap to untap the value of big data. At the turning point of digital revolution, the powers of big data can be used to describe a problem, assess a situation, forecast results, and prepare solutions. Business owners, government, and citizens all stand to gain from Malaysia's vision as ASEAN's leading BDA solution hub.

To make this vision a reality, MDEC is spearheading this platform to lead efforts and create conversations. MDEC works to encourage and increase BDA adoption across all sectors by developing talent in the field of data science and enabling strategic partnerships, while introducing upskilling efforts and spurring integrated initiatives.

Our strategic initiatives are:

- Generating (Increasing) the usage of BDA in private sectors.
- Catalysing the adoption and usage of BDA in public sectors.
- Building the BDA industry in Malaysia.

To propel MDEC forward as an industry leader in ASEAN, we have set up the ASEAN Data Analytics eXchange (ADAX), a regional platform that brings together innovative talent development models and showcase the latest BDA technologies. A national initiative to benefit Malaysia, ADAX has the unique opportunity to serve a greater national agenda. This aspiration can only take flight by building a Big Data community through shared values, skills building and collaboration around a robust data analytic ecosystem.

By piloting advanced data analytics use cases for the ASEAN region and providing a co-working location for BDA start-ups and accelerators, ADAX has a unique opportunity to catalyse the migration of traditional organisations to become Data Driven Organisations.

Data centre & cloud

Malaysia's Data Centre & Cloud industry is marked by broad trends of expansion, efficiency, and consolidation. Rising above

comparisons like China, Indonesia, and India, Malaysia holds the advantage in attracting potential clients and investors thanks to a climate of political stability, location that is free from natural disasters, and competitive real estate market. With a year-over-year growth of over 20% in the last five years in Malaysia, the field of digital data management has never been more ripe for the picking.

The main strategy for the proliferation of data centre and cloud is to cement Malaysia's position as the epicentre for technology-driven delivery of digital content and services in the region, with centres spanning 5 million sq ft by 2020. MDEC works to position Malaysia as a regional hub for data centre and cloud services by leveraging on various factors such as cost efficiency, availability of skilled workers, and a strong foundation of data governance laws.

Local data cloud players are strengthened through MDEC's initiatives by priming their high-value services to be regionally competitive. This is done by facilitating the growth of data centre parks in strategic locations through world-class physical and soft infrastructure.

International businesses also stand to gain from MDEC's FDI policy as it offers an attractive portfolio of incentives for Cloud/Internet Giants to invest and set up facilities in Malaysia.

E-commerce

We live in a time where half the population are digital buyers, which is why e-commerce is an important stepping block to 'future proof' existing businesses while opening up market access. However, the eCommerce ecosystem development in Malaysia is still at an early stage.

According to A.T. Kearney findings under the [National E-Commerce Strategic Roadmap](#), Malaysia is at a turning point of e-commerce growth which must be sped up through government involvement. Issues that need to be resolved are lack of offerings, poor fulfilment experience, low adoption and awareness and lack of supporting ecosystem.

For Malaysia to move beyond the early stage, it needs a strong support and focused government intervention to drive it forward to the growth stage. Through efforts such as #MYCYBERSALE which started in 2014, we have achieved RM67 million Gross Merchandise Value (GMV) in 2014 and RM117 million in 2015. This was made possible by close cooperation with our eCommerce ecosystem players, thereby transforming Malaysia's e-commerce landscape.

In addition to programmes like #MYCYBERSALE, #MYGlobalExport, and eTRADE, the National e-Commerce Strategic Roadmap was developed to double the eCommerce growth rate from 10.8% to 20.8% by the year 2020. This is done through specific government interventions along these Six Strategic Thrusts:

- Accelerate seller adoption of e-commerce
- Increase adoption of e-Procurement by businesses
- Lift non-tariff barriers
- Realign existing economic incentives
- Make strategic investments in selected e-commerce player(s)
- Promote national brands to boost cross-border e-commerce

Internet of Things (IOT)

In the world of rapid digital interaction, IoT gives insights on how consumers integrate technology in their daily lives, a valuable information that can be used in various ways. The growing need for internet-related products and services is driving this transition, not only globally but also here in Malaysia.

In 2015, the Ministry of Science, Innovation & Technology Malaysia launched the National IoT Strategic Roadmap, which forecasted opportunities to reach RM9.5 billion in 2020 and RM42.5 billion in 2025. This is all done to create a national ecosystem to make IoT a new source of economic growth with its industrialisation and proliferation of use.

The National IoT Strategic Roadmap outlines 3 national goals:

- Malaysia as the Regional Development Hub for IoT
- Create a conducive IoT industry ecosystem
- Strengthen technopreneur capabilities in Apps & Services layer

The 3 long-term strategies for IoT are:

- Open Innovation Framework
- Open Community Data Framework
- IoT Malaysia

MDEC has been tasked to lead the IoT industry developmental charter called IoT Malaysia. With this mandate, we have focused our efforts on key verticals that will not only increase the digital adoption and growth of IoT in Malaysia, but also digitalize the way they operate, which include Smart Manufacturing, Smart Agriculture and Smart Transportation.

- Industry Development – to raise critical mass and competitiveness of IoT companies to drive demand
- Digital Transformation – to facilitate IoT adoption and proliferation through public-private partnership for business, government and citizen
- Ecosystem Development – to facilitate the development of IoT ecosystem and enabling environment

Big Data Project Inventory

The United Nations Global Working Group (GWG) on Big Data for Official Statistics has compiled an Inventory of Big Data projects (including exploratory research, feasibility studies, pilot projects and projects currently in production) that have implications for compiling official statistics and/or supporting the measurement of the SDG indicators. The aim is to share broad information about potential Big Data projects in the statistical community and share specific information about partnerships, data sources, and tools. The Inventory includes information such as the objective of the project; the Big Data source used; data access and the use of partnerships; applicability to specific domain(s) of official statistics and/or SDG indicators; methods and technology used; and assessment of quality, among others. The GWG collected this information from the statistical community in two surveys conducted in 2014 and 2015.

The GWG investigates the benefits and challenges of Big Data, including the potential for monitoring and reporting on the sustainable development goals. In this context, the GWG and the greater official statistical community recognize the need to adequately address issues pertaining to methodology, quality, technology, data access, legislation, privacy, management and finance, and provide adequate cost-benefit analyses on the use of Big Data.

This inventory is a joint product of the World Bank and the United Nations Statistics Division (UNSD) put together on behalf of the UN Global Working Group (GWG) on Big Data for Official Statistics.

For more information, access:

<https://unstats.un.org/bigdata/inventory/>

Green ratings in India

Small Industries Development Bank of India (SIDBI), India

<http://smallb.sidbi.in>

Green rating is an estimate of an industry's environment friendliness. It assesses the adverse impact on environment caused by an industry's activities and methods adopted by an industry to minimize the damage. This assessment is done by a credible third party evaluator. The rating is arrived at after considering industry's current processes and technology and their impact on the environment, adoption of clean technology and various processes adopted for mitigating adverse impact on environment. The incentives which were announced in Budget 2014 will cover broader scope of green technology activities in the areas of energy, transportation, building, waste management, and supporting services activities. It also facilitates the transition of the expired (by 31 December 2015) tax incentives relating to renewable energy (RE) and energy efficiency (EE) projects under the Promotion of Investment Act (PIA), 1986.

Relevance of green rating around the world

Rapid industrialization and the associated global warming have placed a question mark on the sustainability of the planet's delicate ecological balance. The "United Nations Framework Convention on Climate Change (UNFCCC)" and more particularly the "Kyoto Protocol" have placed stringent and legally binding Green House Gas (GHG) emission norms on developed / industrialized countries. Countries like the USA and those within the EU have also imposed carbon taxes on fossil fuel based industries.

The increased awareness about environmental degradation is making environmental regulations more stringent the world over. The MSME sector cannot remain insulated from this trend. Exporting MSMEs may soon see themselves set against trade barriers such as the impending imposition of carbon taxes by European countries. In order to position themselves as responsible corporate citizens and as a preventive measure against probable censure from environmental organizations like Green Peace, MSMEs will feel the need for Green Ratings in near future.

Green rating in India

Green Rating initiatives in India are spread across various sectors ranging from buildings to manufacturing industries.

Green building initiative

In order to create more energy efficient and eco-friendly buildings, the Ministry of New and Renewable Energy in collaboration with The Energy and Resource Institute (TERI) initiated Green Rating for Integrated Habitat Assessment (GRIHA), the National Rating System for Green Buildings in India. GRIHA rating system consists of 34 criteria categorized under various sections such as site selection and site planning, conservation and efficient utilization of resources, building operation and maintenance, and Innovation points. For further details, visit GRIHA.

Green rating project

It is a non-government initiative launched by Centre for Science & Environment (CSE) in 1995 to guide Indian industries to improve their environmental performance. The project mainly relied on voluntary participation of companies and depended up on the company's eagerness to avoid bad publicity as these ratings are released for public. Along with the assignment of Green Rating, the initiative charted out steps need to be taken by each industry to improve their performance. In majority of the cases, the companies have implemented the road map provided by CSE. The industries covered in this project are paper and pulp, cement, automobile and the chlor alkali sector. For further details visit Green Rating Programme. A larger proportion of companies rated for green credentials under this programme are large enterprises.

SMERA green ratings

In India Green Rating of enterprises is offered by SME Rating Agency of India Limited (SMERA). Green Rating is a joint initiative of SMERA and SIDBI. The Energy and Resource Institute (TERI) acts as a Knowledge Partner. SIDBI promotes and facilitates the process by offering credit at concessional rate to Green Rated companies. The Government of India (GoI) has urged lending institutions to encourage borrowing MSMEs to go for "Green Rating".

SMERA is only agency that exclusively caters to Indian MSMEs' "Green Rating" needs. Read extract on Green Ratings from OPTIMISM (SIDBI bi-monthly magazine).

Benefits of green rating

- An independent third party evaluation about environment friendliness: It indicates that the MSME is conscious about its duty towards environment and society at large
- Credit at concessional rate: It will help a MSME to obtain credit at a concessional rate from lenders like SIDBI
- Mitigation of environmental risk: It reduces the risk associated with the stringent environmental norms that is becoming stricter
- Confidence among value chain partners: The rating assures lenders, buyers, collaborators, JV partners that the MSME is a responsible corporate citizen and does not adversely impact ecology
- Self-assessment tool: Green Rating is a self-assessment tool that can be used to identify areas of improvement
- Creating awareness: Green Rating awarded by an independent agency improves the visibility of MSME in the eyes of various stakeholders like buyers, suppliers, collaborators/JV partners etc

Green rating process

A typical Green Rating process is described in the below diagram. Typically the entire process starting from information receipt to assignment of rating takes 15 business days (Source: SMERA). The cost of Green Rating conducted by SMERA is Rs. 50,000 (Service tax extra).

1. Request for Rating by MSME
2. Submission of Financial and Managerial Information
3. Finalising the Assignment and Detailed Questionnaire
4. Site Visit and Discussion with Management
5. In-Depth Analysis, Industry Research and Draft Report
6. Proposed Rating before Rating Committee
7. MSME Advised on Rating
8. Appeal before Rating Committee
9. Publishing of Final Rating

Indicative list of documents required

1. SSI registration certificate/Entrepreneurs memorandum

2. Audited accounts report and balance sheet of last three years
3. Pollution control certificate for air, water & noise pollution
4. Latest test results conducted by Pollution Control Board
5. ISO Certificate or any other quality certificate
6. Energy audit certificate, if any
7. Details of process map and energy usage as per process map
8. Any specific step by unit to mitigate harmful impact on environment

How can I use a green rating?

- To establish MSME as a responsible corporate citizen who is sensitive to the environment
- Establishing credibility in the eyes of buyers, suppliers, technical collaborators, JV partners
- To execute projects in environmentally sensitive areas
- To identify the best practices prevailing in the industry and areas of improvement

WIPO GREEN

The Marketplace for Sustainable Technology

WIPO GREEN is an interactive marketplace that promotes innovation and diffusion of green technologies. It does this by connecting technology and service providers with those seeking innovative solutions. WIPO GREEN consists of an online database and network that brings together a wide range of players in the green technology innovation value chain, and connects owners of new technologies with individuals or companies who might be looking to commercialize, license or otherwise distribute a green technology. In this way, the database helps not only to accelerate innovation and diffusion of green technologies, but also contribute to the efforts of developing countries in addressing climate change.

WIPO GREEN contributes to green technology innovation and transfer by bringing together a wide range of technologies and players in the green technology innovation value chain. It connects owners of new technologies with individuals or companies looking to commercialize, license or otherwise access or distribute a green technology.

WIPO GREEN's database assembles in one place technologies at all stages of development, from upstream research to marketable products (and everything in between). These technologies are available for license, collaboration, joint ventures and sale. It therefore adds greater transparency to the market for green technology.

In addition to matchmaking via the database and Partner initiatives, from time to time WIPO GREEN organizes regional matchmaking projects focused on specific fields of technology. Through these matchmaking events, WIPO GREEN brings together providers and seekers of technologies and/or services as well as other facilitators and experts from the WIPO GREEN network and beyond. The WIPO GREEN Network facilitates commercial relationships and transactions by connecting green technology providers and seekers.

For more information, access:

<https://www3.wipo.int/wipogreen/en/>

Eco-innovation

United Nations Environment Programme

<http://www.unep.org/ecoinnovationproject/>

Eco-innovation provides a win-win solution to improving economic competitiveness and sustainability as it starts at the company strategy level and extends influence beyond the company gates to the supply chain

Eco-innovation aims at reducing impacts on the environment, enhancing resilience to environmental pressures, or achieving a more efficient and responsible use of natural resources. The growing market, reputational and regulatory pressures in response to rising resource scarcity and environmental degradation reinforce therefore the business case for eco-innovation.

Operationally, it works through a new business strategy that incorporates sustainability throughout all business operations, based on life cycle thinking and involves partners across the value chain. By implementing a set of coordinated modifications to products (goods / services), processes, market approaches and organizational structures, eco-innovation enables the creation of novel solutions leading to enhanced sustainability performance and competitiveness.

Harnessing eco-innovation for sustainable development

Alarming high levels of resource depletion, and environmental pollution from current production and consumption patterns are pushing the limits of sustainability. Multi-faceted and profound transformations are required to realign development towards a more resource efficient economy. This implies the creation of new strategies, products, processes and practices as well as shifts in consumption behaviour. Eco-Innovation holds the potential for systemic change through creating and meeting a demand for sustainable goods and services.

This is particularly important for developing and transition economies with growing manufacturing sectors. In many of these economies, small and medium-sized enterprises (SMEs) are key to economic activity and growth, providing up to two thirds of formal employment. Unsustainable production practices and business models however hinder company growth. This points to a number of challenges that SMEs in these countries face, such as access to finance and technology, that ultimately make them less competitive in the global market. Eco-Innovation breaks this "business as usual" routine to address these challenges.

What creates an enabling environment for eco-innovation?

For eco-innovation to be viable in the long-run, the following create a conducive environment:

- Business case
- Technical knowledge and expertise
- Enabling policy framework
- Regional and international cooperation

The business case for eco-innovation

- The Business Case for Eco-Innovation publication outlines the key business drivers to implement eco-innovation. It builds on company examples spanning sectors across the globe that generated significant business benefits from eco-innovation.
- In conjunction, a technical Eco-innovation Manual has been developed for implementing partners to identify opportunities and develop strategies to implement eco-innovation. The Manual is complemented by supplements for the agri-food, chemicals and metals sectors.
- The Manual's approach has been validated through a number of regional expert meetings to confirm the eco-innovation approach in different countries and contexts. It is now being piloted through demonstration projects in the countries highlighted on the map above.

The policy & technology context

- The Mainstreaming SCP Policy for Eco-Innovation guideline aims to inform implementing partners about proactive ways to support a policy framework that will stimulate sustainable production and consumption through ecoinnovation. National level action planning will be carried out in countries highlighted on the map above, with some initial activities implemented within the project span.
- The Technology dimension is also highlighted as part of the conducive framework for eco-innovation. The publication Technologies for Eco-Innovation includes an assessment of the 'enablers' for the uptake of technologies for eco-innovation. In turn, this will support implementing partners in assisting SMEs in the identification, adaptation and development of technology for eco-innovation.

Scaling up eco-innovation lessons

- A Final Compendium of best practices and lessons from pilot demonstration projects will be compiled upon their conclusion.

The Eco-Innovation Project

Promoting Resource Efficiency and Eco-innovation in Developing and Transition Economies (REEDTE)

In partnership with the European Commission (EC), UNEP is currently implementing a four-year project to promote resource efficiency and eco-innovation. The project aims to change consumption and production patterns in developing and transition economies by encouraging businesses to reduce their environmental footprint.

The project targets the global network of Resource Efficient and Cleaner Production (RECP) intermediaries, in particular National Cleaner Production Centres and Programmes (NCPCs) and other providers of RECP services. Intermediaries and business supporting institutions can also include local governments, private corporations, non-profit organizations, business associations and academic institutions. They support particularly SMEs and are facilitators of knowledge, experience, funding sources and business contacts.

National implementation activities

Earlier this year Calls for Proposals were launched for the regions of Africa, Asia-Pacific, and Latin America and the Caribbean for:

Pilot Application of Eco-innovation in SMEs and Mainstreaming of SCP Policy for Eco-innovation. Service providers and institutions in the fields of resource efficient and cleaner production (RECP), innovation and other technical areas were invited to submit proposals. UNEP received a total of 64 project proposals, and nine countries have been selected after a thorough evaluation process.

The implementing countries are:

- Pilot application of Eco-innovation in SMEs: Colombia (Chemicals), Egypt (Chemicals), Malaysia (Chemicals), Peru (Metals), South Africa (Metals), Sri Lanka (Agri-food), Vietnam (Agri-food), Uganda (Agri-food).
- Mainstreaming SCP Policy for Eco-innovation : Colombia, Kenya, Peru, Vietnam.

The REEDTE Project is a partnership between UNEP and the EC.

Selected Renewable Energy Publications

Renewable Energy Statistics 2018

The Renewable Energy Statistics 2018 yearbook shows data sets on renewable power-generation capacity for 2008-2017, renewable power generation for 2008-2016 and renewable energy balances for about 120 countries and areas for 2015 and 2016. Further, it features statistics on investments in renewable energy compiled from the OECD-DAC database and 20 major multi-lateral, bilateral and national development financial institutions, presented for the period 2009-2016.

Renewable Capacity Statistics 2018

This publication presents renewable power generation capacity statistics for the last decade (2008-2017) in trilingual tables. For most countries and technologies, the data reflects the capacity installed and connected at the end of the calendar year. Data has been obtained from a variety of sources, including IRENA's questionnaire, official national statistics, industry association reports, other reports and news articles.

Renewable Energy Market Analysis: Southeast Asia

This regional market analysis examines the challenges of economic and population growth, the need to boost energy supply, and growing environmental and energy security concerns. Some insights into the diversity of socio-economic benefits are captured in six case studies, together with a summary of key findings that have emerged from these insights.

Power system flexibility for the energy transition

This report from the International Renewable Energy Agency (IRENA) outlines a planning approach to boost flexibility, specifically to accommodate the largest possible shares of variable renewable (solar and wind) energy sources. The report comes in two parts: Overview for policy makers outlines a range of options to scale up system flexibility; and IRENA FlexTool methodology provides guidance for technical experts on the use of the underlying assessment tool.

For more information, access:

*International Renewable Energy Agency
Masdar City, P.O. Box 236, Abu Dhabi
United Arab Emirates
Tel: +97124179000
E-mail: info@irena.org
Web: <https://www.irena.org>*

TECHNOLOGY OFFERS

CHINA

Fogger sprayer and high-range sprayer

Description

6HY series fogger sprayers and 6HW series high-range sprayers, which are successfully developed by Nanjing Forestry University in collaboration with Nantong Guangyi Mechanical & Electrical Co. Ltd, are the achievements of the national science and technology projects in the 8th-Five-Year-Plan and the State 948 Project. These are mainly used in sanitation and epidemic prevention, pests and diseases control in forests and rubber plants in agriculture. They have the features of high efficiency, low consumption of pesticide, low cost, good droplet penetration. The 6HW series high-range sprayers have widely used in pests and disease control in farmland shelter-forests, plantation along freeways. The vertical range can reach 25-30m, so they are suitable machines for pests and disease control of high trees.

Area of Application

- The 6HY series fogger sprayers are mainly used in sanitation and epidemic prevention, pests and diseases control in forests and rubber plants in agriculture.
- 6HW series high-range sprayers are widely used in pests and disease control in farmland shelter-forests, plantation along freeways.

Advantages

- 6HY series fogger sprayers have the features of high efficiency, low consumption of pesticide, low cost, good droplet penetration.
- For 6HW series high-range sprayers, the vertical range can reach 25-30m, so they are suitable machines for pests and disease control of high trees.

Environmental Aspects

Energy efficiency

Development Status

Fully commercialized

Legal Protection

Patent

Transfer Terms

Equipment supply

Contact:

Nanjing International Technology Transfer Center (NITTC)
No.11 Baochang North Road, Libao Town, Haian County, Jiangsu
Province
Nantong
China
Zip/Pin Code: 226631

Areas of Application

- Environment protection
- Agriculture
- tourism
- War against malaria, dengi and mosquito-borne diseases
- Veterinary products, professional veterinary and home veterinary markets with targeted medical claims.

Advantages

- The special low-density highly porous carrier material can absorb a lot of liquid (i.e. double of its weight), namely the fermentation liquor containing larvicides.
- The air-drying in mild conditions gives a stabilized encapsulated biological mosquito killing agent without liophylization step.
- The chemical composition of the granules gives an appropriate medium to stabilize and enhance the effectivity of the enzymes of larvicides.

Advantages of the product

- Low-density and sizes
- Cheap air-spreadability
- High surface density on water
- Controlled larvicide capacity
- Floatability and time-dependent sinkability
- Low production costs
- Selectivity for blood-sucking mosquitoes
- Combinability with other active ingredients
- No environmental pollution
- Long storage ability
- Combination with attractants for female mosquitoes to put larva in a treated area

Environmental aspects

- Cleaner production
- Energy efficiency

Development Status

Pilot plant

Legal Protection

Patent

Technical specifications

The subject of the present invention are carrier materials for mosquito-larvae killing pesticides (carrier composites). Numerous insecticide preparations have already been developed for exterminating.

Transfer Terms

- Technical services
- Technology licensing
- Equipment supply

Technical specifications

Worldwide

HUNGARY

Carrier materials for mosquito-larvae killing pesticides

Background information

Our partner, a Hungarian Institute has developed a novel way for the production of carrier materials for mosquito-larvae killing pesticides. They are interested in a license agreement for the production of pesticide carrier substrate or selling of production equipments or the carrier material itself.

Continuous room-temperature biodiesel production

Description

Our partner, a Hungarian Institute has developed a novel continuous process for the room-temperature production of biodiesel. The main advantage of this technology is the avoidance of soap formation which so far cause many problems during biodiesel production (emulsion formation, washing problems, slow phase splitting, etc.) They are interested in a license agreement or selling of production equipments.

Areas of Application

Biofuel production plants, fuel mixing firms

Advantages

- Room temperature process, energy saving
- Avoidance of soap formation, thus many other problems do not occur, like: problems during emulsion formation; washing problems; and slow phase splitting
- Continuous production technology in a simple apparatus (tube reactor)
- Cheap catalyst removing (KHSO₄ or H₂SO₄) by recyclization of catalyst-removing KHSO₄ (acid) with regenerable ion-exchangers
- The byproducts (K₂SO₄, glycerol or methanol) can be used as rapeseed production fertilizer or starting material for biogas production
- No water in glycerol phase
- Low methanol and potassium content in the raw ester phase

Environmental Aspects

- Cleaner Production
- Energy efficiency

Development Status

Pilot plant

Legal Protection

Patent

Technical specifications

Vegetable oil methyl esters are generally produced at 60 °C in the presence of 1 % KOH/NaOMe catalyst with stirring for 15-60 min

Transfer Terms

- Technical services
- Technology licensing
- Equipment supply

Target Countries

Worldwide

Contact:

Laser Consult Ltd (Hungary)

H-6701 PO Box 1191.

Szeged

Hungary

Tea catechins as anti-aging compounds

Description

The present invention relates to the preparation of consumable composition for oral administration that contains tea catechins. The composition prepared by the process of this invention is useful in providing controlled release of catechins contained therein.

Area of Application

Application includes antiaging agents

Environmental Aspects

Environment friendly

Development Status

Laboratory model

Legal Protection

Patent

Transfer Terms

- Consultancy
- Technical services
- Technology licensing

Solvent tolerant bacterial lipase

Description

We could offer a technology to synthesize bacterial lipase that has potential applications in the food industry. Brief description of the process / product / technology developed- se to various polar and non-polar organic solvents for 2 h elucidates that the enzyme was stable to all organic solvents tested. The highest relative activity was achieved with chloroform (400%) followed by toluene (250%) and 1-The present invention provides an extra cellular bacterial lipase from *Pseudomonas mendocina* M-37 (MTCC 7054) with high stability and substrate specificity. The bacteria were isolated from oil industry effluent showing high activity on olive oil. The substrate specificity of *Pseudomonas mendocina* M-37 lipase shows that the lipase was especially more active towards the synthetic triglycerides and fatty acids esters that possesses butyryl group like benzyl butyrate (1120% relative activity), tributyrin (744%) and amyl butyrate (550%) respectively. The stability of lipase in organic solvents offers Advantages for ester synthesis. Exposure of M-37 lipaooctanol (215%).

Areas of Application

The bacterial lipase showing high activity in organic solvents and substrate specificity for butyrate esters has possible significant applications in food industry for ester synthesis. The esterification reactions in food industry are carried out in organic solvents and uses butyrate substrates. *Pseudomonas mendocina* lipase has possible applications in synthesis of flavour and fragrance esters; for organic synthesis and modification of fats and oils

Advantages

Pseudomonas mendocina lipase possessing high stability in organic solvents, high substrate specificity mainly for butyrate esters has possible significant applications in food industry for ester synthesis.

TECHNOLOGY OFFERS

INDIA

Environmental Aspects

Environment friendly

Development Status

Laboratory model

Legal Protection

Patent

Transfer Terms

- Consultancy
- Technical services
- Technology licensing

For the above three offers, contact

Amity University

Sector-125, Noida

Distt Gautam Buddha Nagar 201303

Uttar Pradesh

India

A novel compound with leishmanicidal activity

Description

One new unsaturated amide named as Piplamide, N-isobutyl-19-(3',4'-methylenedioxyphenyl)-2E,4E-nonadecadienamide, was isolated from the fruits of the Indian medicinal plant Piper longum by bioassay guided fractionation and isolation, using an in vitro promastigotes assay against of Leishmania donovani. The structure was elucidated on the basis of spectroscopic analysis. a) piplamide shows a very good antileishmanial activity against *Leishmania donovani* promastigotes.

Area of Application

- Piplamide could be evaluated as prospective enzyme inhibitor and could provide lead structure for further optimization of activity for use in antileishmanial drug development.
- Piperlongimin A and piperlongimin B could provide lead structures for the development of novel anticancer therapeutics.

Environmental Aspects

Environment friendly

Development Status

Laboratory model

Legal Protection

Patent

Transfer Terms

- Consultancy
- Technical services
- Technology licensing
- Research partnerships

For the above three offers, contact:

Amity University

Sector-125, Noida

Distt Gautam Buddha Nagar 201303

Uttar Pradesh

India

HUNGARY

Biofertilizers using industrial waste materials

Description

We can offer the technology to manufacture biofertilizers using waste material available from industries. We are interested in transferring this technology to potential business firms who are keen in the biofertilizer market.

Areas of Application

Agriculture

Advantages:

- Waste used is the cheapest source of growth media which has ever been used for production of biofertilizers and biopesticides.
- Effectively controls the pathogens of crops and fruits.
- Increases the growth and yield of the crops.
- Increased shelf life of the product at room temperature.
- Can be used as foliar application, seed treatment or soil treatment.

Environmental Aspects

Waste utilization

Development Status

Pilot plant

Legal Protection

Filed

Transfer Terms

- Joint venture
- Technical services
- Technology licensing
- Research partnerships

Target Countries

Worldwide

Contact:

Hiran Biotech, Research and Development Division,
66 Turner Road Cantt., Kanpur 208004, U.P., India

Neem based biopesticides

We provide technical assistance in the setting of manufacturing units of the biopesticides. The biopesticides manufactured using this technology are quite efficient and cost-effective.

Area of Application

Agriculture, Biotech, fertilizers, Microbiology

Advantages

Cost effective and efficacious products

Environmental Aspects

Chemical free organic products

Development Status

Fully Commercialized

Transfer Terms

- Consultancy

- Joint venture
- Technical services
- Research partnerships

Target Countries

Worldwide

Contact:

*Ishan Biotech, 45 - S, Adarshnagar,
Kunaraaghat, Gorakhpur 273008,
U.P., India*

Health care wheat flour

Health care wheat flour produced from wheat under a new mechanical and very hygienic process contains high percentage of fiber and vitamin – E. Around 400 grams of flour can be produced out of one kilogram of wheat. The rest of wheat can be used to produce maida. The health care wheat flour can be used to prepare chapatti and similar items. Chapatti made with health care flour will be soft, tasty and bowel friendly. The flour is free from additives and preservatives.

Area of Application

Food processing

Advantages:

A product very rich in fiber and vitamin – E. Hygienically produced after perfectly cleaning wheat.

Environmental Aspects

Cleaner production

Development Status

Commercial prototype

Transfer Terms

Turnkey

Target Countries

India

Contact:

*Department of agriculture
Innova Reserach Centre Pvt Ltd
Ochanthuruth, Kochi, 682508, India*

Oral care products

Scientists have developed a process for constructing nanoparticle-polymer complex for sustained release of active agents for oral care (for applications in toothpastes and oral rinses). Polymer multilayers are built up layer by layer on nanoparticles of 5-50 nm, consisting of a water repelling (hydrophobic) shell around a core of multiply (polyanion and polycation) charged material (the core can be of inorganics as silica, titania and/or clay) and encompassing outer layer with an affinity to the tooth enamel.

Area of Application

Oral hygiene application- sustained release of antimicrobial/ flavour compounds

Advantages

- Precisely controlled polymer multilayers can be built on nanoparticles without the requirement of the

cumbersome separation step after each coating of the polymer layers

- Active compounds localised as per the requirement by fine tuning the outer layer of the complexes- retained in the complex despite extensive rinsing with water
- Enables designing systems that can anchor and retain on the surface enamel of the teeth for extended periods by adjusting the ionic strengths

Development Status

- Laboratory model
- Commercial prototype

Legal Protection

Patent

Transfer Terms

Technology licensing

Contact:

*National Chemical Laboratory, CSIR
A208, PAML Building,
Dr Homi Bhabha Road,
Pune 411007, India*

Kitozan biofertilizer

We have five years' experience to produce Kitozan which we helped people to save environment and produce organic fruits and vegetable to feed people.

Area of Application

Biotechnology

Advantages

It can be used with any chemical and fertilizer. It can mix with water and feed for animal. It can change bad soil to be good soil also.

Environmental aspects

- Cleaner production
- Waste utilization
- Energy efficiency
- Systems integration

Development Status

Fully Commercialized

Legal Protection

- Trade mark
- Copyright

Transfer Terms

- Turnkey
- Others

Target Countries

Worldwide

Contact:

*Aloe Life Co. Ltd Thailand
24/548 Vibhawadee Road Donmuang
Bangkok 10210
Thailand*

Ethanol production plant

We are looking for a potential partner who can provide small scale Ethanol production plant.

Area of Application

Ethanol from Sweet shorgum/Sugarcane

Studies

Techno Feasibility Report

Project Type

New idea

Target Countries

India

Assistance from Partner

Complete plant on turnkey basis and equity partner

Contact:

Yugal Green Urja Solution private Limite
F-103, IRWO Classics, Rail Vihar, Sector 57
Gurgaon 122004, India

Manufacture of bio-fertilizers

Description

An Indian Non-Governmental Organization would like to start up a venture in bio-fertilizer industry. They need more information on the know-how of manufacturing aspects of biofertilizer and also about the cost factor.

Area of Application

Agriculture and Agroindustry, Biotechnology

Project Type

Start-up

Contact:

Mr. Preetam Singh Lingwal
Village: Thamana, Pauri Garhwal
Uttarakhand, India
E-mail: preetam.lingwal@gmail.com

Tocopherol production technology

An Indian manufacturing firm specialized in manufacturing and export of agro-based products, intend to construct a Tocopherol extraction plant. They are in need of technical assistance for this project.

Area of Application

Food processing

Project Type

New idea

Contact:

Mr. Ramesh
VEG Trading Company.
106/12, Prakasam Street. Erode, 638 001
Tamil Nadu, India
Tel: +91 424 2223846
Fax: +91 424 2218041
E-mail: ramesh@tasteefoods.com

TECHNOLOGY REQUESTS

White asparagus

A Peru based firm is interested in acquiring technology for production of White Asparagus. They need technology providers consultants and price quotes for this project.

Area of Application

Agriculture industry

Project Type

Start-up

Contact:

Mr. Antonio Donayre
Inversiones, Tacala SAC, Lima, Peru
E-mail: tacalasad@gmail.com

Biotechnology for wastewater treatment system

We are a wastewater service provider and we also research and develop new technology for water, wastewater and waste treatment. We need new idea of technology to develop our strength in this wastewater field, include cleaning canal, remove sediment in waterway, biogas, microbiology detector and treated system quality.

Area of Application

Biotechnology, Engineering, New technology

Studies

Environmental Impact Studies (EIA/EIS)

Project Type

Expansion/Modernisation

Target Countries

Worldwide

Assistance from Partner

Any kind of new technology to develop on the waste

Contact:

Utility Business Alliance
21 Tst Tower 16th floor., Viphavadee-rangsit rd., Jompol, Jatujak
Bangkok 10900
Thailand

Process to remove/extract proteins and polyphenols from plant materials

We are looking to identify new processes or technologies which are able to effectively remove / extract proteins and/or polyphenols from dried plant materials, with the aim of using the remaining material in a consumable product.

Area of Application

Consumable product

Transfer Terms

- venture
- Technical services
- Technology licensing

Project Type

New idea

Target Countries

Worldwide

Contact:

Strategic Allies Ltd.
The Red & White House 113, High Street Berkhamsted, U.K HP4 2 DJ

Selected Analytical Reports and Technology Platforms & Databases of APCTT

Analytical Reports (available online)

1. National Assessment Framework on Enabling Environment, Technology Innovation Ecosystem for Making Sustainable Energy Options Affordable and Accessible (For Indonesia and Lao People's Democratic Republic), January 2014
http://apctt.org/nis/sites/all/themes/nis/pdf/National-assessment-framework_-final_ESCAP.pdf
2. Report on the National Assessment Framework of Enabling Environment and Technology Innovation Eco-system for Making Sustainable Energy Options Affordable and Accessible – Indonesia, May 2014
http://apctt.org/nis/sites/all/themes/nis/pdf/Indonesia_Report-on-National-Assessment-of-Sustainable-Energy_optimized.pdf
3. Indonesia National Sustainable Energy Strategy Report on Enabling Environment and Technology Innovation Ecosystem for Affordable Sustainable Energy Options, May 2014
http://apctt.org/nis/sites/all/themes/nis/pdf/Indonesia-National-Strategy-Report_final.pdf
4. Report on the National Assessment Framework of Enabling Environment and Technology Innovation Ecosystem for Making Sustainable Energy Options Affordable and Accessible - LAO PDR, May 2014
http://apctt.org/nis/sites/all/themes/nis/pdf/Lao_Report-on-National-Assessment-of-Sustainable-Energy.pdf
5. Lao People's Democratic Republic National Sustainable Energy Strategy Report on Enabling Environment and Technology Innovation Ecosystem for Affordable Sustainable Energy Options, May 2014
http://apctt.org/nis/sites/all/themes/nis/pdf/Lao-National-Strategy-Report_final.pdf
6. National Innovation System (NIS) training manual - "NIS Diagnosis and STI Strategy Development to Achieve National Sustainable Development Goals", 2016
<http://apctt.org/nis/sites/all/themes/nis/pdf/NIS%20Training%20Manual.pdf>

Technology Platforms and Databases

1. APCTT's Technology4SME Database
The Technology4SME Database serves as an online platform for information exchange on the availability and sourcing of technologies for small and medium enterprises in countries in the Asia Pacific region.
<http://apctt.org/technology-transfer>
2. Renewable Energy Technology Bank
The primary objective of the Renewable Energy Cooperation-Network for the Asia Pacific (RECAP) established by APCTT is to facilitate technology transfer cooperation among countries in the Asia-Pacific region in the area of renewable energy. RET-Bank provides tested and proven renewable energy technologies (RETs) initially in the areas of solar, biomass, wind, mini-hydro power and geo-thermal energy.
<http://apctt.org/recap/renewable-energy-technology-bank>
3. Global Technology Databases
APCTT has compiled a list of global as well as country-wise technology databases that deal with the technology transfer related services for SMEs and entrepreneurs.
<http://apctt.org/apitude/>



Techmonitor.net

The website for YOU to

- Network with your potential technology partners
- Explore technology and business opportunities
- Know latest technological developments in

- Biotechnology
- Waste Technology
- Non-Conventional Energy
- Food Processing
- Ozone Layer Protection

- Read articles on

- Technology Trends
- Technology Markets
- Technology Transfer

- Gain knowledge on

- Start-up venture creation
- Venture financing
- Innovation management
- Technology transfer
- Green productivity

www.techmonitor.net
Website managed by

Value Added Technology Information Service
Asian and Pacific Centre for Transfer of Technology
New Delhi, India