

Mapping the Deep Tech Start-up Ecosystems in APAC

Report Developed For L'Oreal

FINAL REPORT - Draft

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F R O S T & S U L L I V A N

Introduction

Introduction

To Support L'Oréal to map start-up ecosystems in APAC in order to feed its open innovation strategy

Project Context

L'Oreal is reorganizing around 20 domains that will drive its development for the years to come. At the same time, Open Innovation remains a key pillar for L'Oréal, fuelling innovation pipeline and driving growth.

In order to better capture innovation opportunities and focus its efforts in the right areas, L'Oreal is looking for a mapping of the start-up ecosystems that are developing disruptive technologies in cosmetics and adjacent markets and that could be transferable into cosmetics.

Frost & Sullivan has developed this report to support L'Oreal in understanding the start-up ecosystems

Project objectives

1

Map start-up ecosystems at regional level within the main APAC countries

2

Identify the **influencer factors** that are **driving the growth** of these ecosystems

3

Forecast how the ecosystems will **evolve in the next 5 years**

Introduction

Key questions that this report will answer

Project objectives

1

Map start-up ecosystems at regional level within the main APAC countries



Key questions

- How are start-up ecosystems defined in the countries?
- What is the nature of recent start-ups? Which industries do they gravitate towards? Where are they based?
- Which are the leading start-up companies that have received funding?
- What are the leading incubators?
- Which universities and companies have the most spin-out companies?
- Among competing ecosystems, which are the best ones?

2

Identify the influencer factors that are **driving the growth** of these ecosystems



- What changes in government regulations and policies have supported or hurt the start-up market recently?
- What are the main funding streams for start-ups?
- What are the leading venture capital firms funding Start-ups? In which industries are they interested?
- What is the typical way that start-up companies engage with the VCs, incubators, angel investors?

3

Forecast how the ecosystems will evolve in the next 5 years



- What trends do we see in the start-up world in APAC recently? What is expected in the future?
- How can L'Oreal engage with the start-ups in APAC now?
- What are immediate opportunities to derive value from this ecosystem?

Introduction

Project Scope: The following countries and applications were selected by L'oreal

Dimension	In scope	Out of scope
Geographies	<p>8 geographic areas:</p> <ul style="list-style-type: none"> • China • Japan • South Korea • Singapore • Indonesia • Thailand <p>• India • Malaysia & Vietnam</p> <p>Regional focus within the countries selected (large urban areas, etc.)</p>	Other countries
Applications	<ul style="list-style-type: none"> • Cosmetics / Beauty • Pharma • MedTech (H&W) • Medical / cosmetic device manufacturing • Chemicals / Materials / Textile / 3D printing • Food • Agriculture <ul style="list-style-type: none"> • Biotech • Environment / Sustainability / Waste Management • Digital (AI, VR, big data, Cloud...) • Consumer IoT • Robotics 	<ul style="list-style-type: none"> • E-commerce • Fintech / Insurance • Industry 4.0 / Smart Manufacturing • Semi-conductors • Supply Chain • Energy <ul style="list-style-type: none"> • New Mobility (Shared mobility, EV, Autonomous Vehicle, Drones, etc.) • Education • Cyber-security • Others
Ecosystem players	<ul style="list-style-type: none"> • Focus on Start-ups with the links to their environment (Universities, Incubators, Business Angels, Venture Capital, Technology Transfer Offices, Regulator, etc.) 	<ul style="list-style-type: none"> • Academic research
Activities	<ul style="list-style-type: none"> • Mapping of current ecosystem, growth drivers and potential evolution 	<ul style="list-style-type: none"> • Exhaustive listing of start-ups • Market sizing • Partner scouting • Technology scouting

Introduction

Definitions

Definition of Startup

A startup is a company that is in the initial stage of its operations. These companies are often initially financed by their founders who then try to capitalize on developing a product or service for which there is a perceived demand. Since initial funding could be limited, these startups need to get funding from VCs, CVCs. They work with incubators for refining their innovation and developing a business model. They work with accelerators for scaling up their commercial operations.

For this study, most of the startups identified are less than 10 years old

Definition of a Deep Tech Company for this Project:

Unlike general technology such as digital platforms and apps, future “deep” technologies will advance the technical frontier. Deep-tech innovations are disruptive solutions built around unique, protected or hard-to-reproduce technological work or scientific advances.

Examples of Deep Tech Startups would include:

- Plcoskin, Korea: Research and development on regenerative skin, fillers, breast prosthesis for the next generation.
- Recens Medical, Ulsan, Korea: Development of the First Prototype Devices of Precision Cryotherapy

What it would not include:

- Sayurbox is a web-based platform that offers vegetables and fruit for healthy lifestyle.
- Cubicon is the most reliable, easy to use professional desktop 3D printer

Introduction F&S Approach (1/2)

Scan:

Frost & Sullivan first scanned Crunchbase, Govt sources, Portfolios of VCs, Incubators and Accelerators, media reports, tech blogs to get a list of startups in each application category. Key words were used to get the relevant results

Description of the Company's activities:

The description of the company's activities was important to determine if the company was deep tech or not
Investment numbers (if available) were obtained.

Validation:

Validation was done at the company website, Govt websites and media reports
Investment numbers (if available) were validated.

A Note on Accuracy:

Even with the above steps, its very difficult to get an accurate number of deep tech startups within the scope applications.
At best, F&S would be able to say that the deep tech startups identified is an indicator of the number of deep tech startups in the ecosystem.

This is not to be taken as the exact number of deep tech startups as the actual number could be higher. However, this count gives a reasonable estimation of the deep tech startup activity in the application category.

Some application areas such as IoT and H&W; or Food and H&W overlap. The companies have not been double counted.
The results from above steps combined with the L'Oreal team's suggestions were important for selecting the application categories for deep dive.

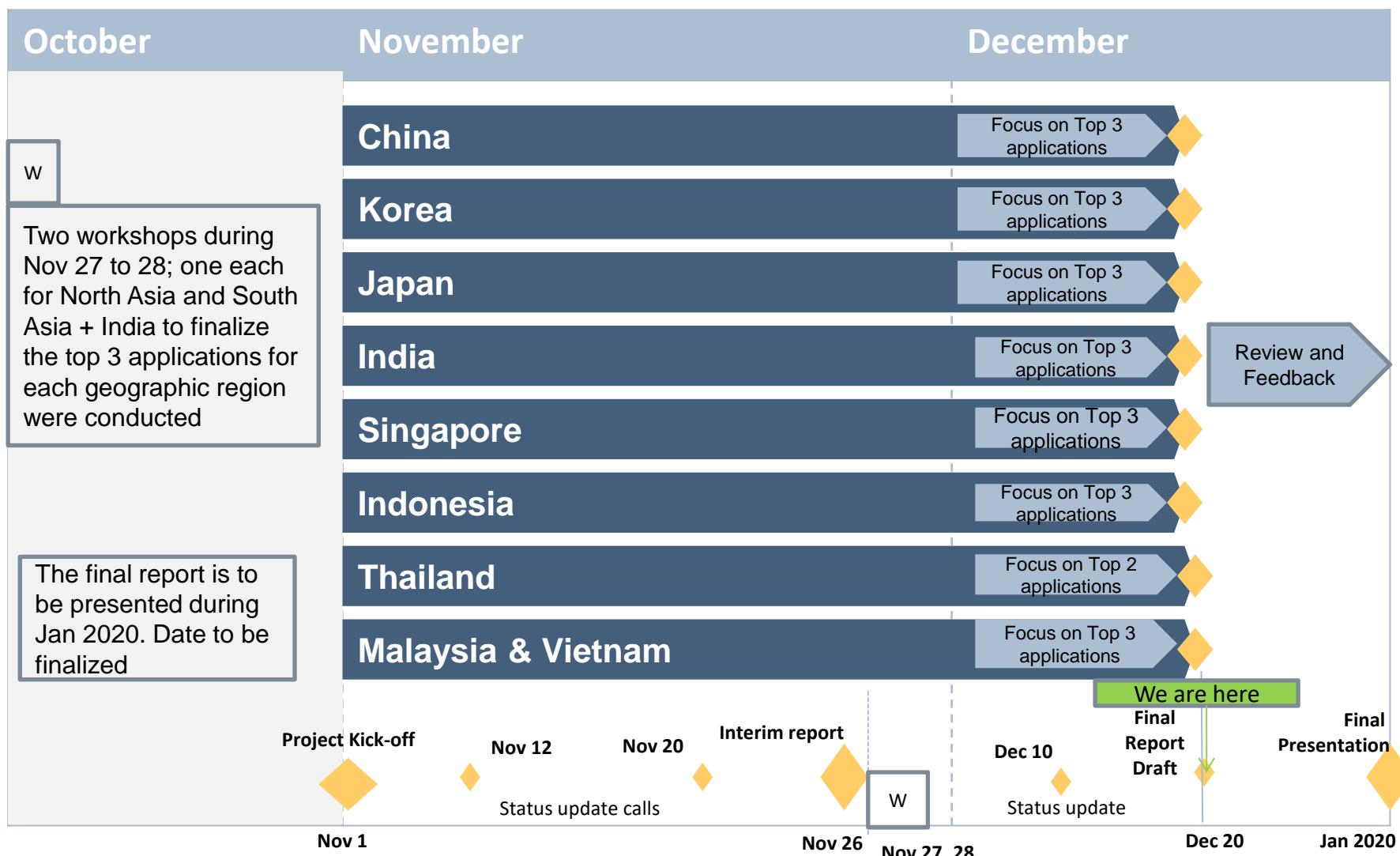
Introduction F&S Approach (2/2)

The approach for understanding the startup ecosystems :

- The deep tech startup ecosystem in the countries in scope for the 12 potential applications in scope were scanned to determine their current status and their potential evolution in the next 5 years.
- From this wide scan, the applications with better developed ecosystems were arrived at.
- Two workshops were conducted with the L'Oreal team to arrive at the top applications for the countries in scope.
- The input for the workshops was based on the initial findings from the preliminary studies
- L'Oreal country teams' inputs were also considered during the workshops for recommending the top applications for each country for deeper investigation
- The selected applications were scanned deeper to determine the status of the ecosystems, the startups, the main hubs, the key research institutes, large corporations, VCs, Incubators and Accelerators

Introduction: Timeline

The Project Kick Off was on Nov 1, 2019. The interim report was delivered Nov 26, 2019. Two workshops (one each for North Asia and ASEAN + India) were conducted on 27th and 28th Nov 2019 to finalize the application areas for each country. The final report draft was delivered Dec 20, 2019

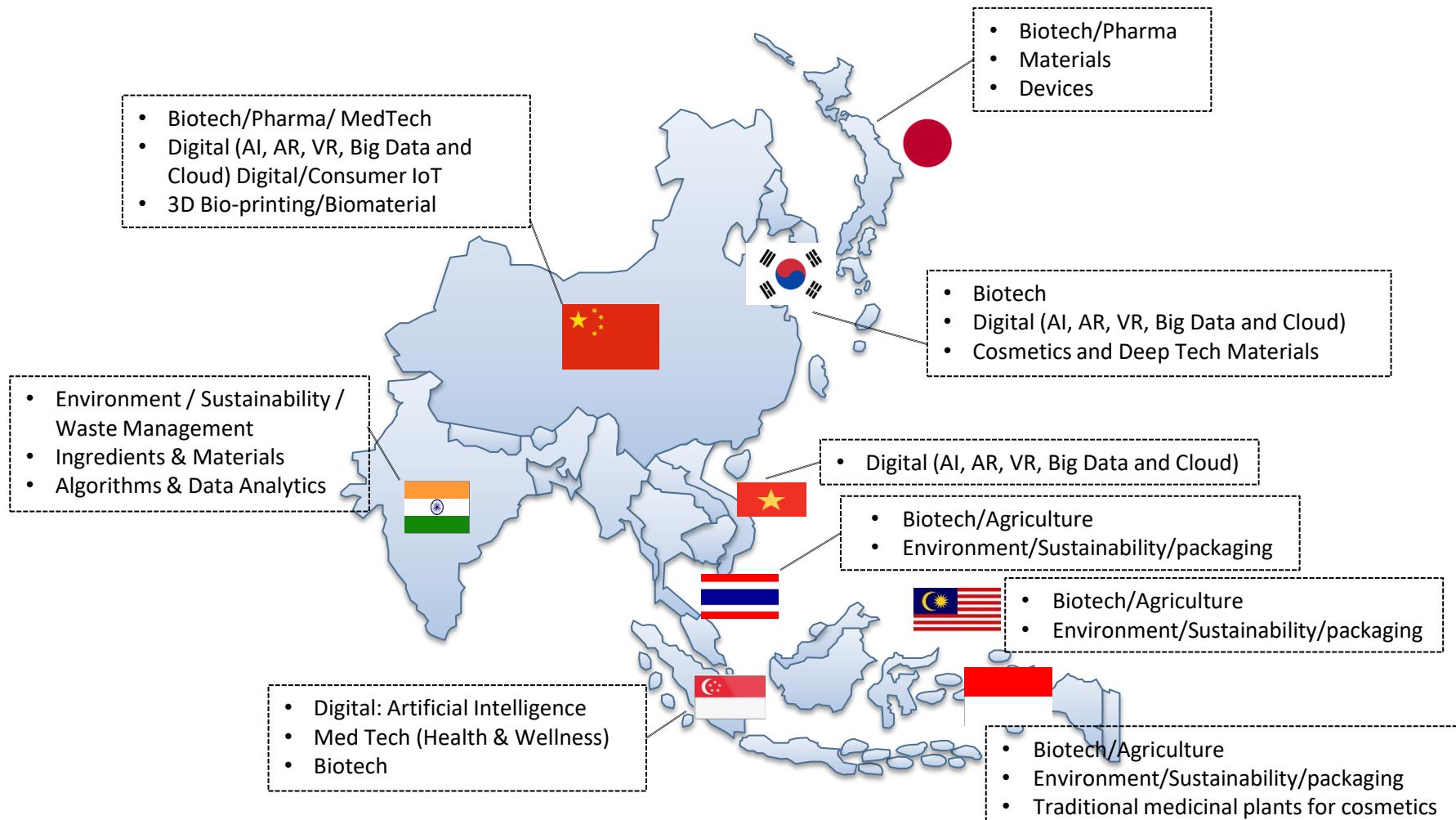


Executive Summary – Key Findings and Recommendations

Executive Summary - Key Findings

The APAC countries have evolving deep tech ecosystems that are dependent on the country's policies, technology research and funding availability

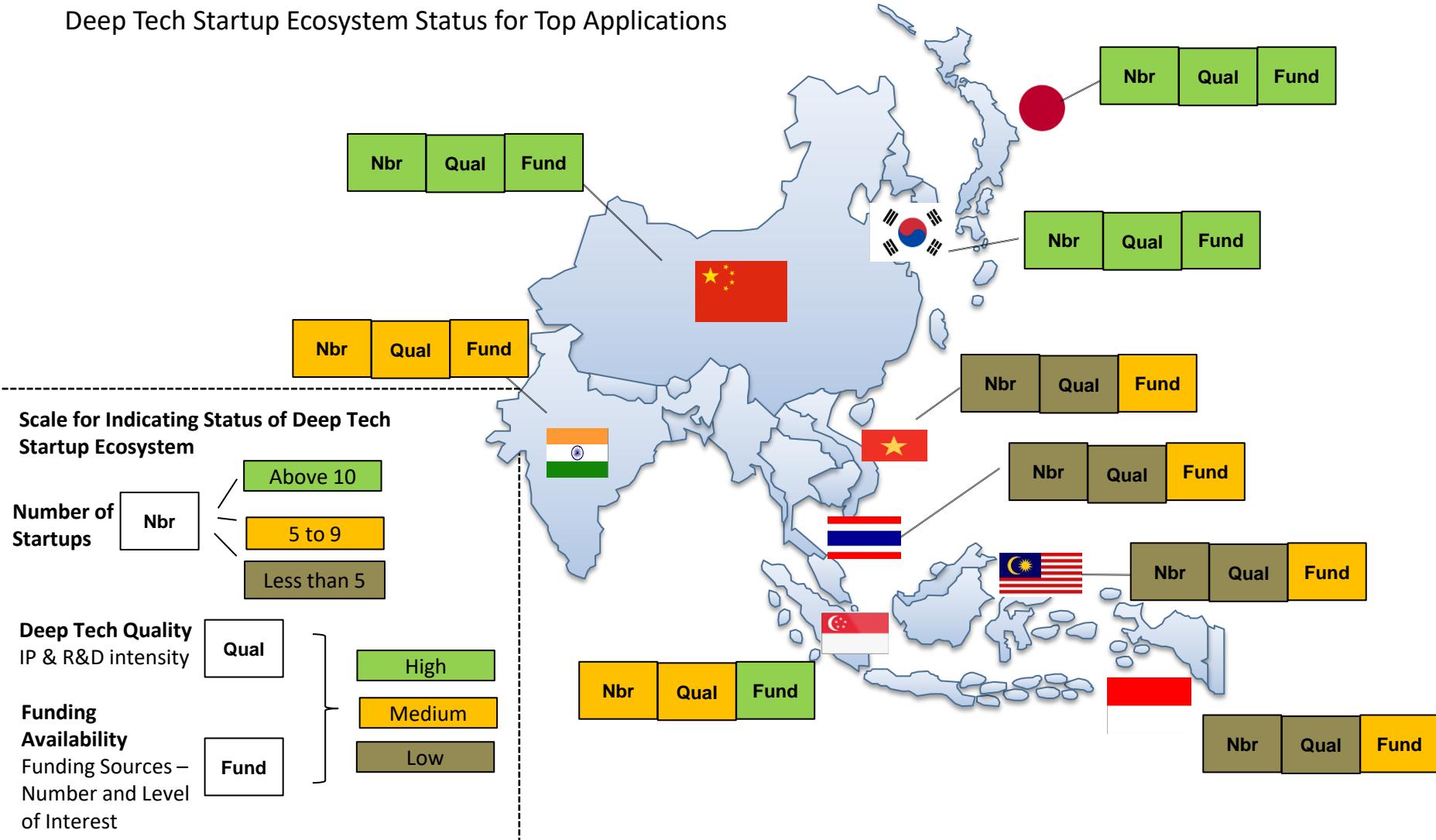
- The top applications with ecosystems that L'Oréal can tap into for open innovation



Executive Summary - Key Findings

North Asia has a much stronger deep tech startup ecosystem; India and Southeast Asia have good potential in certain applications that L’Oreal can tap into

Deep Tech Startup Ecosystem Status for Top Applications



Executive Summary – Recommendation

Action items for L’Oreal that would foster deep tech open innovation in APAC

1. The hubs identified in North Asia would be the first priority for L’Oreal for deep tech open innovation ideas.
 - i. China, Korea and Japan have better defined deep tech ecosystems compared to the other countries in this study. L’Oreal would need to establish contact with the leading VCs, incubators and accelerators in the countries to get more visibility on the startups. The identified startups can be monitored for development and subsequent collaboration.
 - ii. The three countries have very strong research institutes covering topics in the relevant application areas. It would be beneficial for L’Oreal to establish connections with the lead researchers at these institutes
 - iii. The large conglomerates are very active in research & development and also act as incubators for startups. Depending on L’Oreal’s preference, connections can be established with companies such as Tencent, Mitsui, Samsung and Hanwha.
 - iv. L’Oreal could invest in resources to participate in the deep tech ecosystems in these three countries
2. The deep tech ecosystems in India and Singapore are definitely showing signs of growth that will pick up during 2020 to 2025 timeframe.
 - i. The startups identified in India and Singapore could be monitored for collaboration. The VCs, incubators and accelerators identified can help monitor startups.
 - ii. Bengaluru is the most promising deep tech startup hub in India and Singapore is well poised to maintain its position as the leading deep tech startup hub in ASEAN. Establishing connections with government agencies and research institutes such as A*Star and SGInnovate would benefit L’Oreal.
 - iii. L’Oreal could invest in resources to regularly monitor the developing deep tech ecosystems in India and Singapore
3. In Indonesia, Thailand and Malaysia, startups and companies focusing on environmentally friendly packaging, extracts from indigenous plants for cosmetics, halal certified ingredients/products are expected to grow.
 - i. Some of these startups and companies have been identified. L’Oreal can monitor these startups and companies for potential collaboration.
 - ii. Government related agencies and incubators such as BioXcel, Malaysia, National Innovation Agency and NSTDA Thailand would be useful to obtain information on the innovation development in these countries
 - iii. L’Oreal would need to periodically check for development in the identified application areas

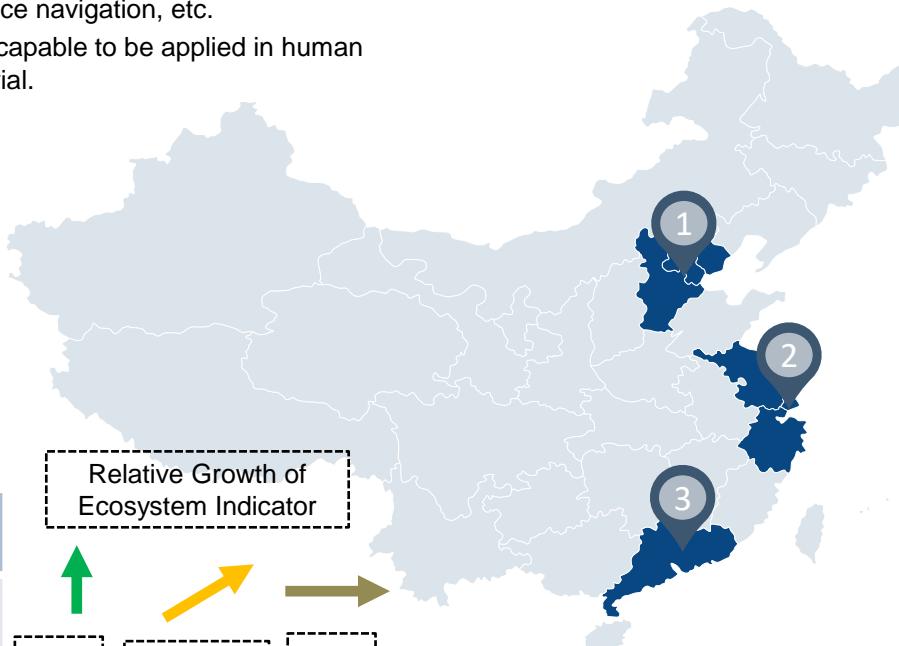
Executive Summary – Key Findings and Recommendations by Country

Executive Summary - Key Findings China



- The main applications of focus for China are:
 - Biotech/Pharma/MedTech: Biotech and pharmaceutical in anti-cancer therapy, genome screening and editing, stem cell, anti-aging beauty, innovative drug development, etc.
 - Digital /Consumer IoT: Artificial Intelligence in facial recognition, gait recognition, AI chip design, human-computer interaction, machine vision, intelligence navigation, etc.
 - 3D Bio-printing/Biomaterial: 3D Bio-printing technology that is capable to be applied in human tissue repairing or aesthetic medicine and the related biomaterial.
- Key start-up ecosystem drivers
 - Driver 1: Supportive government
 - Driver 2: Entrepreneurial aspirations of youngsters
 - Driver 3: National high-tech industrial development zones
 - Driver 4: Active venture capital and sufficient funding
- The future of start-up ecosystems (2020 to 2025)

While all three ecosystems are projected to grow positively, Biotech is expected to grow fastest



Key opportunities for L'Oréal

- The stem cell technology can be used in the development of anti-aging products for L'Oreal.
- The genetic engineering technology applied by these pharmaceutical companies can also be applied in next generation beauty products development.
- The data collected by smart skin test instrument for skins can be used for R&D, production, marketing of beauty brands owners such as L'Oreal via data analysis tools.
- 3D bio-printing technology and biomaterial could be used in the cosmetic medicine and beauty products development.

1. Beijing-Tianjin-Hebei Metropolitan Region (BTH)
2. Yangtze River Delta Metropolitan Region (YRD)
3. Pearl River Delta Metropolitan Region (PRD)



Executive Summary – Recommendations China (1/2)

- The startup ecosystems in China are concentrated in the three major metropolitan regions, the Beijing-Tianjin-Hebei Metropolitan Region (BTH), Yangtze River Delta Metropolitan Region (YRD) and Pearl River Delta Metropolitan Region (PRD). Beijing, Shanghai and Shenzhen/Guangzhou are the leading cities in innovation of the three metropolitan regions. L’Oreal can seek to work with startups and innovative projects in the three regions preferentially.
- Beijing has the most research resources in China. With more than 10 key universities, the city has the best tertiary education resource in China. Many research institutes under Chinese Academy of Sciences are also located in Beijing. Thus, there are many opportunities of cooperation between universities/research institutes and enterprise in Beijing. The top universities such as Peking University and Tsinghua University have their own incubation projects for students and faculties. It will be important to establish contact with Peking University, Tsinghua University and research institutes under Chinese Academy of Sciences as their researches are the most advanced in China. Actually, many cities also have their key universities and these universities are the innovative hubs for the region, such as Fudan University and Shanghai Jiaotong University in Shanghai, Zhejiang University in Hangzhou, Sun Yat-Sen University in Guangzhou. It is also important to establish contact with these universities.
- Financial Advisors (FA) in China have numerous potential projects for financing and equity trading. The FAs in China also play significant roles in the funding process of the startups in China. They are the bridges between startups and funding sources. Reaching leading FAs such as China Renaissance, China eCapital, Zero2IPO, etc., may help to obtain the latest information of innovative startups in China. As many startups will reach FAs for financing and equity trading, the FAs may have many potential projects in hand.
- All levels of government play important roles in the innovative system in China. It is recommended to reach out to the entrepreneurship office or scientific and technological innovation office of local governments when researching specific companies in one city or one High Tech Park in China. The local officers know the local startups very well, and they are glad to help.



Executive Summary – Recommendations China (2/2)

- For the Biotech/Pharma/MedTech, China now is leading in anti-cancer therapy, genome screening and editing, stem cell, etc. And all these technologies can be or have the potential to be applied in the anti-aging and beauty products. The basic technologies of next generation anti-aging and beauty products will be the biotech related technologies. The value chain of biotech in China is not well established, the companies who have the bargain power to impact the upstream will be more lucrative in the future. For the stem cell technology, companies with concrete applications that can be used in medical usages or have the genome screening and editing technology such as Long Long Life and EdiGene can be monitored. The companies that have the technologies in protein engineering such as iCarbonX are also worthy of attention as their technologies can improve or even manipulate the protein in human faces to slow down skin aging.
- For the Digital/Consumer IoT, China has the best companies in digital in the world. China has cultivated millions of talents in digital area including Consumer IoT. With abundant talents, the development cost of digital technology is very low in China. Thus, many startups can afford sizeable R&D teams to be engaged in product development. However, the plagiarism and imitation are also not uncommon in China, thus it is better to do due diligence earnestly before invest or acquire digital companies. The number of patents will be a vital reference value of a digital company. Actually, there are very limited companies in digital and consumer IoT whose business can be used in beauty industry directly, except Skinrun. The major business of Skinrun is developing smart skin test instrument with contains optical modules which can collect information of the testers' skin. The huge database for skins can be used for product development and marketing of skin care products. As for the database for skins, the cloud and AI technologies can be applied to store data and to do analytical work respectively. The startup CloudWalk, whose cloud and AI technologies are for human faces can be monitored further. SenseTime is another company that also has similar technologies.
- 3D Bio-printing/Biomaterial is an interdisciplinary field of 3D printing, biotech and material. This requires huge investment and technology accumulation. There are quite a few companies in 3D bio-printing and biomaterials. Some of these are not in the three major metropolitan regions. Thus, to search 3D bio-printing and biomaterial startups, it is suggested to enlarge the geographical range in China. Revotek, located in the West Zone of Chengdu Hi-Tech Industrial Development Zone, has cutting-edge technology in 3D bio-printing. The companies located in the three major metropolitan regions such as Medprin, Regenovo and Sunp Biotech are have high-growth potential in the future. The 3D bio-printing products and applications can be used in aesthetic medicine and other related fields. With the help of protein engineering or cell engineering, the 3D bio-printing can help to build muscular tissue in human faces to improve looks.

Executive Summary -Key Findings Korea



The ecosystems of the following applications have been identified for L'Oreal to target in South Korea:

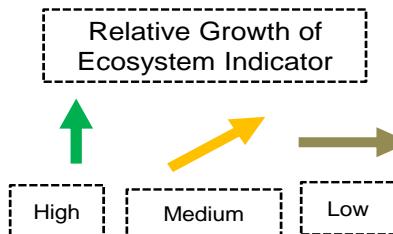
1. **Biotech:** Process for new molecules for pharma; cosmetics; Enzymes for biopharmaceuticals, cosmeceuticals; Extraction of new active ingredients; Stem cells, deregulated areas, bioconversion, fermentation, green tech; green pathways;
2. **Digital:** Artificial Intelligence for skincare ; AR, VR, Big Data and Cloud
3. **Cosmetics and Deep Tech materials:** Vegan cosmetics and materials that are developed in adjacent industries that can be used in cosmetics

Key start-up ecosystem drivers

- Startup Direct Fund and Tax Incentives are available for Startups
- Korea has established leading research institutes for each of the key industry sectors. KAIST, KEITI, KRIIBB, etc foster research and development in the country
- The government is investing in infrastructure for developing industrial clusters. The AI Complex, the medical clusters, etc are examples of such clusters

The future of start-up ecosystems

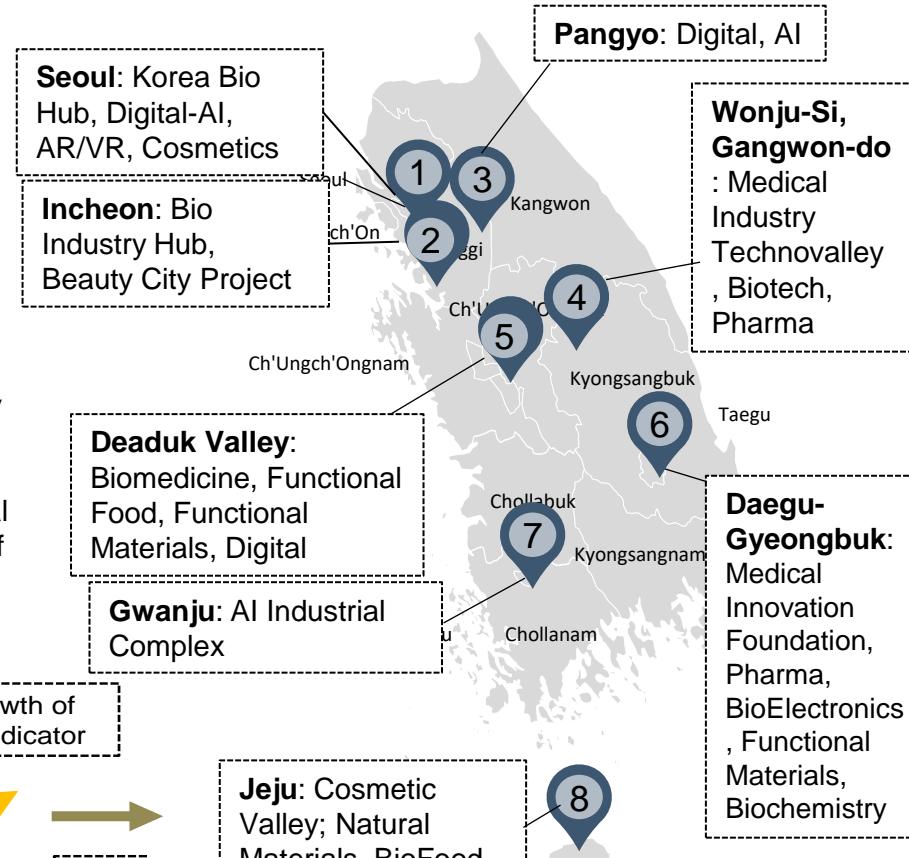
- Growth projected for all three ecosystems



Opportunities for L'Oreal:

- Biomaterials biopharmaceuticals and Regenerative medicine; Surgeries are using stem cells - cosmetic surgery, plastic surgery and dermatological treatments
- Emotion recognition, motion sensing, Analytics for skincare solutions; VR/AR solutions
- Vegan Cosmetics; Nanoparticles; Bioplastics;

South Korea – Geographic Concentration





Executive Summary – Recommendations Korea

- Korea presents good open innovation opportunities that L’Oreal can specifically target. Startups that L’Oreal can monitor are in next-generation regenerative skincare products, biomaterials, cosmeceuticals, and biopharmaceuticals, emotion recognition, motion sensing, analytics for skincare solutions, VR/AR solutions to enhance customer experience, vegan cosmetics, nanoparticles and bioplastics
- The interesting startups are Plcoskin, Exobio, General Bio, Lululabs, Looxid Labs, Acryl, Melixir, Biosynectics and Nanobricks, just to name a few
- It will be important to establish contact with the main research institutes such as KRIIBB, POSTECH, KAIST and KRICT
- TIPS Korea, Dreamplus, Born2Global are Incubators/Accelerators that can be approached
- Some VCs/Corporates to establish contact would be Honest Ventures, Stonebridge Capital, Innopolis Partners, Samsung Bioepis, Celltrion, and Samsung Ventures
- The important hubs would be Seoul-Incheon-Pangyo, Daejeon, Daegu, Deaduk, Gwanju and Jeju

Executive Summary - Key Findings

Japan

- The three main application focuses for Japan are:

Biotech/Pharma: Medicines derived from living organisms in biotech and from chemical basis in pharma.

Material: Advanced materials developed in various applications sectors yet usable in cosmetics

Devices: Electronic and connected devices (IoT) with potential applications in cosmetics and dermatology

- Key start-up ecosystem drivers

Driver 1: Record levels of investment from big corporations and VCs

Driver 2: Noticeable efforts from the government to promote and backup startup

Driver 3: Growing entrepreneurship spirit among the Japanese population

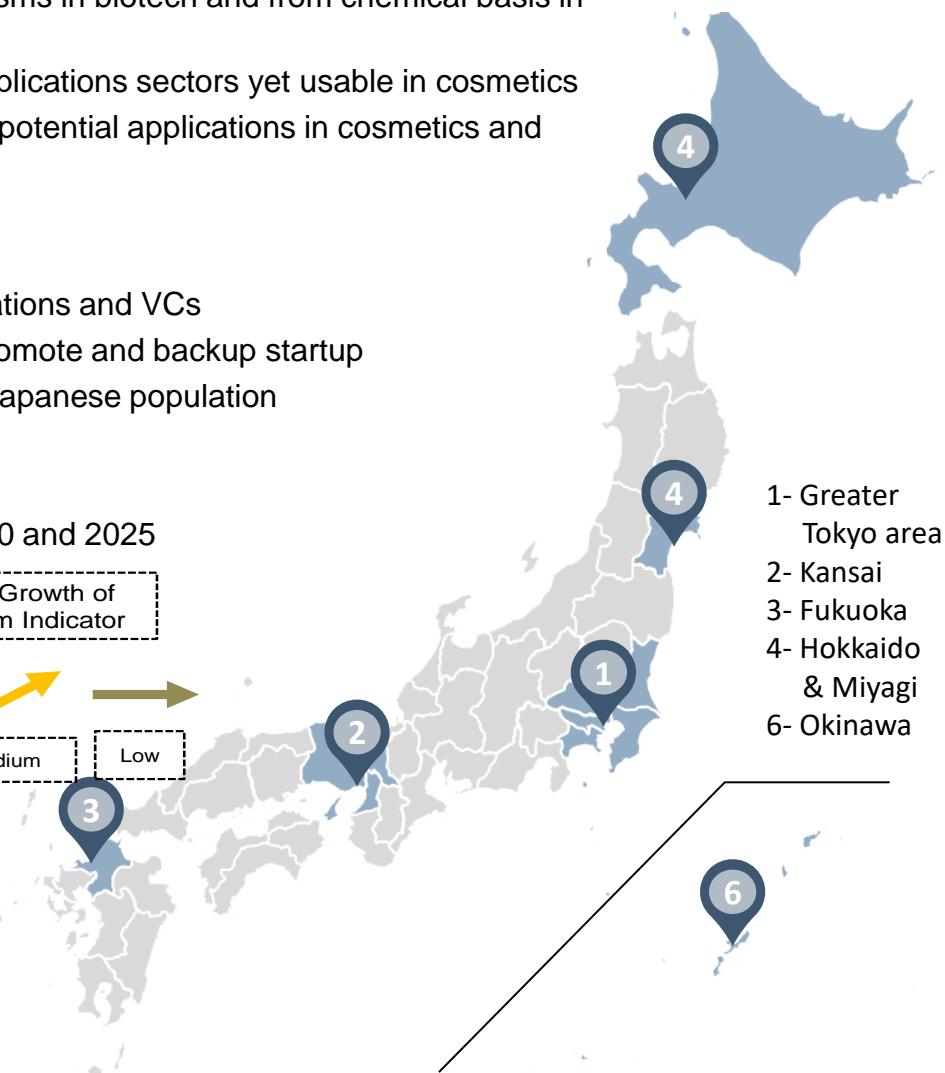
- The future of start-up ecosystems

All three applications will positively grow between 2020 and 2025



- Key opportunities for L'Oréal

- The strongest opportunity for L'Oréal lies in the Biotech/Pharma sector where the regenerative medicine is thriving.
- 3D printing of human tissue is also a subject attracting the interest of the government and investors.
- Devices for monitoring skin and hair condition



Executive Summary – Recommendations

Japan



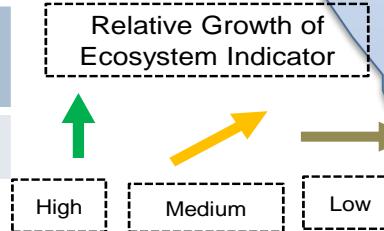
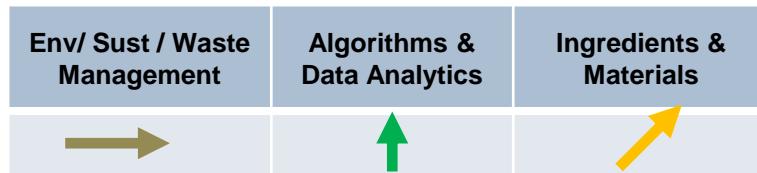
- L'Oréal can take advantage of the strength of Japan in biotech/pharma, more specifically in regenerative medicine, iPSC therapy, nucleic acids engineering, gene therapy, 3D printing of skin and living tissue, advanced material for probing or even connected medical devices
- In the coming years, it would be important to monitor the development of Bonac Corporation, Cyfuse Biomedica, Biomedical Solutions, Xenoma, Goryo Chemical, Synplogen, iHeart or AccuRNA among others
- Investigate further on the VCs JAFCO and Fast Track Initiative focusing on life sciences, and Beyond Next Venture and Real Tech Fund that start investment at the seed stage. Ventures from universities such as UtokyolPC, UTEC or OUVc are worse following since they primarily invest in deep tech developed in-house
- For an active connection with the deep tech startups ecosystems, J-startup and JETRO are important to get in touch, but also RIKEN, NEDO and MIMS for the high level of research they provide
- Important hubs in Japan for all type of deep tech are greater Tokyo (Tokyo, Chiba, Kanagawa, Ibaraki, Saitama), Kansai (Osaka, Kyoto, Kobe), Fukuoka, Miyagi, Hokkaido and Okinawa.

Executive Summary -Key Findings India



- The three main applications for India are:
- Environment / Sustainability / Waste Management:** Converting electronic wastes, plastic wastes to various usable products and developing Decentralized Water Treatment Systems.
- Algorithms & Data Analytics:** AI-powered visual big data analysis, cloud-hosted analytics solution and machine learning algorithms for assisting in personalized treatment.
- Ingredients & Materials:** Plant biotech based on extracts from plant cell cultures, advanced chemicals and materials have high potential in cosmetic products
- Key start-up ecosystem drivers**
- By setting up schemes funded by different technology clusters, the government has taken several initiatives and is also driving the establishment of start-ups focused on emerging and disruptive technologies.
- Government support plays a vital role in driving innovation and small business development through expertise, grants, tax exemptions, subsidies, and education.
- The future of start-up ecosystems**

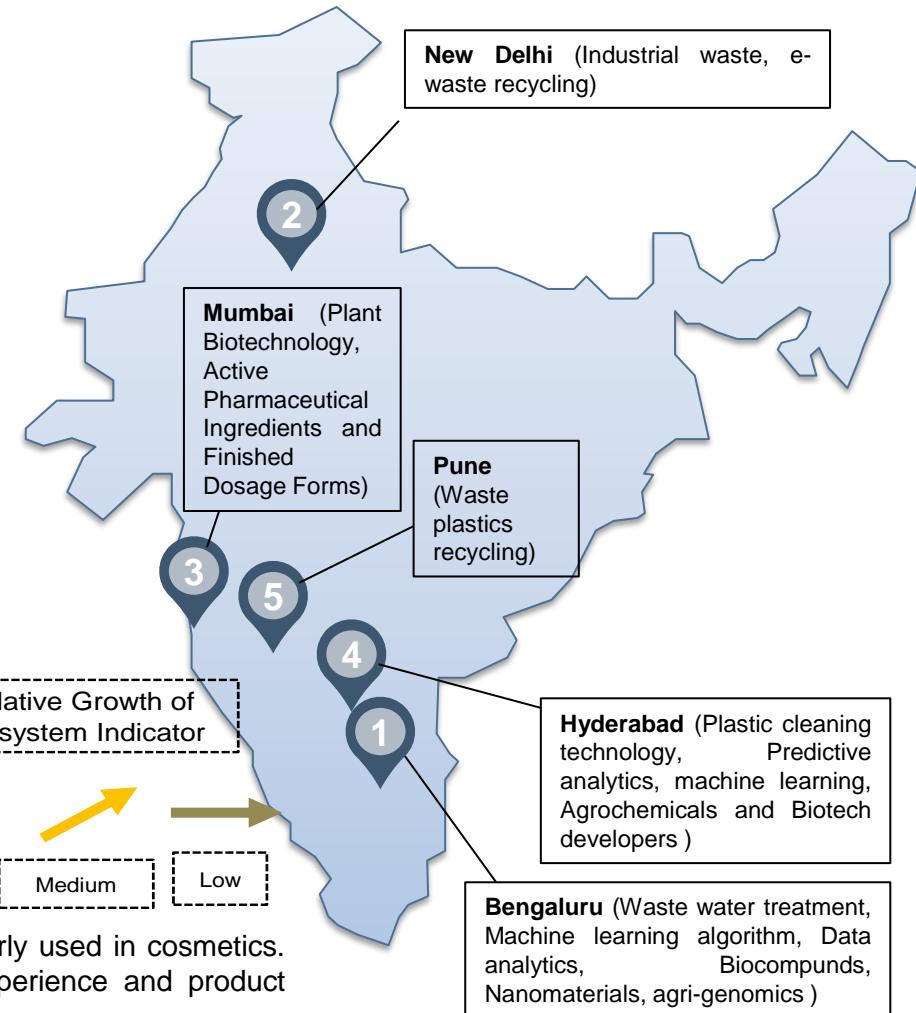
The algorithms and Data Analytics segment is expected to grow relatively faster during 2020 to 2025 period



• Key opportunities for L'Oréal

L'Oréal can look into the Ingredients & Materials sector where there are developments in plant based enzymes majorly used in cosmetics. Algorithms and Data analytics can support enhance customer experience and product development

India – Geographic Concentration





Executive Summary – Recommendations India

- India has a wide range of opportunities that would be of interest to L'Oreal. The startups are into biocompounds, nanomaterials, agri-genomics, agrochemicals, plant biotechnology, active pharmaceutical Ingredients, machine learning algorithms, data analytics, waste water treatment, industrial waste and e-waste recycling.
- The interesting startups are Log 9 Materials, Nanospan, Kopran Ltd., SigTuple Technologies, Uravu Labs, GEM Enviro Management, Niramai Health Analytix and Oncostem diagnostics
- The ecosystem has large companies that can provide support to startups. Sun Pharma, Hetero, AG Biotech and KF Bioplants are well established companies in India where their core competencies are in Plant molecular biology, Genetic Engineering, Plant Biotechnology, Organic Farming, Botanical and Bio Products, APIs and Biosimilars.
- The Data Science Research Institute and Department of Computational and Data Sciences (CDS) are the key research institutes that focus on big data analytics and machine learning algorithms. L'Oreal can establish contact with these institutes
- Openwater.in and the International Institute of Waste Management focus on Water treatment and wastewater management, solid waste management. The TARA and SRI-TBI are the incubators driving developments in Water management, Sustainable agriculture, Waste management, Recycling, Plastics and chemical recycling, Electronic waste. L'Oreal can explore utilizing plastic waste for packaging applications
- Venture Centre is a technology incubator and investor for developing innovative materials, chemicals and biological sciences & engineering. T-Labs and Khosla Labs in Bengaluru are serving both as the technology incubator/accelerator and also acting as the funding agent for developing products based on machine learning and data analytics. L'Oreal can connect with these firms to get strategic support and service
- The important startup hubs in India are in Bengaluru, Hyderabad, Mumbai and New Delhi.

Executive Summary -Key Findings Singapore



The startups landscape in Singapore is robust as the government, large companies, and venture capitalists are investing actively in startups.

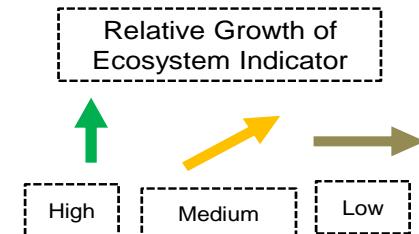
- Large healthcare companies are primarily focusing in healthcare companies. Biotech industry is largely supported by government agencies such as A*Star, Enterprise Singapore, and SGInnovate.
- The three main applications areas identified from Singapore are:
 - Artificial intelligence for smart cities and cosmetics
 - Health & Wellness technologies; remote diagnostics & monitoring and
 - Biotechnology with active focus on synthetic biology

The Key start-up ecosystem drivers:

- Government and Universities' Initiatives
- Emergence of Many Venture Capitalists
- Strategic Location For Market Penetration to Rest of Asia Country

The future of start-up ecosystems:

- Startup ecosystem in Singapore will be supported and nurtured by government agencies and universities' organisations
- Therefore, interesting startups particularly focusing in biotechnology, artificial intelligence, and sensors will increase and grow towards serving the international markets. AI ecosystem expected to grow faster



Key opportunities for L'Oréal

- L'oreal can focus on synthetic biology and AI based technologies
- The advancements in these applications areas happen to benefit L'Oreal in terms of raw materials and AI based cosmetics products such as skin care products and skin analysis devices.

Executive Summary - Key Findings

Indonesia



The 3 key applications for Indonesia are:

- **Biotech/Agriculture:** Raw materials/Ingredients for Cosmetics; Processing;
- **Environment/Sustainability/packaging:** Biodiversity Materials; Bio materials that can be processed
- **Traditional medicinal plants for cosmetics**

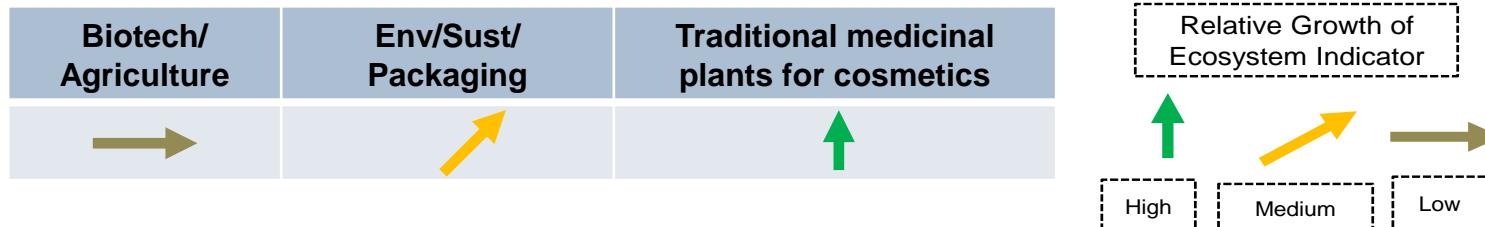


Key start-up ecosystem drivers:

- Global VCs such from Japan and USA such as East Ventures, Hill Ventures and many others view Indonesia as suitable hub in ASEAN region.
- Government encourages the presence of global accelerators such as the Silicon Valley accelerator and many more.

The future of start-up ecosystems:

- Traditional medicinal plants ecosystem to grow faster between 2020 and 2025



Key opportunity for L'Oréal:

- Natural astaxanthin from microalgae; Halal and herbal products; Biodegradable packaging developed from farmed seaweed
- Traditional medicinal herbs for cosmetics and food supplements including Halal cosmetics

Executive Summary - Key Findings

Thailand



The 2 key applications for Thailand are:

- **Biotech/Agriculture:** Raw materials/Ingredients for Cosmetics; Processing;
- **Environment/Sustainability/packaging:** Biodiversity Materials; Bio materials that can be processed

Key start-up ecosystem drivers:

- Government favourable policy for startups which include various incentives, funding, collaboration with local and international incubators and accelerators etc.
- Active R&D from local universities and research institutions in Biotech/Agriculture and Environment/Sustainability/packaging areas.
- Many local and international prominent VCs focusing on Thailand

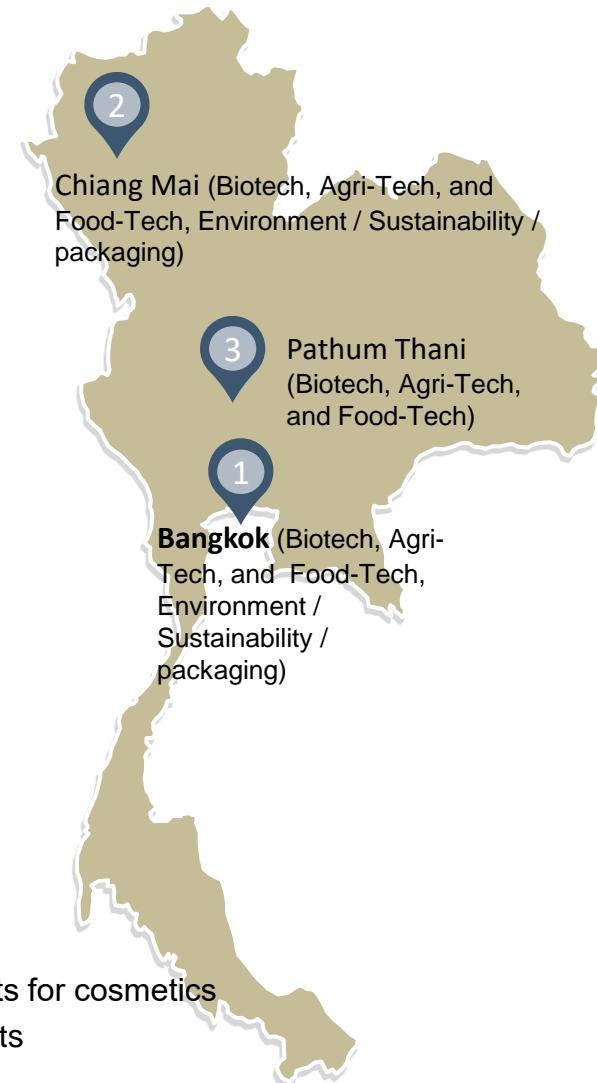
The future of start-up ecosystems:

- Packaging segment to grow faster between 2020 and 2025



Key opportunity for L'Oréal:

- Biotech/Agriculture extraction of active components from Thailand's indigenous plants for cosmetics
- Sustainable packaging using various bio materials usually from agriculture bi-products





Executive Summary - Key Findings

Malaysia

The 2 key applications for Malaysia are:

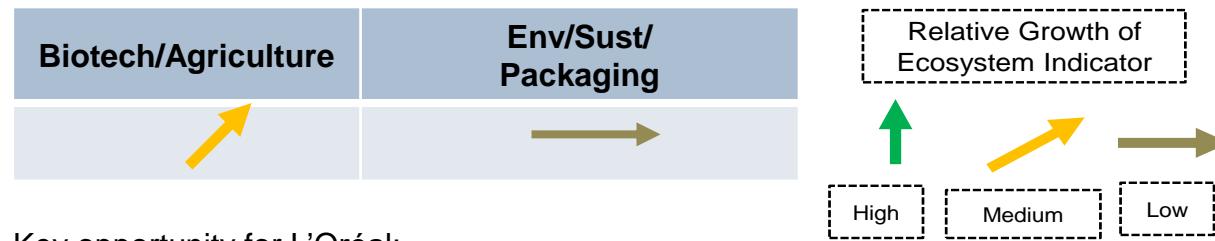
- **Biotech/Agriculture:** Raw materials/Ingredients for Cosmetics; Processing;
- **Environment/Sustainability/packaging:** Biodiversity Materials; Bio materials that can be processed

Key start-up ecosystem drivers:

- Strategic Partnership between the Malaysian Government and private sector to spur the growth of Malaysian startups
- Government policies and regulations such as angel tax incentives and equity crowd funding favour the development of startups

The future of start-up ecosystems:

- Biotech ecosystem growth to be relatively faster between 2020 and 2025



Key opportunity for L'Oréal:

- L'Oréal can leverage on the knowledge of local cosmetics players particularly in the development of Halal products.
- Biodegradable bio plastic might be of L'Oréal's interest since it reduces dependency on plastic packaging.



- 1- Kuala Lumpur
- 2- Perak
- 3- Pulau Pinang
- 4- Johor
- 6- Sabah

Executive Summary -Key Findings

Vietnam



The landscape of startups in Vietnam is strong as government and venture capitalists are investing actively in startups. The venture capitalists from other regions such as US are also investing in startups in this region. Large cosmetics companies dominating AI based technologies for skin care application.

- Key start-up ecosystem drivers:
 - Driver 1: Government initiatives
 - Driver 2: Venture Capitalists investments in AI and digital based technologies
 - Driver 3: Support from Large Cosmetic Corporations

- The future of the Digital start-up ecosystem (2020-2025):



- The future startups in Vietnam will be more focused on digital or cashless payment technologies. Digital marketing using augmented reality is also expected to grow in Vietnam in future.
- Another key focus application of startups is expected to be in the language recognition devices such as from Vietnamese to English speaking or texting AI based devices.
- Key opportunities for L'Oréal
 - L'Oreal can focus on digital marketing strategy, AI based technologies in this region. The advancements in these applications areas happen to benefit L'Oreal in terms of raw materials and AI based cosmetics products such as skin care products and skin analysis devices.
 - L'Oreal can also optimise the speech or text recognition AI technologies to develop personalised skincare or hair care products.



Executive Summary – Recommendations ASEAN (1/2)



Singapore

- Singapore is an emerging hub for startups with many venture capitalists, incubators, and accelerators in the ecosystem. Most of the startups in other ASEAN countries also get funding from Singapore based VCs.
- L’Oreal would need to connect with SGInnovate, Enterprise Singapore, and A*Star as these government agencies are actively working with startups, incubators, and accelerators focusing in biotech, artificial intelligence, and smart nation initiatives.
- The interesting startups include ACM Biolabs, Lion TCR, and RWDC Industries for synthetic biology, Tricog Health and Healint for AI related solutions for healthcare and Visense for AI for image recognition
- NTUitive, SGInnovate, and Red Ventures are VCs and incubators that L’Oreal can connect with.

Indonesia

- The startups in Indonesia are largely supported by government agencies and a few local, regional and international incubators, accelerators and VCs.
- L’Oreal can monitor the development of startups in areas such as bioplastics from seaweed and extraction of active ingredients for cosmetic applications from indigenous plants such as Jamu.
- The interesting startups and companies to monitor are Evoware, Avani Eco, Mustika Ratu and Marta Tilaar.
- Some Applied Research Institutes that can be approached are SMART Biotechnology Center, Research Center for Biotechnology LIPI and Daewoong Pharmaceutical Biotech Research Center.
- Some VCs/Corporates to establish contact would be Sovereign's Capital, East Ventures and Skystar Capital.
- The important hubs are in Jakarta, Surabaya, Bali, Central Java and North Sumatra

Executive Summary – Recommendations ASEAN (2/2)



Thailand

- Startups ecosystem in Thailand are largely supported by government agencies and a few local and international incubators, accelerators and VCs.
- L’Oreal can monitor the development of startups in areas such as bioplastics from agriculture bi-products active ingredients extraction for cosmetic applications from indigenous plants.
- The interesting startups are Quality Plus Aesthetic, JuicelInnov8, Universal Biopack, Fang Thai and Bio-Eco.
- Some Incubators/Accelerators that can be approached are SPARK, NIA, SPRINT and BIOTEC.
- Some VCs/Corporates to establish contact would be NIA Venture, Tech Fund, 500 Startups and Kejora Ventures.
- The important hubs are Bangkok, Chiang Mai and Pathum Thani.

Malaysia

- Startups ecosystem in Malaysia are mainly being nurtured by government agencies and few incubators/accelerators and VCs
- L’Oreal can monitor startups into bioplastics and companies that extract active ingredients for cosmetic applications from indigenous plants such as tongkat ali and kacip fatimah. The interesting startups are Biotropics, Natural Wellness Biotech, Zelcos Laboratory, Indochine Bio Plastiques and NanoMalaysia.
- Some Incubators/Accelerators that can be approached are MTDC, MAGIC and BioXCell.
- Some VCs/Corporates to establish contact would be Cradle Fund, MTDC, MLSCF, Biotech Commercialisation Fund (BCF) and Malaysian Bioeconomy Development Corporation.
- The important hubs are Kuala Lumpur, Selangor, Ipoh, Pulau Pinang, Johor Bahru and Kota Kinabalu

Vietnam

- The startups ecosystem in Vietnam is largely supported by large corporations and government agencies.
- L’Oreal could connect with VCs such as G&H Ventures and Access Ventures to tap into the AI startup ecosystem. The startups that L’Oreal can monitor are Hekate.Ai and Eyeq. Hekate develops personalised beauty devices that can support multiple languages and Eyeq develops makeup tester tools that can recommend the relevant makeup or skin care products for users.
- The Vin Group is a large corporation that which focuses on the image processing, voice recognition, and user interaction researches, to build AI based skin care and hair care devices. L’oreal can explore to collaboration with this corporation for nurturing startups
- The main hubs would be in Ho Chi Minh City, Hanoi and Da Nang.

Top 3 Applications - China



Top 3 applications selected for China

These are based on Frost & Sullivan research findings and discussions with L'Oreal team



01



Biotech/Pharma/ MedTech/

This application covers the following:

- *Biotech and pharmaceutical in anti-cancer therapy, genome screening and editing, stem cell, anti-aging beauty, innovative drug development, etc. that can be applied in diagnosis and therapy as well as aesthetic medicine.*
- *Cosmetics or aesthetic medicine related biotech.*

02



Digital (AI, AR, VR, Big Data and Cloud) Digital/Consumer IoT

This application covers the following:

- *Artificial Intelligence in facial recognition, gait recognition, AI chip design, human-computer interaction, machine vision, intelligence navigation, etc.*
- *AR/VR, big data, data mining, IoT technologies can be applied in beauty products or beauty devices.*

03



3D Bio-printing/ Biomaterial

This application area covers the following:

- *The 3D Bio-printing technology that is capable to be applied in human tissue repairing or aesthetic medicine.*
- *Biomaterial that is capable to be applied in human tissue repairing, aesthetic medicine and cosmetics.*



- The startup ecosystems is predominantly driven and facilitated by the government in China. The government in China can effectively create a superior business environment for startups in policies, regulations, taxation, and other political, economic or financial aspects to help startups achieve rapid and healthy development. Additionally, most universities and research organizations are funded by the government. Even some leading venture capital companies (VCs) and private equity companies (EPs) in China are established and operated by government.
- The National-Level High-Tech Industry Development Zone are key for the startup ecosystems in China. National-Level High-Tech Industry Development Zone are the high-tech zones which are approved by the State Council and supported by the national government. Companies located in these zones not only benefit from better infrastructure and access to talent, but can also receive special incentives such as lower tax rates and government subsidies, which is vital for startups. According to Ministry of Science and Technology, there are 120,058 companies are settled in the National-Level High-Tech Industry Development Zone with 20,914,906 employees in 2018.
- With a strong university system churning out well-trained talents in biotech and related area, China is now leading some sub-areas of biotech as well as pharma and medtech in the world. According to National Bureau of Statistics, China has invested RMB9,505.3 million, RMB58,088.6 million, RMB 41,894.2 million in biotech, pharma and medtech respectively in 2018.
- China is also leading in the digital innovation in the world. According to National Bureau of Statistics, China has invested RMB227,336.7 million, RMB49,323.9 million, RMB34,901.2 million in electronic and communications device, electron device, computer related device respectively in 2018.
- 3D bio-printing and biomaterial is identified as the interdisciplinary field of material and biotech. There are many innovative startups in the 3D bio-printing and biomaterial in China, whose products can be widely applied in the cosmetics and aesthetic medicine in the future.

Biotech/Pharma/Medtech

Major Startups



Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc.)	Current value	Funding Stream				Funding scale
					Year	Round	Investors		
Realbio Technology	Shanghai	Its research projects covers microbial genome sequencing, metagenomic sequencing, and transcriptome sequencing. Its high throughput sequencing platform is able to provide early cancer screening, human microbiome research, and health management.	Founded in 2014	USD 40 Million +	2016	Pre-A	Bio Fund, Green Pine Capital	RMB 40 million	
					2017	A	YUANYI Capital	USD tens of millions	
					2019	A+	YUANYI Capital, WUXI Capital, LUCION Capital	RMB tens of million	
Long Long Life	Shenzhen	It applied the latest stem cell biotechnology in anti-cancer and anti-aging beauty products. It has also built a stem cell therapy and translation platform for clinical research.	Founded in 2017 Chief Scientist: Qilong Ying (Winner of McEwen Award for Innovation)	Undisclosed			Undisclosed		

Source: Wind, VC websites, startup websites, Frost & Sullivan

Biotech/Pharma/Medtech

Major Startups



Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc.)	Current value	Funding Stream			
					Year	Round	Investors	Funding scale
Stemirna	Shanghai	It focuses on the innovation of mRNA drugs using its patent – Core Shell Structure Platform for mRNA Vaccines. It is a new-model nanocarrier delivery platform which guarantees the safety and effectiveness of mRNA drug delivery through a unique two-layer structure.	Founded in 2016	USD 15 Million +	2017	Angel	Huarui Tech	Undisclosed
					2018	Pre-A	Lapam Capital, Puhong Investment	Undisclosed
					2019	A	Zhangjiang Torch Ventures, Longmen Capital, Jiuyo Capital, Fanghua Investment	RMB tens of millions
EdiGene	Beijing	It has developed ex vivo and in vivo genome-editing therapies for a range of diseases. It offers one time treatment for patients without HLA-matching donors through autologous hematopoietic stem cell transplant. It has built a high-throughput screening based on CRISPR technology.	Founded in 2015	USD 25 Million +	2018	Pre-B	Lilly Asia Ventures, HG Capital, IDG Capital, WI Harper Group	RMB hundreds of millions
					2019	B	Lilly Asia Ventures, Green Pine Capital, IDG Capital	RMB 70 million
					2019	B+	Lilly Asia Ventures, IDG Capital	RMB 81.5 million

Source: Wind, VC websites, startup websites, Frost & Sullivan

Biotech/Pharma/Medtech

Major Startups



Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc.)	Current value	Funding Stream			
					Year	Round	Investors	Funding scale
United Imaging	Shanghai	It has developed a full portfolio of diagnostic and advanced medical imaging products including Computed Tomography, Molecular Imaging, Magnetic Resonance, X-ray Radiography.	Founded in 2010	USD 5 Billion +	2013	Angel	Lianhe Capital	Undisclosed
					2017	A	China Life Investment Fund, China SDIC Gaoxin Industrial Investment, China Telecom, GTJIA Investment	RMB 3.33 billion
					2018	B	GTJIA Investment	Undisclosed
iCarbonX	Shenzhen	It uses big data and AI to analyze proteomic, metabolomics and microbiomic data to build a digital health management platform that features genetic testing, sports data tracking, customized sports programs, and personalized beauty products according to skin type, personalized dietary plans.	Founded in 2015 Founder: Jun Wang, (Former CEO at BGI, the world's largest genome technology company)	USD 1 Billion +	2016	A	Zhongyuan Union Cell and Gene Engineering Corporation, Tencent	USD 100 million
					2016	Strategic	Bridge Capital	RMB 300 million
					2016	B	Undisclosed	Undisclosed

Source: Wind, VC websites, startup websites, Frost & Sullivan

Biotech/Pharma/Medtech

Applied Research Institute



Applied Research Institute	Facts and figures	Key interests	Partners
Institute of Medicinal Biotechnology	It is a key national institute for the discovery and development of anti-microbial. The institute laid a solid foundation for the discovery and development of antibiotics.	<ul style="list-style-type: none"> • Anti-cancer Therapy • Cardio-vascular Therapy • Immunoregulation • Cell Engineering • Enzyme Engineering • Microbial Metabolite Engineering • Molecular Pharmacology • Computer-aided Drug Design 	<ul style="list-style-type: none"> • National Foundation for Cancer Research of the United States • Gates/NIH Foundation
Biotechnology Research Institute of Chinese Academy of Agricultural Sciences	The institute provides important supports for the research of a large-scale gene transformation, molecular breeding, new crop variety development, and bio-safety evaluation of genetically modified organisms, etc.	<ul style="list-style-type: none"> • Crop Molecular Breeding • Plant Functional Genomics and Molecular Biology • Biofortification and Metabolic Regulation • Microbial Protein Engineering 	<ul style="list-style-type: none"> • Ministry of Agriculture • Chinese Academy of Sciences • National Natural Science Foundation in China
Advanced Theranostics and 3D Imaging Laboratory, Tsinghua University	It is involved in the development of image-guided surgery, three-dimensional medical images, medical robotics and fusion of these techniques for minimally invasive precision diagnosis and therapy for about 20 years.	<ul style="list-style-type: none"> • Minimally Invasive Precision Diagnostic and Therapeutic Techniques • 3D Autostereoscopic Medical Image • Long Viewing Distance 3D Autostereoscopic Display; • Medical Image Processing and Image-guided Surgical Navigation; • Computer Assisted Interventional System and Robotics. 	<ul style="list-style-type: none"> • Johns Hopkins University • Harvard Medical School • Weill Cornell Medical College • Beijing Tiantan Hospital • 301 Hospital • Navy General Hospital

Source: VC websites, startup websites, university websites, research institute websites, Frost & Sullivan

Biotech/Pharma/Medtech

Applied Research Institute



Applied Research Institute	Facts and figures	Key interests	Partners
BGI Research Centers	BGI-research is a non-profit institution focusing on multi-omics based researches and applications in life sciences, biotechnology and medical fields. It aims to build the omics platform and core algorithms for high throughput and low cost omics data generation and analysis, and support applications in healthcare and agriculture.	<ul style="list-style-type: none"> • Omics Detection • Biodiversity Genomics • Protein engineering • Metagenomics Research • Genome Synthesis and Editing 	<ul style="list-style-type: none"> • Shanghai Cooperation Organization • China National Center of Biology Development • Ministry of Science and Technology
National Center for Gene Research	It focus on rice genome re-sequencing for genotyping, genome-wide association studies (GWAS) to identify common genetic factors, comparative genome and transcriptome analysis, rice functional genomics, and de novo genome sequencing of other plants and vertebrates.	<ul style="list-style-type: none"> • Rice Genetics • Miscanthus genetics • Bioinformatics • genome re-sequencing for genotyping 	<ul style="list-style-type: none"> • China National Rice Research Institute • National Key Laboratory of Crop Genetic Improvement • Institute of Genetics and Developmental Biology, Chinese Academy of Sciences
Shanghai Institute of Biochemistry and Cell Biology	As a nation-renowned institution, it seeks preeminence in exploring the fundamental knowledge about nature and human diseases, and applying that knowledge to advance the public good.	<ul style="list-style-type: none"> • Protein Science • Gene, RNA and Epigenetic Regulation • Signal Transduction • Cell and Stem Cell Biology • Cancer and other Diseases 	<ul style="list-style-type: none"> • The University of Chicago • The University of Tokyo • Novo Nordisk • Samsung • Inserm

Source: VC websites, startup websites, university websites, research institute websites, Frost & Sullivan

Biotech/Pharma/Medtech

Incubators, Accelerators



Incubator/ Accelerators	Location	Fact & Figures	Key Startups	Key Interests
Bio-medicine Incubator at Zhongguancun Life Science Park	Beijing	The incubator has successfully incubated more than 100 startups. It provides startups with molecular biology laboratories, pure water systems, experimental sewage processing systems, ventilation and air conditioning systems, cell culture rooms, and public meeting rooms to ensure the smooth business of startups.	<ul style="list-style-type: none"> iGene Tech MyGenostics Bainuoqi Biotech Blood Biotech CELL APY Syngen Tech AT Health 	<ul style="list-style-type: none"> Stem cell Bio-medicine Molecular Biology Neuroscience Precise Surgery
PKU Care Industrial Park	Beijing	Founded by Peking University and Founder Group, it relies on Peking University's rich resources in medical experts, advanced management, strong education and research, as well as the financial support and industrial integration of Founder Group	<ul style="list-style-type: none"> Cloud Magnet Bluepha New Horizon Health Tianji Pharma Cheerland Euler Genomics 	<ul style="list-style-type: none"> Bioinformatics Health Management Cancer Treatment Cell Therapy Genome Editing Microbiome Research
Pharma Valley at Zhangjiang High-tech Industrial Park	Shanghai	Established by the Ministry of Science and Technology, the Ministry of Health, the Chinese Academy of Sciences, and the Shanghai Municipal People's Government, it aims to accelerate the development for biotechnology and modern pharmaceutical industries.	<ul style="list-style-type: none"> Stemirna Genomicarebio Shell Biotech Haihe Biopharma Boci Med AQ Biopharma ZD Medtech 	<ul style="list-style-type: none"> Cell Therapy Tumor Immunotherapy Vaccine Development Microbiome Research Neuroscience Molecular Biology Enzyme Engineering GM Technology

Source: VC websites, startup websites, university websites, research institute websites, Frost & Sullivan

Biotech/Pharma/Medtech

Incubators, Accelerators



Incubator/ Accelerators	Location	Fact & Figures	Key Startups	Key Interests
Jiangsu Medical Device Industrial Park	Suzhou	Established by the Jiangsu Municipal People's Government and the Suzhou Institute of Biomedical Engineering Technology of the Chinese Academy of Sciences, it is the only national level medical device industrial park in China.	<ul style="list-style-type: none"> • Yuwell • BIOSINO • Frankeman 	<ul style="list-style-type: none"> • Precise Surgery • Medical Imaging • Surgical Robotics • Surgical Navigation • Rehabilitation Robots
Biolake at Wuhan East Lake High-tech Development Zone	Wuhan	The Wuhan National Bio-industry Base is China's second largest state-level biotech industrial base in view of overall strength. Its six major parks are for biology innovation, biomedicine, biofarming, medical devices, medical health and bioenergy. The base's current tenants include eight of the Fortune Global 500, 16 listed companies and 258 high-level startup teams.	<ul style="list-style-type: none"> • Bravovax • Wuhan Cell Therapy Institute • Shengmingyuan Stem Cell • Hygeianey • StemU 	<ul style="list-style-type: none"> • Molecular Diagnosis • Tumor Cell Diagnosis • Infectious Disease Treatment • Genetic Screening • Biomedicine

Source: VC websites, startup websites, university websites, research institute websites, Frost & Sullivan

Biotech/Pharma/Medtech

Funding Sources



Funding source name / can be VC, public program	Description	Key Innovation Topics	Latest Funding
Hillhouse Capital	<ul style="list-style-type: none">Hillhouse is a global leading investment management firm, founded by Lei Zhang in 2005. It mainly focuses on consumer, TMT, and healthcare industries.	<ul style="list-style-type: none">Innovative DrugsCAR-T Immune TherapyPrecise Medical Device	Feb, 2019 RMB147 million investment in Haihe Pharmaceutical
GTJIA Investment Group	<ul style="list-style-type: none">GIG has an asset under management of RMB20 billion and has raised 24 funds dedicating to the healthcare industry. GIG has invested in more than 130 companies, 60 of which are in the healthcare industry.	<ul style="list-style-type: none">Cell TherapySmall-molecule DrugBiochemical DiagnosticsImmune Diagnostics	May, 2019 RMB300 million investment in Sinopharm Online
Lilly Asia Ventures	<ul style="list-style-type: none">Lilly Asia Ventures is a leading biomedical venture capital firm, with offices in Shanghai, Hong Kong, and Palo Alto. It focuses on startups developing breakthrough products that treat diseases and improve human health.	<ul style="list-style-type: none">Anti-tumor DrugGenome EditingAdvanced Medical Device	Nov, 2019 USD 100 million investment in PEIJIA Medical

Source: VC websites, startup websites, Frost & Sullivan

Biotech/Pharma/Medtech

Funding Sources



Funding source name / can be VC, public program	Description	Key Innovation Topics	Latest Funding
Sequoia Capital China	<ul style="list-style-type: none">As one of the leading VC company worldwide, Sequoia China focuses on TMT, healthcare, consumer, and industry. It has invested Alibaba, DJI, BGI, JD, Bytedance, etc.	<ul style="list-style-type: none">Medical ImagingIndividualized Cell TherapyMedical Cloud Platform	Nov, 2019 Investment in EOC Pharma
Legend Capital	<ul style="list-style-type: none">Founded by Lenovo, Legend Capital focuses on early-stage venture capital and expansion-stage growth capital investment in healthcare field.	<ul style="list-style-type: none">Genomic Precision MedicineEarly-stage Cancer DiagnosisCell TherapyMinimally Invasive Surgery	Nov, 2019 RMB60 million investment in Genowis
Qiming Venture Partners	<ul style="list-style-type: none">Founded in 2006, Qiming Venture Partners is a leading China venture capital firm focusing on healthcare, entertainment, and enterprise services.	<ul style="list-style-type: none">Vaccine DevelopmentAnti-aging TreatmentChemiluminescence Immunoassay instrument	May, 2019 RMB50 million investment in dMed

Source: VC websites, startup websites, Frost & Sullivan

Biotech/Pharma/Medtech

What is the typical way that start-up companies engage with the VCs, incubators, angel investors?



WuXi AppTec builds its biotech startup ecosystem

Established in December 2000, WuXi AppTec is China's leading biopharmaceutical company. WuXi AppTec provides a broad portfolio of R&D and manufacturing services that enable companies in the pharmaceutical, biotech and medical device industries worldwide to advance discoveries and deliver groundbreaking treatments to patients. With industry-leading capabilities such as R&D and manufacturing for small molecule drugs, cell and gene therapies, and testing for medical devices, WuXi AppTec's open-access platform is enabling more than 3,700 collaborators from over 30 countries to improve the health of those in need.

In 2011, WuXi AppTec has established its own venture capital firm, WuXi Venture Fund, now known as **Six Dimensions Capital**, to actively invest in various early stage life science and biotech companies in China. Now WuXi AppTec is one of the biggest venture capital firms in biotech field nationwide in terms of total funding, and it has built a whole ecosystem of biotech startups in China.

WuXi AppTec's
Portfolio Companies



Biotech/Pharma/Medtech

Top China VC/PE companies in Biotech, Pharma, Medtech





Main startups' hubs (based on the location of startups, applied research institutes, large corporations (that invest in startups), VCs:

1. Bio-medicine Incubator at Zhongguancun Life Science Park; PKU Care Industrial Park
2. Pharma Valley at Zhangjiang High-tech Industrial Park
3. Jiangsu Medical Device Industrial Park
4. Biolake at Wuhan East Lake High-tech Development Zone



2020 to 2025 view

- Immunotherapy will become a key development area for China's medical industry in the future. Immunotherapy has been an effective treatment especially for melanoma, lymphoma, and kidney cancer. Immunotherapy drugs empower the body's immune system by enabling the body to fight cancer — an approach that can slow or halt cancer in certain patients. Chinese biotech startups are now exploring the different types of immunotherapy, what kinds of patients should be treated with it, how researchers are looking to further develop this treatment, and more.
- Gene therapy is regarded to be the next-generation biotech in China. Gene therapy is a brand new experimental method of fighting disease that involves correcting or replacing a person's mutated or malfunctioning genes. Gene therapy is regarded as a promising research method and now being used in clinical trials and may lead to improved health outcomes for patients with inherited bleeding and immune disorders as well as some forms of blood cancer and other diseases.
- Chinese biotech startups also focus on the liquid biopsy technology, which is a simple and non-invasive alternative to surgical biopsies that enables doctors to discover a range of information about a tumor through a simple blood sample. In the near future, startups are trying to increase the test accuracy to cope with different types of tumors and different stages of diseases so that this can be applied into practical use.
- Stem cell therapy has been popular in China. It is the use of stem cells to treat or prevent a disease or condition. Bone marrow transplant is the most widely used stem-cell therapy, but some therapies derived from umbilical cord blood are also in use.
- Medical robots, especially the surgical robots and exoskeleton robots, will be more applied in hospitals and medical research centers in China. Medical robots can help doctors improve work efficiency, or help injured patients undergo recovery training, such as walking assistance.

Digital Digital/Consumer IoT

Major Startups



Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc.)	Current value	Funding Stream				Funding scale
					Year	Round	Investors		
CloudWalk	Shanghai	CloudWalk Technology's products include facial recognition terminals, facial scanning door entry and infrared binoculars scanning machines.	Founded in 2015	RMB20 billion	2016	A	PCI Tech, JieAo Fund	RMB200 million	
					2017	B	Puhua Capital, Shunwei Capital, Oriza Holdings, etc.	RMB500 million	
					2019	C	Zhangjiang Haocheng Venture Capital, etc.	Undisclosed	
Watrix	Beijing	Watrix is world-wide leader of gait recognition, which is walking behavior identification, it focus on breakthroughs in computer vision and provides total solution for industries.	Founded in 2016 CEO: Yongzhen Huang	RMB200 million	2016	Angle	Lenovo Holdings, etc.	RMB60 million	
					2018	Pre-A	Nanshan Venture Capital, Huahe Capital, etc.	RMB100 million	
					2018	A	Dingqing Investment	Undisclosed	
XLoong	Beijing	XLoong combines intelligent glasses products and augmented reality technology, mainly focused on the fields of hardware, optics and algorithms.	Founded in 2015	RMB200 million	2015	A	Luxshare	RMB tens of millions	
					2016	A+	BOE	RMB50 million	
					2017	Pre-B	Gobi Ventures	RMB tens of millions	

Source: Wind, VC websites, startup websites, Frost & Sullivan

Digital Digital/Consumer IoT

Major Startups



Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc.)	Current value	Funding Stream			
					Year	Round	Investors	Funding scale
Skinrun	Shanghai	SkinRun provides smart skin test instrument with contains optical modules which can collect information of the testers' skin. The company also has a huge database for skins that can support the daily business operations.	Founded in 2011	Unknown	2017	Strategic	Ruikangsheng Investment	Undisclosed
					2017	Pre-A	Jiading Ventures	RMBmillions
					2019	A	Kairos Capital, Zehou Capital	RMBtens of millions
Pachira	Beijing	Pachira develops enterprise speech recognition solutions to enable voice data analytics for telecom operators, financial service providers and automobile companies.	Founded in 2010	Unknown	2013	B	Gobi Ventures	USD 5 million
					2016	C	Navinfo, Gobi Ventures	USD 10 million
					2019	D	Starwin Capital, Shanghai Capital	Undisclosed
Yidu Cloud	Beijing	Based on the well-developed Data Process & Application Platform, Yidu Cloud integrates massive multi-source medical data, generates full life cycle medical data of patients for personal healthcare.	Founded in 2012	RMB12 billion	2015	A	Magic Stone	RMB200 million
					2015	B	Magic Stone	Undisclosed
					2018	C	China Investment Corporation	Undisclosed

Source: Wind, VC websites, startup websites, Frost & Sullivan

Digital Digital/Consumer IoT

Applied Research Institute



Applied Research Institute	Facts and figures	Key interests	Partners
Beijing Academy of Artificial Intelligence	<p>It is under the guidance and support of the Ministry of Science and Technology and the Beijing Municipal Government. It targets to promote revolutionary and disruptive breakthroughs in artificial intelligence theory, methods, tools, systems, etc., leading the frontiers of artificial intelligence and technological innovation in China.</p>	<ul style="list-style-type: none"> • Deep Learning Fundamental Theories • Innovative Machine Learning Algorithm • Natural Language Processing • AI Chip development 	<ul style="list-style-type: none"> • Peking University • Tsinghua University • Chinese Academy of Sciences • Baidu • Xiaomi • ByteDance • Meituan
Zhongguancun Virtual Reality Research Institute	<p>The institute has been committed to the promotion and application of virtual reality technology, providing a full range of solutions for domestic VR/AR manufacturers, improving the relevant application level of virtual reality technology.</p>	<ul style="list-style-type: none"> • Augmented Reality • Virtual Reality • Ultrasonic Touch Technology • Sensor • Binocular Camera • Wearable Devices 	<ul style="list-style-type: none"> • Institute of Computing Technologies of Chinese Academy of Science • SUN3D Technology • 4D HOJIN • Vii Care
Institute of Computing Technology of the Chinese Academy of Sciences	<p>It is the first academic establishment to specialize in comprehensive research on computer science and technology in China. It has successfully built China's first general-purpose digital computer and now has turned itself into an R&D base for high-performance computer technology.</p>	<ul style="list-style-type: none"> • Minimally Invasive Precision Diagnostic and Therapeutic Techniques • 3D Autostereoscopic Medical Image • Long Viewing Distance 3D Autostereoscopic Display; • Medical Image Processing and Image-guided Surgical Navigation • Computer Assisted Interventional System and Robotics. 	<ul style="list-style-type: none"> • AMD • ST-Micro Electronics • Tsinghua University • University of Science and Technology of China

Source: VC websites, startup websites, university websites, research institute websites, Frost & Sullivan

Digital Digital/Consumer IoT

Applied Research Institute



Applied Research Institute	Facts and figures	Key interests	Partners
Department of Computer Science and Technology, Tsinghua University	Through over sixty years of unremitting efforts, it has been developed into a computer science department with strong scientific research and teaching accomplishments, and has developed great influence and reputation domestically.	<ul style="list-style-type: none">Parallel and High Performance ComputersDistributed SystemsStorage SystemsInformation ProcessingDeep LearningComputer VisionPervasive Computing	<ul style="list-style-type: none">Carnegie Mellon UniversityNational University of SingaporeTencentSamsungMicrosoft
Alibaba Damo Academy	Founded by the Internet giant Alibaba, the Alibaba Damo Academy is dedicated to exploring the unknown through scientific and technological research and innovation.	<ul style="list-style-type: none">Machine LearningData ComputingAI ChipRoboticsQuantum Technologies	<ul style="list-style-type: none">Zhejiang UniversityTsinghua UniversityNanyang Technological UniversityChinese Academy of ScienceMinistry of Transport
Tencent AI Lab	Tencent AI Lab has more than 70 scientists from world-renowned universities and more than 300 experienced engineers in AI technology. The major application scenarios of the AI research are Content AI, Game AI, and Social AI, basically covering the main business aspects of Tencent.	<ul style="list-style-type: none">Computer VisionSpeech RecognitionNatural Language ProcessingMachine Learning	<ul style="list-style-type: none">Harbin Institute of TechnologyMassachusetts Institute of TechnologyOxford UniversityThe Chinese University of Hong Kong

Source: VC websites, startup websites, university websites, research institute websites, Frost & Sullivan

Digital Digital/Consumer IoT

Applied Research Institute



Incubator/ Accelerators	Location	Fact & Figures	Key Startups	Key Interests
Zhongguancun Innoway	Beijing	<p>It is located in the Zhongguancun Industrial Park, established by Beijing and Haidian Government. It is an international platform which has successfully incubated more than 2,900 startups and rose a total funding of RMB9.1 billion.</p>	<ul style="list-style-type: none">• Horizon Robotics• Ding Xiang• CanBot• NOLO• Uni Explore• Sound AI	<ul style="list-style-type: none">• Machine Learning• Data Computing• Robotics• Recognition Technology
Tsinghua X-Lab	Beijing	<p>The incubator programme launched by Tsinghua University functions as a forum for VC investors and the students of the university. Student who manage to get admission into the programme are provided all necessary equipment for the projects free of charge by the university and they have the opportunity to make their idea into a start-up.</p>	<ul style="list-style-type: none">• Geek+• Owl Reality• 3D Cellular• Future Information• XBENTURY	<ul style="list-style-type: none">• Robotics• Virtual Reality• Data Science• Deep Learning• Cloud Computing

Source: VC websites, startup websites, university websites, research institute websites, Frost & Sullivan

Digital Digital/Consumer IoT

Incubators, Accelerators



Incubator/ Accelerators	Location	Fact & Figures	Key Startups	Key Interests
Microsoft Accelerator	Beijing Shanghai	The Microsoft Accelerator is an investment project aimed at discovering and supporting startups with emerging technology capabilities. Since the establishment of the Microsoft Accelerator in China in 2012, two accelerators have been established in Beijing and Shanghai, incubating thousands of high-tech startups.	<ul style="list-style-type: none"> Sky Lark MaLong Technology Naturali Tenxor eHANG Youzi Tech Euler Space 	<ul style="list-style-type: none"> Cloud Computing Edge Computing AI Algorithm Deep Learning Smart Home
Tencent Public Space & Double Hundred Program	Shenzhen Shanghai Beijing Hangzhou	<p>Tencent places great emphasis on portfolio building: it acquires successful start-ups as well as supports emerging companies within the framework of incubator programs.</p> <p>Double Hundred Program refers to the program that Tencent plans to invest RMB10 billion to accelerate 100 high-tech startups.</p>	<ul style="list-style-type: none"> Enflame 	<ul style="list-style-type: none"> AI Chip Development Natural Language Processing Consumption AI

Source: VC websites, startup websites, university websites, research institute websites, Frost & Sullivan

Digital Consumer IoT

Funding Sources



Funding source name / can be VC, public program	Description	Key Innovation Topics	Latest Funding
Linear Capital	<ul style="list-style-type: none">Linear Capital focuses on investing in data and AI-driven startups.Linear has an asset under management of 1.5 billion and a portfolio of startups with total valuation over USD 11 billion.	<ul style="list-style-type: none">Facial RecognitionVoice RecognitionIndustrial IoTSmart Home	Feb, 2019 Investment in Horizon Robotics
Chinese Academy of Science Venture Capital (CASVC)	<ul style="list-style-type: none">Founded by Chinese Academy of Science, CASVC focuses on investing smart manufacturing, AI and big data, biotech, medtech, new materials, and new energy, etc.	<ul style="list-style-type: none">AI Fundamental AlgorithmAI Chip DevelopmentOptical Fiber Communication5G TechnologySemiconductor	Jan, 2019 RMB tens of millions of investment in Cambricon
ZhenFund	<ul style="list-style-type: none">ZhenFund have been ranked "No.1 Early-Stage Investment Firm" by Zero2IPO five years in a row 2014-2018.ZhenFund now has a network of over 700 portfolio companies, including over 10 unicorns based in China.	<ul style="list-style-type: none">AI-based Data ServiceComputer VisionChatting Robot & AI Voice InteractionNeural Network Solutions	Sep, 2019 USD tens of millions of investment in Recurrent AI

Source: VC websites, startup websites, Frost & Sullivan

Digital Digital/Consumer IoT

Funding Sources



Funding source name / can be VC, public program	Description	Key Innovation Topics	Latest Funding
Shenzhen Capital Group	<ul style="list-style-type: none">Established by Shenzhen Government in 1999.SCGC has registered capital of RMB5.42 billion, and total asset under management of RMB348.96 billion.	<ul style="list-style-type: none">Industrial Vision TechnologyDronesHuman-computer InteractionMedical Imaging	Mar, 2019 RMB30 million Investment in HuaRui AI
YF Capital	<ul style="list-style-type: none">Founded by Jack Ma in 2010.Focused sectors include Internet, AI, healthcare, financial services, logistics, and consumption.	<ul style="list-style-type: none">AI Fundamental ResearchComputer VisionAR/VR solutionSmart City	May, 2018 Investment in Leyan Technologies
Matrix Partners China	<ul style="list-style-type: none">Matrix Partners China was founded in 2008 to focus exclusively on investments in China.Past major successes include Didi, eleme, Guazi, MOMO, Cheetah Mobile, Liepin, etc.	<ul style="list-style-type: none">Industrial Big Data PlatformConsumer IoTFacial RecognitionGesture Recognition	Nov, 2018 RMB150 million investment in elens

Source: VC websites, startup websites, Frost & Sullivan

Digital Digital/Consumer IoT

What is the typical way that start-up companies engage with the VCs, incubators, angel investors?



Accelerated Digital Startups:



FUTURUS



XMOV



Microsoft Accelerator China Program

Microsoft Accelerator is a global initiative to accelerate the success of innovative deep-tech companies by providing unprecedented access to top partners and customers, business connections, and technical knowledge. China is the only country in the world with two Microsoft Accelerators, one in Beijing and the other in Shanghai.

Microsoft Accelerator has built close cooperation with Shanghai Municipal People's Government. As Shanghai has initiated a plan to develop itself into a global innovation center in science and technology by 2020, to which Microsoft Accelerator Shanghai is an active contributor.

Microsoft Accelerator Shanghai has successfully graduated 40+ startups as of today. These burgeoning companies are pushing the edge of technologies like cloud computing, big data, artificial intelligence, and the internet of things. Their solutions are built for industry applications in medical technologies, smart city, autonomous driving, and other industries in need of digital transformation for Shanghai to drive its rapid development.

The total market valuation for Microsoft Accelerator's China graduates has reached more than RMB 90 billion with post-incubation growth of more than 400%. Four companies are now listed on China National Equities and Exchange Quotations (NEEQ) - also known as the New Third Board Market.

Microsoft Accelerator China was founded in 2012 and has been named "The Best Accelerator/Incubator in China" for five consecutive years by China Venture Group.

Digital Digital/Consumer IoT

The Most Relevant Ecosystems



Main startups' hubs (based on the location of startups, applied research institutes, large corporations (that invest in startups), VCs:



1. Zhongguancun Innoway; Tsinghua X-Lab; Microsoft Accelerator (Beijing); Tencent Public Space & Double Hundred Program (Beijing)
2. Microsoft Accelerator (Shanghai); Tencent Public Space & Double Hundred Program (Shanghai)
3. Tencent Public Space & Double Hundred Program (Hangzhou)
4. Tencent Public Space & Double Hundred Program (Shenzhen)

Digital Consumer IoT

Potential Evolution in the next 5 years



2020 to 2025 view

- Given its “Made in China 2025” initiative, China will boost its national-level AI+ strategy, led by the Chinese government. The digital application in China is an overall technological ecosystem with AI technology as the core, surrounded by robotics, big data services, cloud computing, autonomous driving, drones, AR/VR, and various vertical applications. It is defined as the comprehensive “AI+” development strategy.
- Within the AI+ framework, China will focus more on the following AI segments, including voice technologies (speech recognition, speech synthesis, etc.), vision technologies (biometric recognition, image recognition, video recognition, etc.), natural language processing technologies (machine translation, text mining, emotional analysis, etc.), and AI chip development.
- At present, about 40% of AI companies in China are clustered in the field of computer vision. In terms of the industry competitive landscape, the leading AI algorithm companies will focus more on fundamental research and development of AI technologies and establishment of technology platforms, such as the facial recognition data platform established by SenseTime and Face ++, and they will further expand related technologies to body recognition, intelligent robotics, autonomous driving and other fields, with the technological supports from their supercomputing centers and cloud computing platforms.
- The leading AI companies in various subdivisions are establishing their computer vision technology ecosystems. For example, DJI will further develop its AI systems for intelligent drones. HIKVISION will independently develop AI technology in the field of video surveillance and security. HAIER and GREE will build new smart home systems. Other technology giants like Baidu, Alibaba, Tencent, are creating the most encompassing AI ecosystems integrating the various AI startups from different segments.
- Chinese AI startups are also making a big push into AI chip and semiconductor development, optical computing, quantum computing, and other cutting edge technologies to enhance their competitiveness on the global stage.

3D Bio-printing/Biomaterial

Major Startups



Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc.)	Current value	Funding Stream				Funding scale
					Year	Round	Investors		
Revoteck	Chengdu	Revoteck is a biotech company specializing in synthetic and bio-based 3D printing for clinical and research applications.	It was funded in 2014.	Undisclosed	It is a subsidiary corporation of BRC, a listed comprehensive company. All the fund of Revoteck is provided by BRC.				
Medprin	Guangzhou	Medprin mainly develops biomaterial designed for repairing damaged human tissue with bio-based 3D printing technology.	It was funded in 2008.	Undisclosed	2014	Angle	Share Capital; Jifu Investment	Undisclosed	
					2015	A	Share Capital	Undisclosed	
					2017	B	Stone Capital	Undisclosed	
Regenovo	Hangzhou	Regenovo provides professional integrated solutions in 3D printing technology for biomedical applications. It devotes to develop biomedical 3D printer equipment, materials and software	It was funded in 2013.	RMB595 million	2015	Angle	Bulls Fund; Share Capital; First Seafront; Pengrui Investment; Rise Sun; HED Ventures	Undisclosed	
					2017	A	Share Capital; Rise Sun; HED Ventures	Undisclosed	
					2018	B	Puhua Capital	Undisclosed	

3D Bio-printing/Biomaterial

Major Startups



Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc.)	Current value	Year	Round	Investors	Funding scale
Bluepha	Beijing	Bluepha produces biomaterial called PHA, which is a kind of biodegradable polymer, considered as good alternative to petroleum-based plastics.	It was funded in 2016.	Undisclosed	2016	Seed	Tsinghua X-Lab	Undisclosed
					2017	Angel	Frees Fund; Tus Star; Taiyou Fund	RMB5.6 million
					2018	Pre-A	Leaguer Group; Frees Fund	RMB10 million
					2019	A	ZGC Group; Frees Fund; Qianhai FoF	RMB40 million
Simatech	Suzhou	Simatech is a biotech company focusing on manufacturing silk fibroin biomaterials and developing state-of-the-art techniques for a variety of biomedical applications, including orthopedic surgery, plastic surgery, 3D bio-printing, drug delivery, and cosmetics.	It was funded in 2013.	Undisclosed	2014	Angel	Leader VC; Suzhou Industrial Park Venture Capital	Undisclosed

3D Bio-printing/Biomaterial

Major Startups



Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc.)	Current value	Year	Round	Investors	Funding scale
Sunp Biotech	Beijing	SunP Biotech is specialized in 3D bio-printing and advanced 3D bio-printing products. Its key products are 3D bio-printer and bio-ink for 3D bio-printer. It also provides 3D bio-printing services.	It was funded in 2014.	Undisclosed	2018	A	Orca Capital	RMB10 million+
USUN Biochemical	Jiangyin	USUN produces protein-based materials such as Mussel Adhesive Protein. Mussel Adhesive Protein products can be applied in the areas of chronic wound healing, wound debriding, itching relief, scarring and pigmentation.	It was funded in 2011.	Undisclosed	2015	Angel	Yinxinggu Investment; Silan Venture; China Venture Capital; Dingtai Huaying	Undisclosed

3D Bio-printing/Biomaterial

Applied Research Institute



Applied Research Institute (including Large Corporations that invest in Startups/spin-offs)	Facts and figures	Key interests	Partners
Sichuan 3D Bio-printing Institute (Chengdu)	It was established in 2016, and it was the first Research Institute for 3D bio-printing.	<ul style="list-style-type: none">• 3D bio-printing	<ul style="list-style-type: none">• Revotek• West China Hospital of Sichuan University• Southern Medical University• Southwest Jiaotong University• Dikang Biomaterials
R&D Center of Medprin (Guangzhou)	It is the internal R&D center for Medprin in 3D bio-printing and medical apparatus and instruments.	<ul style="list-style-type: none">• 3D bio-printing• Medical apparatus and instruments	<ul style="list-style-type: none">• China Additive Manufacturing Industry Alliance• National Post-doctoral Management Committee
Innovative Lab of Regenovo (Hangzhou)	It is the internal R&D center for Regenovo in 3D bio-printing and biomaterial.	<ul style="list-style-type: none">• 3D bio-printing• Biomaterial	<ul style="list-style-type: none">• Zhejiang Translational Medicine Association• Zhejiang University• Cancer Hospital of the University of Chinese Academy of Sciences (Zhejiang Cancer Hospital)

Source: VC websites, startup websites, university websites, research institute websites, Frost & Sullivan

3D Bio-printing/Biomaterial

Applied Research Institute



Applied Research Institute (including Large Corporations that invest in Startups/spin-offs)	Facts and figures	Key interests	Partners
National Engineering Research Center For Biomaterials (Chengdu)	Supported by Ministry of Science and Technology, It was established in 2000 in Sichuan University.	<ul style="list-style-type: none">• Biomaterials for regenerative medicine• Biomechanics	<ul style="list-style-type: none">• Ministry of Science and Technology• Sichuan University• Chinese Society for Biomaterials
Biomaterials and Tissue Engineering Research Center, Chinese Academy of Sciences (Shanghai)	Supported by Chinese Academy of Sciences, It was established in 2001.	<ul style="list-style-type: none">• Bioactive materials and tissue engineering scaffolds• Nano-biomaterials	<ul style="list-style-type: none">• Shanghai SICCAS High Technology Corporation• Shanghai Jiao Tong University
South China Institute of Collaborative Innovation (Dongguan)	It was joint established by Municipal Government of Dongguan and South China University of Technology in 2012, aiming to develop frontier technology in Dongguan. It also has its own investment funds to support innovative startups in Dongguan.	<ul style="list-style-type: none">• 3D bio-printing• Biomaterial• Organic photoelectric functional materials• Bioactive molecule• Macromolecular Materials	<ul style="list-style-type: none">• South China University of Technology

Source: VC websites, startup websites, university websites, research institute websites, Frost & Sullivan

3D Bio-printing/Biomaterial

Incubators, Accelerators



The number of startups that are capable to develop 3D bio-printing related products is very small. Actually, the startups of 3D bio-printing are scattered around China in the incubators or accelerators for high-tech. It is hard to define specific incubators or accelerators for 3D bio-printing, but some incubators or accelerators that have startups of 3D bio-printing or biomaterial can be identified.

Incubator/Accelerators	Location	Fact & Figures	Key Startups/Companies	Key interests
The West Zone of Chengdu Hi-Tech Industrial Development Zone	Chengdu	It is a state-level high-tech industrial development zone approved by the Ministry of Science And Technology.	<ul style="list-style-type: none">• Revotek• Puchuan Biomaterials• Dikang Biomaterials	<ul style="list-style-type: none">• Digital Biomaterial
Guangzhou Science City	Guangzhou	It is one key part of Guangzhou Hi-Tech Industrial Development Zone focusing on research and development of high-tech.	<ul style="list-style-type: none">• Medprin• Weimi Bio-Tech• Vipotion	<ul style="list-style-type: none">• Digital• Photoelectric Technology• Biomaterial
Hangzhou High-tech Enterprise Incubator Park	Huangzhou	In 2011, it was recognized as a state-level incubator for high-tech enterprises by the Ministry of Science and Technology	<ul style="list-style-type: none">• Regenovo	<ul style="list-style-type: none">• Digital Biomaterial
Zhongguancun Biomedical Park	Beijing	It is funded by Haidian District government for incubation of biotech startups.	<ul style="list-style-type: none">• Sunp Biotech	<ul style="list-style-type: none">• Biotech• Biomaterial

Source: VC websites, startup websites, university websites, research institute websites, Frost & Sullivan

3D Bio-printing/Biomaterial

Funding Sources



Funding source name / can be VC, public program	Description	Key Innovation Topics	Latest Funding
Share Capital	<ul style="list-style-type: none">It was established in Shenzhen in 2007. It is the earliest professional venture capital institution of limited partnership system in China.It mainly invests in early and mid-stage startup projects.	<ul style="list-style-type: none">BiotechRobotics	October, 2019 invested RMB300 million in Denovo Biopharma
Stone Capital	<ul style="list-style-type: none">It was founded in 2001. It is known to be one of the earliest private equity investment firms in China.It has established more than 80 funds in angel investment, venture capitalism, private capitals, mergers & acquisition, private placements and securities, with a total asset valuation of over 50 billion RMB under its management.	<ul style="list-style-type: none">BiotechTMT	October, 2019 invested RMB tens million in Benewtech
Tsinghua X-Lab	<ul style="list-style-type: none">It is a university-based education and investment platform designed to foster student creativity, innovation and entrepreneurship. It brings together Tsinghua students, faculty, alumni, experienced entrepreneurs, investors and experts from across society.	<ul style="list-style-type: none">BiotechTMTEducation	September, 2018 invested KDH Express.

Source: VC websites, startup websites, Frost & Sullivan

3D Bio-printing/Biomaterial

Funding Sources



Funding source name / can be VC, public program	Description	Key Innovation Topics	Latest Funding
Frees Fund	<ul style="list-style-type: none">It was founded in 2015, and focuses on early and early-stage investment. Its key investment interests are deep technology and consumption. It has invested in more than 100 startups in both the U.S. and China markets in the past five years.	<ul style="list-style-type: none">BiotechDigitalFMCG	November, 2019 invested RMB40 million in Bluepha.
TusStar	<ul style="list-style-type: none">It is an incubator for startups. It also has its own Investment department for startups and innovation projects.	<ul style="list-style-type: none">BiotechTMTDigitalRobotics	November, 2019 invested millions of RMB in Underwater Dynamics.
Orca Capital	<ul style="list-style-type: none">It is a boutique VC focusing on innovative technology.	<ul style="list-style-type: none">BiotechTMTDigital	November, 2018 invested tens million of RMB in Motovis.

Source: VC websites, startup websites, Frost & Sullivan

3D Bio-printing/Biomaterial

The Most Relevant Ecosystems



Main startups' hubs (based on the location of startups, applied research institutes, large corporations (that invest in startups), VCs:

1. Zhongguancun Biomedical Park
2. Guangzhou Science City
3. Hangzhou High-tech Enterprise Incubator Park
4. The West Zone of Chengdu Hi-Tech Industrial Development Zone



3D Bio-printing/Biomaterial

Potential Evolution in the next 5 years



2020 to 2025 view

- The 3D bio-printing industry began to industrialization in 2017 in China: many startups in the bio-printing industry began to develop primary products that have the potential for commercialization. The industry will keep in the early stage of industrialization in the next five years.
- A standardized system for 3D bio-printing industry will be established by industry associations and related regulatory authorities in China. The standardized system for 3D bio-printing industry will cover the sections of design, special materials, process technologies, test criterion, etc. The standardized system will be very vital for the commercialization of 3D bio-printing and related biomaterial.
- The value chain for 3D bio-printing and related biomaterial industry will be improved in the next five year in China. As the players in China have noticed that some key biomaterials for 3D bio-printing are imported from oversea, and to lower the cost of 3D bio-printing, developing the upstream biomaterial independently will be the key to the commercialization of 3D bio-printing. The mass production-scale will be based on the relatively lower total cost of 3D bio-printing products.
- Related research institutions and universities will play more important role for the commercialization of 3D bio-printing and related biomaterial industry in the next five years in China. The well-trained researchers and graduates of these organizations will be the major employees of the companies in the industry. Adequate supply of talents will help to the further commercialization of 3D bio-printing technology.
- The funding organizations such as VCs and PEs will keep sourcing and investing the startups in 3D bio-printing and related biomaterial in the next five years. Some leading biotech, pharmaceuticals companies will also invest or merger startups in this area, and integrate the business of the invested/acquired startups to their major business.

Top 3 Applications - Korea



Top 3 applications selected for Korea

These are based on Frost & Sullivan research findings and discussions with L'Oreal team



01

Biotech



This application covers the following:

- Exploiting biological processes to create molecules targeting pharma; cosmetics and other purposes;
- Enzymes for biopharmaceuticals, cosmeceuticals;
- Extraction of new active ingredients;
- Stem cells, deregulated areas, bioconversion, fermentation, green tech; green pathways;

02

Digital (AI, AR, VR, Big Data and Cloud)



This application covers the following:

- Artificial Intelligence – Focus Areas for Korea
 - AR, VR, Big Data and Cloud
- Disruptors and their innovations; Investors in the ecosystem

03

Cosmetics and Deep Tech Materials



This application area covers the following:

- Disruptive innovations in cosmetic materials;
- Green chemistry or processes that can replace classical ingredients in cosmetics
- Vegan Cosmetics
- Materials that are developed in adjacent industries that can be used in cosmetics;



Overview

- The Korean government favors tech startups, Korea is well known for their tech companies such as Samsung, LG and Hanwha. Almost 70% of Korean R&D is performed by business corporations
- There are many government programs for tech startups. Many startups can be started with government spending. A good idea or concept is all that may be required to qualify for government funds. A product or prototype is not essential in many cases. The Korean government is keen on innovation and so wants to give all bright ideas a chance to succeed.
- Even if government funding is not given, there are many avenues to seek private funding. There are many private accelerators in Seoul such as FTaccelerator, Sparklabs, 500startups, FastTrackAsia, and much more. A tech startup has a good chance of getting the attention of these accelerators. There are also many angel investors such as K Cube Ventures and Bon Angels.
- Korea has been focusing on niche segments within biosimilars, and cell therapy in the last 12 years with an aim to target the global market.
- Seoul aims to boost growth areas in AI to stay competitive. In 2018, the first tranche of \$9billion government fund to foster technology startups was released. Also in 2018, Samsung announced that the company would invest \$160 billion into new technologies and start-ups over the next three years.
- As of mid 2019, the country is developing a national AI strategy and intends to roll it out soon. By 2030, it intends to build 2,000 AI-based factories, which are a more advanced version of smart factories, and enact manufacturing innovation laws.
- Korean players understand that digital innovation will define the future of beauty products and will provide cosmetics companies a very strong competitive advantage
- Korea also aims to lead the eco-friendly market by making products and manufacturing greener.

Biotech – the most relevant ecosystems



Major Relevant startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Funding Stream (Investors)
1. Plcoskin	Seoul	<ul style="list-style-type: none"> Next-generation regenerative skincare products. Plcoskin is aiming to put YOULIEF as a pioneer in the anti-aging industry. The startup is doing research and development on regenerative skin, fillers, breast prosthesis for the next generation. 	<p>Founded by Ethan Baek and Chris Jung in 2017, the startup also launched cosmetics brand Youlief, aimed to make a positive difference in people's lives.</p>	<ul style="list-style-type: none"> Plcoskin has investments from U-Tech Valley and K-Start up. Initially, a loan from the government and after that, we have been funded by angel investments. Now we have a Venture Capitalist (VC), which is HGI.
2. Genome and Company	Gyeonggi-do	<ul style="list-style-type: none"> Researching and developing dietary supplements, cosmeceuticals, and new drugs utilizing microbiome. Developing microbiome based add-on therapy for programmed cell death. 	<p>Received \$18M funding Market Cap: \$400M Founded in 2016</p>	<ul style="list-style-type: none"> Genome and Company is a public listed company
3. Cell2in	Seoul	<ul style="list-style-type: none"> The main area of research of Cell2in is to improvise the quality of cells, specially for cell therapy, cell culturing and stem cells. 	<p>The start-up has been co-founded by professors of top-ranked universities in South Korea. Founded: Feb 2016</p>	<ul style="list-style-type: none"> Government grants around \$5million CKD Venture Capital Corporation Investment (\$0.7 million) Honest Ventures Investment (\$ 1million) Dong-Yu technology Corporation Investment (\$1million)

Biotech – the most relevant ecosystems



Major Relevant startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Funding Stream (Investors)
4. N-Finders	Seoul	<ul style="list-style-type: none"> Regenerative medicine brand “RE:” with a collection that includes RE: PRP, RE: PDO Thread and Ozein Peel(O₃) which received the world’s first patent. N-Finders intents to develop and produce products to integrate into many parts of the human body by developing technology which regenerates biopsy tissue. 	The company was founded in 2012. The startup is now looking for a potential market in Indonesia	<ul style="list-style-type: none"> Private investors
5. ExoCoBio	Seoul	<ul style="list-style-type: none"> Exosome, cosmeceuticals, and biopharmaceuticals 	Founded in 2017	<ul style="list-style-type: none"> Atinum Investment, InterVest, KDB Capital, SBI Investment, TS Investment
6. General Bio	Wonju	<ul style="list-style-type: none"> Developing new bio materials from microorganisms and natural and functional ingredients. 	Founded in 2013	<ul style="list-style-type: none"> Coolidge Corner Investment, L&S Venture Capital, Mirae Asset Venture Investment, SJ Investment Company, LLC, SJ Investment Partners

Biotech – the most relevant ecosystems



Applied Research Institute (including Large Corporations that invest in Startups/spin-offs); Universities	Facts and figures	Key interests	Partners
Korea Research Institute of Bioscience and Biotechnology (KRIBB), Daejeon	The TTO nurtures and incubates startups . The biological resource center was started in 1985 and has expanded	Bioscience and Biotechnology Genomics, Proteomics, Plant Biotech among other interests	Has an extensive global collaboration network
Korea Biotechnology Industry Organization (Korea Bio), Gyeonggi-do	Established 2008. Approximately 300 businesses related to the Korean biotechnology industry	Development of the biotechnology industry into a future core national growth engine	Extensive global network. Participates in global events. Hosts major events in Biotechnology in Korea
POSTECH Life Sciences Gyeongsangbuk-do <ul style="list-style-type: none"> • Biotechnology Research Center; • Biotech Center, 	<ul style="list-style-type: none"> • In May 1990, Biotechnology Research Center was established as an affiliated research institute to promote biotechnology research based on basic life sciences. • Jointly founded with POSCO in 2000, the Postech Biotech Center is a dedicated biotechnology research organization . Based on its stable biotechnology research infrastructure model, the Postech Biotech Center strives to vitalize the development of source technologies that are essential for developing new drugs 	Core areas of research; molecular medicine, plant biotechnology, and Nanobiotechnology	POSTECH currently has 136 partner institutions from 33 countries.



Biotech – the most relevant ecosystems

Korean companies are seeking niche areas to excel in the global stem cell therapy market

Cell Research Companies in Korea		Key interests
Samsung Bioepis, Seoul	<ul style="list-style-type: none">A biopharmaceutical company dedicated to unlocking the potential of biosimilar medicines and transforming the way biologic therapies are brought to patients. The company has the largest number of approved products by the FDA and EMA, followed in second place by Celltrion	Biosimilar medicines and therapies Samsung group company. Has commercialization agreements with leading companies worldwide
Celltrion, Incheon	<ul style="list-style-type: none">Celltrion is a leading biopharmaceutical company, specializing in research, development and manufacture of biosimilar and innovative drugs. Celltrion strives to provide more affordable biosimilar mAbs to patients who previously had limited access to advanced therapeutics	Biosimilars; improving manufacturing efficiency of biosimilars In 2019, Celltrion signed a partnership deal with the Canada-based iProgen Biotech Inc. to bolster its pipeline for novel biotherapeutics.
Eutilex, Seoul	<ul style="list-style-type: none">Biotech company	T cell and antibody therapies
Kangstem Biotech, Seoul	<ul style="list-style-type: none">Biotech company	Cord Blood-derived Stem Cell, Culture Media
Kolon Life Science, Seoul	<ul style="list-style-type: none">Biotech company	Cell & Gene Therapy, APIs
MEDIPOST, Seoul	<ul style="list-style-type: none">Biotech company	Stem cell technology & regenerative medicine
STC Stem Cell Treatment & Research Institute, Seoul	<ul style="list-style-type: none">Biotech company	Stem Cell Treatments
SCM Life Science, Seoul	<ul style="list-style-type: none">Biotech company	Subfraction Culturing Method for extraction of stem cells and Stem Cell Medicine

Biotech – Incubators, Accelerators



Incubator/ Accelerator	Location	Fact & Figures	Key Technologies and Interests
Korea Bio Hub	Hongneung, Seoul	<ul style="list-style-type: none"> A total of 22 startups in biotechnology, medical devices and digital health care are currently based at Seoul Bio Hub, 20 of which were selected by Seoul Bio Hub 	Biotechnology, Med Tech, Digital Devices
TIPS Korea (Korea Institute of Startup & Entrepreneurship Development)	Daejeon City	<ul style="list-style-type: none"> Investment-driven tech incubator program for Korean Startups. It is one of the most popular startup accelerators in South Korea. The program nurtures Korean startups that focus on innovative and groundbreaking technologies. They have a large network of angel investors and offer mentorship through professional support and matching Korean startups with R&D funds. This includes up to 1 billion won per tech startup for up to 3 years. 	<ul style="list-style-type: none"> All startups including Deep Tech
	Seoul	<ul style="list-style-type: none"> Future Play is a 4 month paid program. In addition, since 2014 they have helped over 60 Korean tech startups get funding and mentorship. Future Play has formed partnerships with LG Electronics and Amorepacific to bridge the gap between startups and big firms. Therefore, this will reduce the risk of many of the Korean tech startups that join the accelerator program. 	<ul style="list-style-type: none"> Early Deep tech startups Electronics Biotech Cosmetics Materials

Biotech – Incubators, Accelerators



Incubator/ Accelerator	Location	Fact & Figures	Key Technologies and Interests
	Daejeon	<p>Bluepoint partners focuses on developing and nurturing advanced manufacturing startups with MiraeHoldings and Neopharm to meet the market demands.</p> <p>Mirae Holdings + Neopharm + KRIIB (Korea Research Institute of Bioscience and Biotechnology) (BI) + KAIST (BI)</p>	Biotechnology, ICT, Retail
	Gyeongsangbuk-do	<p>Through its Idea Market Place, targeting all industries, POSCO discovers talent with entrepreneurial qualities and creative ideas by providing support using its extensive global networks.</p>	All Industries
Medicity Daegu: Daegu- Gyeonbuk Advanced Medical Complex	Daegu	<p>The Daegu-Gyeongbuk Advanced Medical Complex, which was established to realize high-value-added medical commercialization by promoting R & D achievements, attracted 15 national medical institutions and 124 medical companies. It is possible to support one-stop enterprises by attracting all the funding and application, clinical, personnel training, licensing and business support organizations required for business.</p>	Biotechnology, Med Tech, Medical Devices, Pharma

Biotech – funding sources

VCs and Funding Sources



Funding source	Description	Key Innovation Topics
CKD Venture Capital Corporation	<ul style="list-style-type: none">CKD Venture Capital Corporation is a Seoul, Korea-based venture capital firm. Founded in 1997, CKD Venture Capital Corporation considers seed, early stage, late stage and mezzanine investments	<ul style="list-style-type: none">Stem cells, regenerative medicine
Korea Government R&D grant	<ul style="list-style-type: none">The Korean government provides incentives for R&D centers to attract high value added foreign investment.	<ul style="list-style-type: none">Assigning Ventures & SMEs to lead creative economy and supporting their overseas expansionCreation of new growth engines for finding new industries and markets
Honest Ventures	<ul style="list-style-type: none">Honest Ventures is a South Korean investment firm that invests in areas such as bio-healthcare, ICT, manufacturing, software, and more	<ul style="list-style-type: none">Bio-healthcare, ICT, manufacturing, software, and more
Stonebridge Capital	<ul style="list-style-type: none">A venture capital firm based in Seoul. Invests in late-stage technology companies including bio/healthcareIndicated in 2019 to invest more into biotechnology startups	<ul style="list-style-type: none">Biotechnology drug development; HealthcareHas invested in a few Biotech/Healthcare startups in Korea. Biotechnology; has invested in Intocell that develops drug conjugates

Biotech – funding sources

VCs and Funding Sources



Funding source	Description	Key Innovation Topics
COOLIDGE CORNER INVESTMENT	Located in Seoul and Busan. Has a seamless process of selecting, incubating, and investing in startups. A venture capitalist firm specializing in the early stages of startup development. In partnership with Silicon Valley based BootstrapLabs, who are a global accelerator for technological startups. Provides professional support until the startups are ready to enter the global market.	<ul style="list-style-type: none">• ICT, Education, Retail, IOT, Gaming, Biotechnology
INNOPOLIS PARTNERS	Located in Seoul. They invest in and support hardware-based startups in manufacturing and bio sectors. They work together with Korea Science & Technology Holdings (KST) which is a technology-integrated group of 17 government-funded research institutes.	<ul style="list-style-type: none">• Manufacturing, Biotechnology• Has invested in Lab Genomics and ISUABXIS in Biotech space

What is the typical way that start-up companies engage with the VCs, incubators, angel investors?



TIPS Korea:

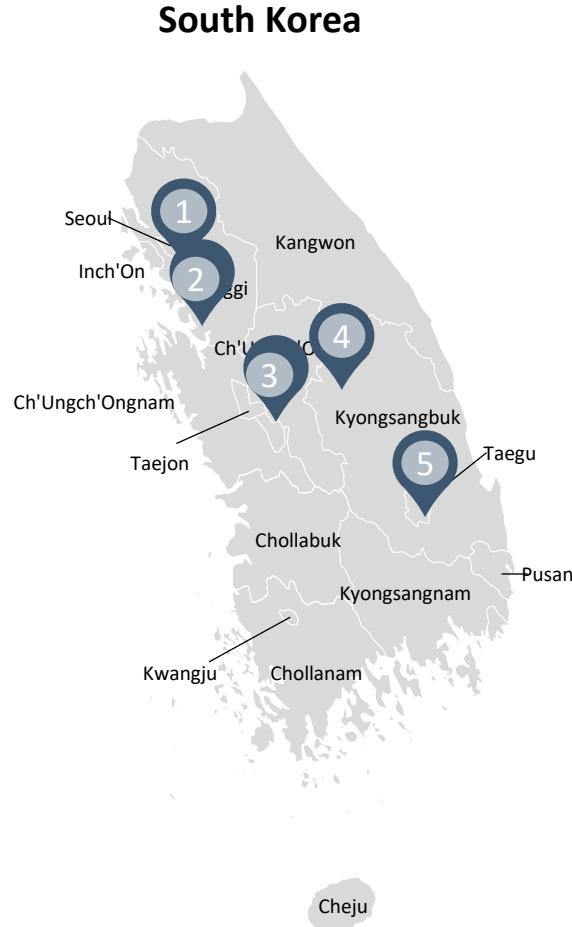
Korean startups that wish to apply need to be tech-related and have at least two people with a concrete technical R&D plan. Once accepted they will sign an Investment Agreement in order to receive the R&D funds from the government.

The R&D Fund will be given by the Korean government. Therefore, the **Korean startup** does not have to give up equity. However, if the startup is successful they will have to pay back 10% of the R&D Fund in installments up to 3 years. Furthermore, if the business fails they will not be liable for this payment. Finally, the CEO of the **Korean Startup** must hold Korean citizenship. However, there is no problem if the Korean citizen is a Co-CEO of the company. Furthermore, the Korean co-founder must hold more than 60% of the company's shares.

Angel Investment (100M KRW) + Business Incubation and Mentoring from Successful Angel Investors + R&D Funding (500M KRW) + Additional Financial Assistance (400M KRW; comprising in Startup Funding, 200M KRW in an Angel Matching Funds, 100M KRW in Overseas Marketing Assistance).



Biotech – the most relevant ecosystems



Main startups' hubs (based on the location of startups, applied research institutes, large corporations (that invest in startups), VCs):

1. Seoul: Korea Bio Hub
2. Incheon; Songdo International City – Bio Industry Hub
3. Deaduk Valley, Daejeon: Bio Medicine, Healthcare, Functional Food
4. Wonju-Si, Gangwon-do -Medical Industry Technovalley, Biotech, Pharma
5. Daegu-Gyeongbuk - Medical Innovation Foundation, Pharma; Bio Electronics, Functional Materials, Biochemistry

Potential Evolution For Biotech in the next 5 years

2020 to 2025 View



Within the next 5 years, will this application grow?

How is this application going to be disrupted; who are going to invest in this application?

Research to develop products that can replace human tissue is gaining traction. Artificial organ / graft development, cloning using stem cell research and bionic technology are of particular interest.

The biotechnology market in Korea is not large enough and the players have to compete in the global market. The Korean companies can't compete with the huge R&D spend of the large global companies. Hence, Korean companies strategy would be target niche areas and excel – Biopharmaceuticals and Regenerative medicine. These two areas seem very promising for Korean technology. Tissue engineering is another area that will see development. Surgeries are using stem cells - cosmetic surgery, plastic surgery and dermatological treatments are set to grow.

The Korean government is amending the laws relating to advanced biopharmaceuticals and regenerative medicines so that Korean companies can compete in the global market. To this effect, South Korea is to fast track new drug approval, clinical stem cell therapy research.

Artificial Intelligence based new drug development platforms, "smart clinical trial infrastructure" will grow in importance over the next 5 years

Large companies such as Abbot Laboratories , Roche , Samsung Bioepis and Celltrion will continue to spend billions of dollars in R&D in the biotechnology space. Startups will seek out niche areas to grow. This market will see a lot of M&A transactions as the large companies will see value in acquiring the successful startups.

Korea has established a very strong biotechnology ecosystem that can target opportunities in the US, China and also Japan. With the amendment of laws, biotechnology is set to grow in strength in the next 5 years.

Digital – the most relevant ecosystems



Major Relevant startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Funding Stream (Investors)
Skelter Labs	Seoul	Smart Assistant	Founded in 2015	Golden Gate Ventures, Kakao Brain, Kakao Ventures, Lotte Homeshopping, Stonebridge Ventures
Lululab	Seoul	Lumini is a personalized AI skin assistant that analyzes the user's skin and recommends the best products and services for each user.	Founded in 2017. Lululab is a spin-off company of C-Lab, Samsung Electronics' in-house venture program and a member company of Born2Global Centre.	Private investors – Samsung Electronics
Looxid Labs	Seoul	Seamlessly integrate an emotion recognition system with VR using an eye and brain interface.	Founded in 2015	Hastings Asset Management, Daesung Private Equity, Sejong Venture Partners and Samsung Venture investment
Reziena	Seoul	Beauty IoT startup. Reziena has plans to develop an AI platform based on users' personal data with the goal of offering them a more high-quality and personalized beauty care service in the comfort of their home.	Founded 2018, selected by Beiersdorf Accelerator program in 2019	Future play and the Korea government TIPS Amorepacific TechUP+ Beiersdorf Accelerator Program

Source: Crunchbase, Seoulz.com, K-Startup, e27, Venture Radar, Local Governments, VC websites

Digital – the most relevant ecosystems



Major Relevant startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Funding Stream (Investors)
Acryl	Seoul	"emotion recognition" technology, which will allow AI platforms to understand emotions of users rather than to just give answers based on data.	Founded in 2011. LG Electronics said it aims to forge deeper ties with Acryl as such technology is vital for the robot business, which is considered one of the major future growth engines for the company.	Bluepoint Partners; LG acquired 10% stake in Acryl during 2018 paying \$934k.
Roburus	Seoul	AI-Based Technology to offer personalised service. AI/ machines learning based facial recognition and development of robots and kiosks to store customer data and for smart ordering systems	Founded in 2016; \$5 million funding	Private investors
Kinetic Lab	Gyeonggi-do	R&D startup company based on motion sensing technology using wearables and 3D camera	Founded in 2016	KOTRA, KITECH, KISED, Korea Post and GoQBa Tech are listed as partners
Doubleme	Gyeonggi-do	The startup provides a novel hologram experience through its 3D capture system – the HoloPortal that converts 2D videos into dynamic 3D models in real-time.	Founded in 2014 with HQ in the US but a major presence in Korea. The startup estimates that the market size for volumetric video will reach \$2.8 billion by 2023 and it will help in its growth for the easy utilisation advantage over other complex volumetric video solutions available.	Awarded \$3 million in 2018 R&D grant by Institute for Information & Communications technology Promotion (IITA), Korea

Digital – the most relevant ecosystems



Applied Research Institute (including Large Corporations that invest in Startups/spin-offs); Universities	Facts and figures	Key interests
Korea Advanced Institute of Science and Technology (KAIST), Daejeon,	KAIST (Korea Advanced Institute of Science and Technology) that set up an AI graduate school also set up an industry-university collaboration center in Pangyo. All these surrounding infrastructures will be enough to create synergy.	AI, ICT
Samsung Research	Samsung Research is developing next generation artificial intelligence technology which will adapt all Samsung products and services to become the new leader in Artificial Intelligence. One of the global leaders for patents in AI.	AI for Communications, Robotics, IoT, Health & Wellness, Security among main interest areas.
SK Telecom	SK Telecom is a leading telecommunication company in Korea. Its interests now expand beyond telecommunication into other Digital Areas. SK Telecom wants to drop "Telecom" from its company name to highlight its focus on Data and AI	SK Telecom's '5G Cluster' is an advanced 5G environment with cutting-edge ICT including AR, VR, and AI
Naver's D2 Startup Factory (D2F)	An accelerator for tech startups operated by the country's largest internet portal operator Naver Inc.	During October 2019, D2F selected the three startups in the fields of artificial intelligence (AI), digital health care and mobility for its accelerator program

Digital – Incubators, Accelerators



Incubator/ Accelerator	Location	Fact & Figures	Key Technologies and Interests
DreamPlus, Hanwha Corporation	Seoul	<ul style="list-style-type: none"> DreamPlus is an ICT accelerator powered by Hanwha Corporation. 	<ul style="list-style-type: none"> ICT
Primer	Seoul	<ul style="list-style-type: none"> Primer has been around for a while and is one of the most well-known accelerators in Korea. They have invested in over 130 startups that are focused on IT and software services. 	<ul style="list-style-type: none"> ICT, Software
Born2Global	Seoul	<ul style="list-style-type: none"> Introduced in 2016 by the Seoul Metropolitan Government in Yongsan District, central Seoul, the Seoul Global Startup Center runs the Born2Global Accelerator Program for the recruitment of foreign technology startup entrepreneurs in Korea. 	<ul style="list-style-type: none"> Tech Startups
Mashup Angels	Seoul	<ul style="list-style-type: none"> Mashup Angels is an early-stage startup accelerator in Korea that specializes in ICT. They have supported over 90 startups to date including fashion and beauty startup StyleShare. Mashup Angels have over 6 years of experience in angel investing. They have provided a management program through a group of entrepreneurs, hands-on business professionals, and experts. Their investments range from \$50,000 to \$300,000 for a 10% equity stake in the company. 	<ul style="list-style-type: none"> ICT

Digital – Incubators, Accelerators



Incubator/ Accelerator	Location	Fact & Figures	Key Technologies and Interests
SparkLabs	Seoul	<ul style="list-style-type: none"> This global accelerator was founded in 2012. They already have the best team of mentors in Korea. They invest in Korean Startups that want to expand to the U.S., Japan, and China. Their main headquarters are located in Seoul but SparkLabs already has several overseas startups. 	<ul style="list-style-type: none"> The industry they focus on the most is ICT - internet, online gaming, mobile, digital media, and e-commerce sectors. Consumer services, enterprise, cloud computing, financial tech, artificial intelligence and hardware are also in their interest list In addition, their Demo Days are some of the best in Asia due to their vast mentor network. Which is why SparkLabs has one of the best startup accelerators in South Korea.
500 Startups	Seoul	<ul style="list-style-type: none"> Typically invest \$100-250K per investment into 15-20 new companies a year in Korea. The investment decisions within 2 weeks. We invest in founders who would rather fail than aim for something small. 	<ul style="list-style-type: none"> Fin Tech, Edu Tech, Food, Digital
NEOPLY	Bundangdong	<ul style="list-style-type: none"> NEOPLY, a Seoul-based startup accelerator, is focused on investing in startups in South Korea. NEOPLY has incubated more than 40 startups. 	<ul style="list-style-type: none"> User experience platforms, platform for learning foreign languages through private tutoring; Digital billboard platform



Digital – funding sources

Funding source name / can be VC, public program	Description	Key Innovation Topics
Daesung Private Equity	<ul style="list-style-type: none">A venture capital firm specializing in investments in many industries. Daesung Private Equity Inc. was incorporated in 1987 under the Daesung Group.	Telecommunications, electricity, food and beverage, broadcasting, clothing, biotechnology, information technology, nanotechnology, and environmental and energy technology
	<ul style="list-style-type: none">Samsung Venture Investment Corporation was established to promote promising small and medium-sized companies engaging in the development of new technologies. Provides a comprehensive total solution, which includes not only investment funds but also management support, technical support and market registration	Semiconductors, telecommunication, software, internet, bio engineering and medical industry from start-ups to established companies that are about to be listed on the stock market
POSCO Venture Capital Corporation	<ul style="list-style-type: none">Founded and financed by POSCO to help build stronger startups. More than 200 professors from POSTECH, help this VC fund evaluate the technologies it invests in. The POSTECH VC portfolio is over 60 billion Korean Won.	IT, Advanced Materials, BioTechnologies, Renewable Energy and Life Sciences
Softbank Ventures Asia	<ul style="list-style-type: none">SoftBank Ventures Asia will focus on finding artificial intelligence-related startups globally, with an emphasis on Asia and Korea	AI, IoT, and robotics startups

VCs and Tech Incubators for Digital Startups (Partners of TIPS - KISED)



카이트창업기체단
Entrepreneurship
Foundation



Primer



COOLIDGE CORNER
INVESTMENT

INNOPOLIS
PARTNERS

posco



ActnerLAB



megalInvestment

WAPS
With Advanced Passion & System

infobank

KAIST
청년창업투자지주(주)
KAIST Venture Investment Holdings



What is the typical way that start-up companies engage with the VCs, incubators, angel investors?

SparkLabs Global Startup Accelerator Program

Startup Accelerators in South Korea usually last about 3 months. Startups that enter are in their seed to early-stage and are looking to go global. Sparklabs invests up to \$40,000 for a 6% equity stake in the startup. However, this is negotiable per startup.

Startups are matched with 4 to 6 mentors. They get weekly sessions with these mentors through teaching sessions. Also, Korean startups will have access to Sparklabs's General Partners. Furthermore, they will have office spaces at MARU180, cloud services, and legal advice.

Finally, there is the Demo Day where the **Korean startups** are highlighted. Startups can present to potential investors and get feedback from SparkLab's partners. At Demo Day will have a large media presence and will attract influential figures from the industry. SparkLabs is the **first of the Startup Accelerators in South Korea** to be a part of the Global Accelerator Network (GAN).



The K-Startup Grand Challenge is an annual project conducted and financed by the Korean government and offers startups a fantastic global platform for their ideas and a break into the robust Asian market.

Promising startups with a clear objective to expand into Asia by using the Korean market as a stepping-stone may register and apply online



Digital – Main Industrial Clusters

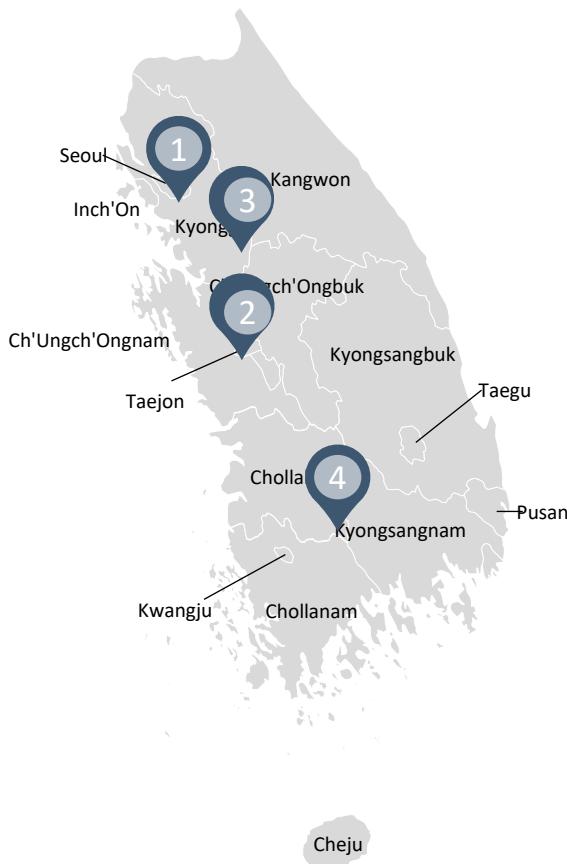


Digital Industrial Clusters	Location	Fact & Figures
Pangyo Techno Valley	Gyeonggi Province, South Korea	<p>There is a strong AI trend within Pangyo Techno Valley that is seen as the Silicon Valley of South Korea. Pangyo Techno Valley is planning to form an AI cluster and make a leap as the second global innovative cluster. Startup supporting agencies will also work on helping startup companies go global. They are going to help startup companies since their establishment and attract foreign supporting agencies to Pangyo. Gyeonggi-do and Gyeonggido Business & Science Accelerator (GBSA) are putting all of their efforts into attracting AI cluster to Pangyo Techno Valley. Their plan is to convert Pangyo Techno Valley into an innovative cluster connected to ICT (Information Communication Technology) and BT (Bio Technology).</p>
AI Industrial Complex	Gwanju	<p>The national AI research center in Gwanju will be Korea's top convergence technology research facility aimed at supporting national research projects for core technologies such as AI as well as research and work by private enterprises. It will also help researchers test, verify and standardize the AI systems they have developed. Gwangju Metropolitan City was exempted from a preliminary feasibility test earlier this year. It is going to invest \$334 million (406.1 billion KRW) until 2024 to create an 'AI-based scientific technology startup complex'.</p>



Digital – the most relevant ecosystems

South Korea



Main startups' hubs (based on the location of startups, applied research institutes, large corporations (that invest in startups), VCs:

1. Seoul: Mapo, Hongreung, Magok, Gaepo, Gangnam Teheran Valley
2. Deaduk Valley, Daejeon
3. Pangyo, Gyeonggi
4. Gwanju – AI Industrial Complex

Potential Evolution For Digital in the next 5 years

2020 to 2025 View



Within the next 5 years, will this application grow?

How is this application going to be disrupted; who are going to invest in this application?

In 2018, South Korea released an ambitious plan to invest 2.2 trillion won (\$2 billion) by 2022 for developing core artificial intelligence (AI) technology over five years with the aim of becoming a global powerhouse in the sector.

In response to a shortage of AI engineers in the country, the South Korean Government has released a plan to start at least six new AI schools by 2020 and groom 10,000 talents by 2023 in the area of computer software and artificial intelligence.

Having much support from the government, AI startups and businesses are also booming, building a strong AI ecosystem in the nation. Both the government of South Korean and companies think the same — AI is definitely a vital technology for the nation's growth.

An increasing number of skincare and cosmetics companies here are utilizing big data and artificial intelligence (AI) technologies for personalized marketing strategies aimed at attracting the post-millennial generation (Gen Z), according to industry officials.

Big Data analytics are proving to be particularly useful for the beauty industry to provide tailored services and customization of products, such as a serum meant for a specific type of skin.

Virtual Reality and Augmented Reality combined with AI and Haptic reality will be making inroads into many industries, including the cosmetics industry. The AR and VR environments will be utilized for enhancing marketing and also customer experience.

Investment will be led by large corporations such as Samsung, SK and LG, with the government also investing into the development of this important technology area. This segment also has the highest interest among VCs, Incubators and Accelerators.

Korea, with its focus on digital technologies, will provide many startups with a myriad of opportunities in the next 5 years

Cosmetics & Deep Tech Materials – the most relevant ecosystems



Major Relevant startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Funding Stream (Investors)
ZEVAHEALS	Seoul	A natural essential oil company, ZEVAHEALS used natural ingredients in cosmetics range to keep the skin healthy via the Troxderm range	Founded in 2016.	Private investors
Melixir	Seoul	Vegan cosmetics. Unique serums and face oils. Plant-based squalene instead of from sharks. Replacing animal testing in cosmetics,	Founded in April 2018	Primer is the Accelerator; Private investors funding
BioSynectics	Seoul	Functional nanoparticle ingredients for Cosmetics and Pharma Nanoparticulation Using Fat and Supercritical fluids	Founded in 2004. R&D agreements with many pharma companies. Recognized as a venture company with new technology during 2007	Went public in 2017 and is listed on KONEX
Nanobrick	Gyonggi-do (HQ) and Seoul	The company offers new nano materials and applications	Established in 2007.	Nanobrick is a publicly listed company
 ANPOLY Advanced Natural Polymer	Pohang –si, Gyeongsanbuk-do	Manufactures biopolymers — nanocellulose and nanochitin from pulp and crab shell — and sells them to manufacturers of plastic goods	Hwang Dong-soo, a scientist, developed bioplastics and established the company in 2017	ANPOLY is a startup company by POSTECH Entrepreneurship Center. The founder is a professor at Pohang University of Science and Technology

Cosmetics & Deep Tech Materials– the most relevant ecosystems



Applied Research Institute (including Large Corporations that invest in Startups/spin-offs); Universities	Facts and figures	Key interests
AmorePacific 	<p>Amore Pacific has its own R&D set up since 1954. It also partners with other companies such as Givaudan (for Microbiome research). The company also partners with Pureplay, an incubator for nurturing startups.</p>	<p>Ginseng, Scalp and Hair, Beauty foods are some of the research areas covered by AmorePacific R&D.</p>
LG Household & Healthcare 	<p>LG H&H was originally spun out of the company LG Chem as a cosmetics business in 2001, with total sales in the realm of \$650 million. However, thanks to its series of acquisitions, LG H&H grew its total sales to \$3.3 billion by 2018</p> <p>The Cosmetics Research Center was established in 1984</p> <p>LG conducts inhouse research, partners with other research agencies and also scouts for innovation from startups</p>	<p>Cutting-Edge Bio-Fusion Technology</p> <p>Differentiated New Formulation Technology</p> <p>Scientific Research of Traditional Korean Herbal Medicine</p> <p>Fermentation-applied Technology for Bio-Ginseng</p> <p>New Powder Formula Technology for Improved and Long-Lasting Makeup Application</p> <p>Development of Technology for Differentiated New Containers</p>
Kolmar 	<p>Since the founding of the company during the 1990s, the company has also focused on its R&D activities</p>	<p>Skin-care and Skin science R&D – quasi drugs</p> <p>Make-up R&D - complexion</p> <p>Personal Care R&D – Hair loss</p> <p>Skin Science R&D – Fermented Herbal Medicine</p>

Cosmetics & Deep Tech Materials– the most relevant ecosystems



Applied Research Institute (including Large Corporations that invest in Startups/spin-offs); Universities	Facts and figures	Key interests
Korea Institute of Materials Science (KIMS) 	Established in 2007 at Changwon, Gyeongnam	Research and develop metal , ceramic materials , surface related materials , fusion-composite materials and their processes
The Korea Research Institute of Chemical Technology (KRICT) 	The institute was established to develop eco-friendly chemical process and technologies. The institute has used plant-based components of isosorbide and nanocellulose to develop the bio-polycarbonate. Their aim is also to develop bio-plastics	<ul style="list-style-type: none"> High value-added green chemical materials such as Bio-Polycarbonate Bioplastics Virus growth inhibitor
POSTECH 	Pohang University of Science and Technology is a private research university in Pohang, South Korea dedicated to research and education in science and technology. The institution was established in 1986	Organic Nanostructured Materials <ul style="list-style-type: none"> Production of Organic Nanoparticles for Biomedical Use (, Cosmetics) Biomedical Use of Biodegradable Nanoparticles (Drug Delivery, Biomedical Sensing) Mass Production of Functional Colloids for Cosmetics (Self-Curable Cosmetics)
SK Bioland 	SK Bioland has a R&D facility at Jeju Island. The company manufactures and supply active ingredients to the cosmetics industry	Natural extraction, separation, purification, synthesis and fermentation of cosmetic ingredients

Cosmetics & Deep Tech Materials – Incubators, Accelerators



Incubator/ Accelerator	Location	Fact & Figures	Key Technologies and Interests
APTechUp+ (Amore Pacific+ and Future Play)	Seoul	<ul style="list-style-type: none"> It provided support to start-up companies virtualive, Biovit, Trove, Paffem, and Reziena, 	<ul style="list-style-type: none"> Cosmetics technologies Beauty care technologies
Nivea Beauty Accelerator	Seoul	<p>Nivea Beauty Accelerator (NX) was started by Beiersdorf, a global skincare brand. They own global skincare brands such as LaPrairie, Eucerin, and NIVEA. They launched their beauty accelerator program in Korea (Hongdae). Beiersdorf is the first global brand that has launched a beauty accelerator in Korea. They have made partnerships with WeWork Korea and are looking to capitalize on the K-beauty boom of the past few years.</p>	<ul style="list-style-type: none"> Skincare, Beauty Products Innovations
Primer	Seoul	<ul style="list-style-type: none"> Primer was founded in January 2010 as the first startup accelerator in Korea by five successful entrepreneurs Though main focus is on ICT, they also work with cosmetics and materials companies (Melixir) 	<ul style="list-style-type: none"> Primarily ICT - internet, software, gaming. Also invests in materials and cosmetics companies

Cosmetics & Deep Tech Materials – Incubators, Accelerators

The three not-for-profit Organizations to foster Startups



Incubator/ Accelerator	Location	Fact & Figures	Key Technologies and Interests
	Seoul	<ul style="list-style-type: none"> Startup Alliance Korea is a not for profit organization co-established by the Korean government during 2013. The organization's mission is to foster startup's expansion into the global market. Startup Alliance effectively links different members of the ecosystem and strives to be the catalyst for creating a virtuous cycle for the startup ecosystem. 	<ul style="list-style-type: none"> Any type of startups
 Korean Startups & Entrepreneurs (KSE)	New York, USA and Seoul, Korea	<ul style="list-style-type: none"> Korean Startups & Entrepreneurs (KSE) is a 501(c)(3) non-profit organization seeking to cultivate and develop the technology startup ecosystem in the United States, particularly involving Korean-American and South Korean founded companies 	<ul style="list-style-type: none"> Startups, Tech Startups, Venture Capital
 D.CAMP Connecting Entrepreneurs	Seoul	<ul style="list-style-type: none"> Established in 2012, Dream Bank (Banks Foundation for Young Entrepreneurs) is a non-profit foundation funded by the Korean banking industry. Its mission is to create more jobs and boost Korean economy by nurturing the Korean startup scene. They assist entrepreneurs by providing both financial and non-financial support. 	<ul style="list-style-type: none"> Any type of Startups

Cosmetics & Deep Tech Materials – funding sources

2 slides (from investors in startup slides)



Funding source
name / can be VC,
public program

Hanwha Investment
Corp



- Hanwha Investment Corporation actively seeks out companies with groundbreaking technologies that transform industries
- Hanwha Investment Corporation is a venture capital / private equity firm based in Korea with over \$500 million under management.
- Hanwha Investment Corporation embodies and boasts its strategic collaboration with Hanwha Group, which is the 8th largest conglomerate in Korea

Key Innovation Topics

Hanwha Investment Corporation invests in early stage and growth equity businesses in chemicals & materials, bio-medical science, digital media, renewable energy and software.

BainCapital
PRIVATE EQUITY

- Bain Capital, a global private equity firm has been expanding its presence in Korea since 2016. They have been active in the cosmetics segment picking up stakes in various cosmetics companies. They are also keen on investing in startups

Bain Capital acquired Carver Korea , a leading Korean specialty cosmetics company during 2016.

Bain also acquired a 40 percent stake in local botulinum toxin maker Hugel

Strong Ventures

- A venture capital firm investing in seed stage companies in South Korea and the US.

Has been active investing in startups in Food, Cosmetics,

What is the typical way that start-up companies engage with the VCs, incubators, angel investors?



The NX Accelerator in Korea is Beiersdorf's first own acceleration program. The selection program included a thorough evaluation of more than 200 beauty startups in South Korea, based on criteria such as business potential, concept innovativeness as well as team capabilities. The 10 finalists were given the chance to present themselves to Beiersdorf in the pitch event held by NX in cooperation with WeWork Korea. International judges from Beiersdorf's headquarters and Asia-Pacific offices as well as external experts selected the first batch for NX. NX provides the opportunity to pitch for investment from Beiersdorf.



Inside 8 sessions, the IR Pitching Competition seeks to unearth outstanding startups able to compete globally and then to promote them in domestic and overseas startup ecosystems.

Food Tech

Beauty&Fashion

Entertainment

Mobility

Fin Tech

Bio&Health

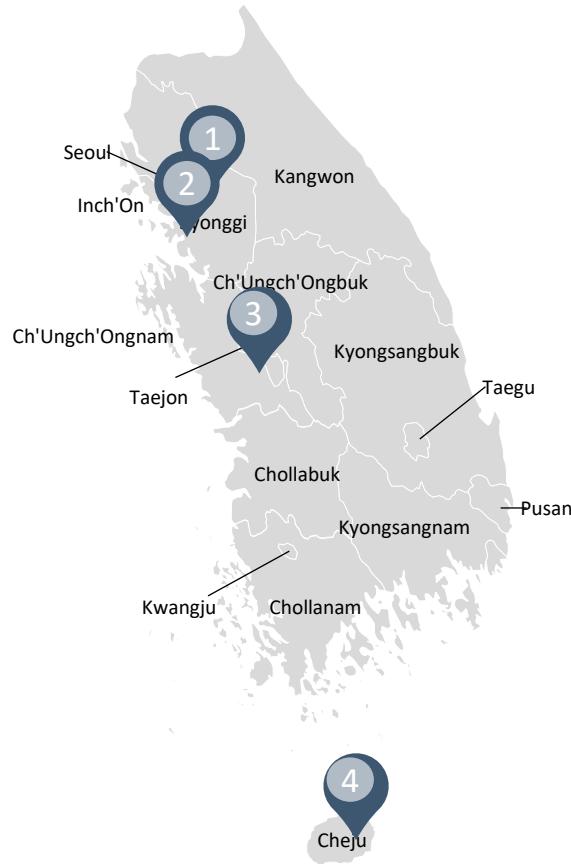
Edu Tech&Life Style

Frontier Tech

Cosmetics & Deep Tech Materials – the most relevant ecosystems



South Korea



Main startups' hubs (based on the location of startups, applied research institutes, large corporations (that invest in startups), VCs:

1. Seoul: Hongdae, Junggu
2. Incheon: Beauty City Project
3. Ch'Ungch'Ongbuk: Deaduk Valley, Functional Materials
4. Jeju Area: Jeju Cosmetic Valley; Natural Materials, BioFood, Agriculture, Functional Cosmetics

Potential Evolution For Cosmetics & Deep Tech Materials in the next 5 years - 2020 to 2025 View



Within the next 5 years, will this application grow?

How is this application going to be disrupted; who are going to invest in this application?

Innovation in cosmetics is leading to interesting products for skin, scalp and hair. A whole host of beauty foods are being developed. There is growing interest in tradition Korean herbal medicine is gaining. Bio-Ginseng is another growing area.

Among the main trends, there is a clear growing preference for vegan cosmetics. According to Olive Young, sales of vegan cosmetics rose about 70% in 2018. Since South Korea has not yet established its own vegan certification, the products are qualified as 'vegan' by other countries, such as the UK and Australia. The growth of vegan cosmetics is part of a bigger ethical skincare trend that includes eco-friendly packaging.

The technologies being developed by cosmetics R&D labs include:

- Bio-Fusion Technology
- Fermentation Technology
- Powder Formula for Improved and Long-Lasting Makeup Application
- Fragranced bodycare products that can activate emotions among consumers
- Micro dust cleansers
- New packaging technologies

Companies, brands and manufacturers in the skincare field should explore this emerging trend for future growth opportunities.

Materials being developed in other industries that could find applications in the cosmetics industry would be environment friendly solvents, bio plastics for packaging, innovative packaging technologies that can increase the shelf life of products.

The Korea beauty industry is one of the largest in the world. Investments will be mainly from the large established players. These large companies will also seek innovative products from innovative startups. Disruption in this industry will be driven by both the large companies and also innovative startups.

Top 3 Applications - Japan



Top 3 applications selected for Japan

These are based on Frost & Sullivan research findings and discussions with L'Oréal team



01



Biotech/Pharma

This applications cover the following points:

- Regenerative Medicine with cosmetic applications;
- Pharmaceutical molecules development with cosmetics interests;
- green process and technologies, targeting pharma, cosmetics and other purposes.

02



Materials

This application covers the following:

- Materials developed in automotive or printing industry such as paints or inks that can be applied to cosmetics;
- Advanced materials (new, smart, multifunctional, etc...) with that can be used in cosmetics;
- 3D printing advances that can be of particular interest to L'Oréal.

03



Devices

This application covers the following:

- Electronic and connected devices (IoT) with potential applications in cosmetics and dermatology fields such as anti-aging, spot erase, etc...;
- Other medical and cosmetic devices of specific interest for L'Oréal.

Overview



- Record levels of venture capital investment in Japan suggest that some of the nation's biggest companies are increasingly deploying some of their massive cash reserves (273 trillion yen as of March 2019, a record high, according to data from the Bank of Japan) into the country's tech start-up sector, yet at a pace many times slower than in the US, China, and Europe.
- Japanese companies are sitting on a cash pile of 273 trillion yen as of March, a record high, according to data from the Bank of Japan, and they can invest directly in startups or through their own venture capital funds.
- Among Japanese corporates, a popular scheme is a so-called "two-person fund" in which a single company outsources its startup investment activities to an independent venture capital fund.
- Japanese venture capital investment hit 52.9 billion yen in the April-June quarter of 2019, a 65% increase from a year earlier. Japan is catching up with the gap with other nations.
- While appetite is growing, venture capitalists may find difficulties in finding prospective startups in a country where lifetime employment is a norm for employees in major companies. One major roadblock for startups is securing talent.
- The Japanese government took noticeable actions to help develop efficient startup ecosystems: the most important contribution of the Abenomics “third arrow” reforms is a strong commitment to support and promote a startup ecosystem in Japan, along with the partnerships between large firms, government-university-industry ties, R&D efforts in technology to legitimize startups as a necessary driver of innovation. The government growth strategy includes plans to grow startups into unicorns, reaching 20 unicorns by 2023.
- Tokyo is the largest focal point, gathering over 77% of the investment and leading by far in the number of startups, all application combined. It is also the place to be for networking, with dozens of startups events.

Biotech/Pharma – The Most Relevant Ecosystems



Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Current value	Funding Stream (Investors)
Bonac Corporation	Fukuoka (Fukuoka)	specializes in research and development of nucleic acid medicines.	Founded in 2017 by Tadaaki Ohgi. Opened branches in Tokyo and Okinawa.	Total funding ¥5.6 billion Paid-in capital ¥3.9 billion (2017)	Sumitomo Chemical, Fujifilm, DCI Partners, Toray Industry, Nippon Venture Capital, SMBC Venture capital, Shinsei Corporate Investment, Mizuho Venture Capital, and Chikuho Bank (¥ 1.5 billion, 2015) (¥ 4 billion, 2017)
Synplogen	Kobe (Hyogo)	Provides high-throughput DNA synthesis at remarkable lengths and levels of efficiency, at competitive prices.	Spin-off from Kobe University, founded in 2017 by Akihiko Kondo and Kenji Tsuge. Strategic capital alliance and comprehensive partnership agreement with Tupac.bio in 2019.	Total funding over ¥ 1.1 billion Paid-in capital ¥1.118 billion (2019)	Jafco (¥1 billion, 2019) Spiber (¥100 million, 2018)
Metcela	Kawasaki (Kanagawa)	Research and development of fibroblast-based therapies for cardiac diseases.	Founded in 2016 by Kenichi Nogami, Kenichi Nogami, and Takahiro Iwamiya. Initiated joint research with University of Tsukuba. Selected for J-Startup 2019.	Total funding ¥920 million Paid-in capital NA	Beyond Next Ventures and Eight Roads Ventures + others (¥520 million in Series A, 2019) 3 grants from NEDO (STS grant ¥70M in 2016, SCA grant ¥70M in 2017, Hashiwatashi grant in 2018 ¥100M)

Biotech/Pharma – The Most Relevant Ecosystems



Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Current value	Funding Stream (Investors)
iHeart Japan	Kyoto (Kyoto)	Develops regenerative medicinal products for severe heart failure, using iPSC technologies.	Patent assignment agreement with Kyoto University. Founded in 2013 by Kenji Kakuta after 8 years in a biotechnology-focused VC. iHeart Japan is selected as one of the Forbes 200 Superstar Entrepreneurs in 2018.	Total funding ¥891.5 million Paid-in capital ¥10 million (2018)	Grants from NEDO (2014) and AMED (2018) Miyako Capital (¥ 220 million in Series A, 2014) Real Tech Fund + SBI Investment (¥ 767 million in Series B, 2016)
Modulus discovery	Minato (Tokyo)	Accelerates pre-clinical drug discovery by combining dynamics simulation and disease biology insights, to cut costs and timelines toward identification of high value clinical molecules.	Founded in 2016 by Kazuki Ohno and Suguru Roy Kimura. Partners with University of Tokyo, MIT Startup Exchange and PeptiDream. Collaboration Agreement With Tokyo Institute Of Technology and Research Data Transfer Agreement with Astellas Pharma in 2019.	Total funding ¥800 million Paid-in capital NA	Fast Track Initiative, PeptiDream, and DBJ-Capital (¥ 800 million in Series A, 2018)
Braizon Therapeutic	Bunkyo (Tokyo)	Research and development of new drugs, diagnostics, and life science research reagents, mainly for use in the CNS area.	Spin-off from the University of Tokyo and Tokyo Medical and Dental University and founded by respectively Professor Kazunori Kataoka and Professor Takanori Yokota, in 2015. Partner with iCONM. Selected for J-Startup 2019.	Total funding ¥751 million Paid-in capital ¥388 million (2019)	Fast Track Initiative, UTokyo Innovation Platform, SMBC Venture Capital (¥645 million in Series B, 2018)

Biotech/Pharma – The Most Relevant Ecosystems



Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Current value	Funding Stream (Investors)
AccuRNA	Bunkyo (Tokyo) Kawasaki (Kanagawa)	Provides effective treatment for refractory diseases for which there is currently no cure, in the form of nucleic acid medicine utilizing proprietary DDS platform.	Founded in 2015 as a spin-off the University of Tokyo. Feasibility Study Agreement with Astellas Innovation Management LLC in 2019. Partner with iCONM (Innovation Center of NanoMedicine, in KING SKYFRONT the “International Strategic Special Zone” in Kawasaki)	Total funding ¥720 million Paid-in capital ¥338 million (2018)	Fast Track Initiative, UTokyo Innovation Platform, SMBC Venture Capital, NanoCarrier (¥520 million, 2018)
Aqua Therapeutics	Kobe (Hyogo)	Research, development, manufacture and sale of pharmaceuticals, quasi-drugs and cosmetics.	Founded in 2012 by Yoshinori Yoshikawa.	Total funding over ¥ 500 million Paid-in Capital NA	Innovation Network Corporation of Japan, Nissay Capital, SMBC Venture Capital, and Mitsubishi UFJ Capital (¥ 500 million, 2015)
ReboRNA	Fujizawa (kanagawa)	Develops low-molecular compounds to target ribonucleic acid for area of unmet medical needs in genetic rare disease including spinal muscular atrophy.	Founded in 2018 by Koji Fuji as part of the Takeda Entrepreneurship Venture Program.	Total funding ¥265 million Paid-in Capital NA	Takeda Pharmaceutical and Mitsubishi UFJ Capital (¥ 265 million, 2018)

Biotech/Pharma – The Most Relevant Ecosystems



Applied Research Institute, Corporation, University	Facts and figures	Key interests	Partners
AIST-Department of Life Science and Biotechnology 	Founded: 2001 Location: Tsukuba (Ibaraki) AIST has invested in 147 startups and the Department of Life Science and Biotechnology has two open innovation laboratories with Waseda University and Osaka University.	Diagnostic technology with biomarker, optimization technology for drug discovery, drug-candidate prospecting, stem cell engineering, health assessment technology, medical device development, production by recombinant plant, production by recombinant microorganism, bioprospecting	AIST has 129 international partners under MoUs.
RIKEN-Center for Biosystems Dynamics Research 	Founded: 2018 Location: Kobe (Hyogo) RIKEN Ventures has invested in 17 startups, the Center for Biosystem Dynamics Research has two collaborative centers with Otsuka Pharmaceutical and DAIKIN.	Diagnostic technology with biomarker, optimization technology for drug discovery, drug-candidate prospecting, stem cell engineering, health assessment technology, medical device development, production by recombinant plant, production by recombinant microorganism, bioprospecting	RIKEN has collaborative agreements or MOUs with more than 300 institutions overseas.
Institute for Frontier Life and Medical Sciences Kyoto University 	Founded: 2016 Location: Kyoto (Kyoto) Two biomedical research institutes in Kyoto University, Institute for Virus Research and Institute for Frontier Medical Sciences, merged, and Institute for Frontier Life and Medical Sciences newly started in October 2016.	Virus research, Regeneration Science and Engineering, Biosystems Science, Infectious Diseases, Animal Experiments for Regeneration	The institute has been appointed as Joint Usage/Research Center for Transdisciplinary Collaboration on Tissue Engineering and Regenerative Medicine and as Joint Usage/Research Center for Fusion of Advanced Technologies and Innovative Approaches to Viral Infections and Life Science.
Institute for Frontier Medical Sciences, Kyoto University			

Biotech/Pharma – The Most Relevant Ecosystems



Applied Research Institute, Corporation, University	Facts and figures	Key interests	Partners
Biotechnology Research Center of the University of Tokyo  THE UNIVERSITY OF TOKYO	<p>Founded: 1993 Location: Tokyo (Tokyo) Biotechnology Research Center of the University of Tokyo, is a leading research center in the area of microbial and plant biotechnology.</p>	<p>The research center plays a leading role in research and educational activities in microbial/plant biotechnology to solve problems associated with food shortage, environmental pollution, natural resource depletion, and human health.</p>	<p>The Biotechnology Research Center partnerships with Karlsruhe Institute of Technology (Germany), Biotechnology Institute of Minnesota University (USA) and Southwest University (China) as an effort to expand international collaboration and academic exchange.</p>
Takeda Pharmaceutical Co., Ltd. 	<p>Founded: 1781 Location: Tokyo (Tokyo) Takeda Pharmaceutical Co., Ltd. is one of the top 20 largest pharmaceutical companies in the world by revenue. The company built up Japan's first pharma-led open innovation ecosystem in 2017.</p>	<p>Oncology, gastroenterology, rare diseases, neuroscience, plasma-derived therapies, vaccines</p>	<p>Takeda supports public-private partnerships that aim to improve health worldwide, together with the Government of Japan, such as The Global Fund to Fight AIDS, Tuberculosis and Malaria, Global Health Innovative Technology (GHIT) Fund, and Coalition for Epidemic Preparedness Innovations (CEPI).</p>
Daiichi Sankyo Co., Ltd. 	<p>Founded: 2005 Location: Tokyo (Tokyo) Daiichi Sankyo Company, Limited achieved JPY 2,305.4 billion in revenue in 2018. The company has its open innovation competition(TaNeDS Global) and venture funds for pharmaceutical companies.</p>	<p>Oncology, pain, neuroscience, cardiovascular and renal diseases, rare diseases, other diseases, cell therapy, technology and related research</p>	<p>Daiichi Sankyo R&D primarily focused on bringing forth novel therapies in oncology, including immuno-oncology, pain management, neurodegenerative diseases, heart and kidney conditions, and other rare diseases.</p>

Biotech/Pharma – The Most Relevant Ecosystems



Applied Research Institute, Corporation, University	Facts and figures	Key interests	Partners
Shiseido Company, Limited 	<p>Founded: 1872 Location: Tokyo (Tokyo) Shiseido Company, Limited is a Japanese multinational personal care company, that is a skin care, hair care, cosmetics and fragrance producer. It is one of the oldest cosmetics companies in the world.</p>	<p>Basic research on dermatology, dermatological solution development, research in the field of medicine, and brain science research.</p>	<ul style="list-style-type: none"> • Tranexamic acid • Potassium 4-methoxysalicylate (4MSK) • W-PRP • Hair Regenerative Medicine • Glycyglycine
Kao Corporation 	<p>Founded: 1887 Location: Tokyo (Tokyo) Kao Corporation is a chemical and cosmetics company.</p>	<p>Kao conducts biological science research in a variety of fields, including health science, skin and hair science, and microbial biotechnology.</p>	<ul style="list-style-type: none"> • Chamomile ET • hair-growth agent, t-flavanone • RGF host cells • Microbial control technologies • innovative DHI production process

Biotech/Pharma – Incubators, Accelerators



Incubator/Cluster / University	Location	Fact & Figures	Key Technologies & Interests
Shonan iPark 	Shonan (Kanagawa)	<ul style="list-style-type: none"> Shonan iPark's incubation initiative aims to discover and activate Japanese academic organizations and startups, which have promising seeds and technologies. Japan's first pharma-led open innovation ecosystem opened in 2017. 	Provide Takeda's knowledge and Know-How as Asia's No. 1 pharmaceutical Company GI, Oncology, CNS and Vaccines.
Saito Life Science Park 	Saito (Miyazaki)	<ul style="list-style-type: none"> Saito Life Science Park (Saito LSP) is the most active Bio Cluster in Japan aiming at research and development in the biomedical field. It was created in April, 2004 about 18km away from Osaka central area. 	The field of Bio-life science, Robot, Home Information Appliance or New Energy.
Okinawa Health Biotechnology Research and Development Center <small>沖縄健康バイオテクノロジー研究開発センター</small> <small>Okinawa Health Biotechnology Research & Development Center</small>	Okinawa (Okinawa)	<ul style="list-style-type: none"> An incubation facility for health biotechnology-related startup companies. Renting laboratories equipped with advanced machines to companies, a wide range of research is possible to promote the biotechnology industry in Okinawa. 	Health biotechnology
Bio-S 	Sapporo (Hokkaido)	<ul style="list-style-type: none"> A Hokkaido-born health sciences industry cluster for scientific development related to food and health – nurturing potential through collaboration with businesses and regions 	Food and health
Kanagawa Science Park 	Kawasaki (Kanagawa)	<ul style="list-style-type: none"> KSP supports startups and the growth of early and middle-stage companies in the Kanagawa Science Park. It aims at creating new industries by setting up R&D oriented venture businesses and promoting research cooperation among industry, academia and the public sector. 	bio/healthcare, medical equipment

Biotech/Pharma – Incubators, Accelerators



Incubator/Cluster / University	Location	Fact & Figures	Key Technologies & Interests
Kobe Biomedical Innovation Cluster (KBIC) 	Kobe (Hyogo)	<ul style="list-style-type: none"> Kobe City launched the "Kobe Medical Industry Development Project (currently KOBE Biomedical Innovation Cluster)" as part of earthquake reconstruction projects to revitalize Kobe's economy after the Great Hanshin-Awaji Earthquake that hit Kobe on January 17th, 1995. 	Innovative drug discovery, regenerative medicine & tissue engineering, and minimally invasive medical device development.
Fuji Pharma Valley 	Fuji (Shizuoka)	<ul style="list-style-type: none"> The Fuji Pharma Valley Project is being promoted with the grand aim of realizing the longest healthy life span in the world. Medical research institutes, including the Shizuoka Cancer Center, pharmaceutical and medical equipment makers, and a wide range of health-related industries are concentrated at the foot of Mount Fuji. 	Medical and health fields
Fukuoka Bio Valley Project 	Fukuoka (Fukuoka)	<ul style="list-style-type: none"> The Fukuoka Bio Valley Project covers more than 200 biotech related companies in Fukuoka. 	Biotechnology or related fields
Tsuruoka Metabolome Cluster 	Tsuruoka (Yamagata)	<ul style="list-style-type: none"> The Tsuruoka metabolome cluster aims at becoming the mecca of the metabolome research, leading the world thanks to the metabolome analysis technology developed at Keio University advanced bioscience laboratory (IAB). 	Medical, environmental and food-related fields

Biotech/Pharma – Funding Sources



Funding source	Description	Key Innovation Topics	Latest Funding
DCI Partner (Tokyo) 	Investing in biotech start-ups since the period of NIF Ventures, they are currently managing the largest size of the life science fund in Japan and playing a key role in supplying funds to promising start-ups. Also act as a platform to incubate seeds that have great potential.	<ul style="list-style-type: none"> • Biotech/Pharma • Healthcare • Health Diagnostics 	Participated in Aprinoia Therapeutics Series B in 2018 (¥1.2 billion)
Fast Track Initiative (Tokyo) 	Independent venture capital firm with an exclusive focus on life sciences and healthcare services. Invests primarily in seed and early stage companies with competitive advantages.	<ul style="list-style-type: none"> • Life Sciences (Including Biotech/Pharma) • Healthcare 	Participated in Modalis Therapeutics Series B in 2019 (¥2.7 billion)
SMBC Venture capital (Tokyo) 	Venture from Sumitomo Mitsui Banking Corporation, its main fund investing in unlisted companies with high growth potential. Also have a fund that invests in venture companies that mainly commercialize research results at universities and research institutions.	<ul style="list-style-type: none"> • Internet • Software • Information Technology • E-Commerce • Biotech/Pharma 	Participated in Heartseed Series B in 2019 (¥2.8 billion)
JAFCO (Tokyo) 	JAFCO invests in Japanese and US life science companies and provide support for universities and research labs in commercializing their research results by investing seed capital. It provide support for enhancing corporate value through deep involvement in management and business expansion of investees.	<ul style="list-style-type: none"> • Life Sciences (Including Biotech/Pharma) • Consumer Internet 	Participated in Appier Series B in 2019 (¥8.7 billion)

Biotech/Pharma – Funding Sources



Funding source	Description	Key Innovation Topics	Latest Funding
Mitsubishi UFJ Capital (Tokyo) 	Venture capital firm focusing on life science, ICT and high technology investments. Provides a variety of support for companies, including business advice and the introduction of potential business partners. Backed by the collective financial might of the MUFG Group.	<ul style="list-style-type: none"> • Software • Internet • Healthcare • Biotech • Pharmaceutical 	Participated in Phyabit Series A in 2019 (¥320 million)
UTokyo Innovation Platform 	The University of Tokyo has built partnerships with companies in a wide range of industries, and is engaged in matching the needs of both these companies and the startups it backs up. Also working on establishing carve-outs to uncover seeds of innovation buried in large companies	<ul style="list-style-type: none"> • Biotech • Medical devices • Robotics • Aerospace • Medical 	Participated in Synspective Series A in 2019 (¥10.9 billion)
Japan Asia Investment (Tokyo) 	Independent venture capital firm that has accumulated experience over 15 years as a pioneer of venture capital investments in Asia. Established a globally linked organization that pursues investment opportunities in the three regions of Japan, Asia, and the United States.	<ul style="list-style-type: none"> • Biotech/Pharma • Internet • Healthcare • Advertising • Medical 	Participated in YAMAP Series B in 2018 (¥1.2 billion)
Whiz Partners (Chiba) 	Invests in companies in Japan, the U.S., Europe, and Asia, focusing on life science, biotechnology, and information technology fields.	<ul style="list-style-type: none"> • Biotech/Pharma • Healthcare • Medical • Therapeutics 	Participated in WHILL Series C in 2018 (¥4.8 billion)

What is the typical way that start-up companies engage with the VCs, incubators, angel investors?



J-Startup

A new initiative created by the Ministry of Economy, Trade, and Industry (METI) in 2018, the J-Startup Program, cultivates the brightest of Japan's startups to succeed in the world market. Recommenders from leading business communities (top-venture capitalists, accelerators, representatives from large companies, etc.) determine and select a group from over 10,000 Japanese startups to join the program.

Candidates to the program must be deep tech, platform and “Sustainable Development Goal”-oriented startups with original idea, mission and growth potential among other criteria.

An external judging committee reviews them in accordance with the reasons of recommendation. Startups passing through the rigorous examination are granted certification as special startups of the J-Startup program.

The J-Startup Program works with JETRO and the private sector to provide the following services to the selected startups:

- Granting private business spaces and fee preferences
- Professional mentors from leading technology companies
- Collaboration opportunities with large companies in similar fields
- Welcoming programs from Ministers and other important figures
- Marketing services designed for startups to succeed in overseas markets
- Opportunities to exhibit at the world's largest tech conferences, such as CES and SLUSH



What is the typical way that start-up companies engage with the VCs, incubators, angel investors?



KSP

Kawasaki Deep Tech Accelerator, located in AIRBIC and KSP, is a growth support mentoring program for deep tech start-up using technologies developed for example in universities. It provides hands-on assistance by experienced mentors, matching with relevant investors and companies. The applicants benefit of further support even after the program end, with for example continued access to co-working spaces.

During the project period of 2018, 22 companies such as operating companies and financial institutions participated as founding supporter institutions and participated in numerous other matches.

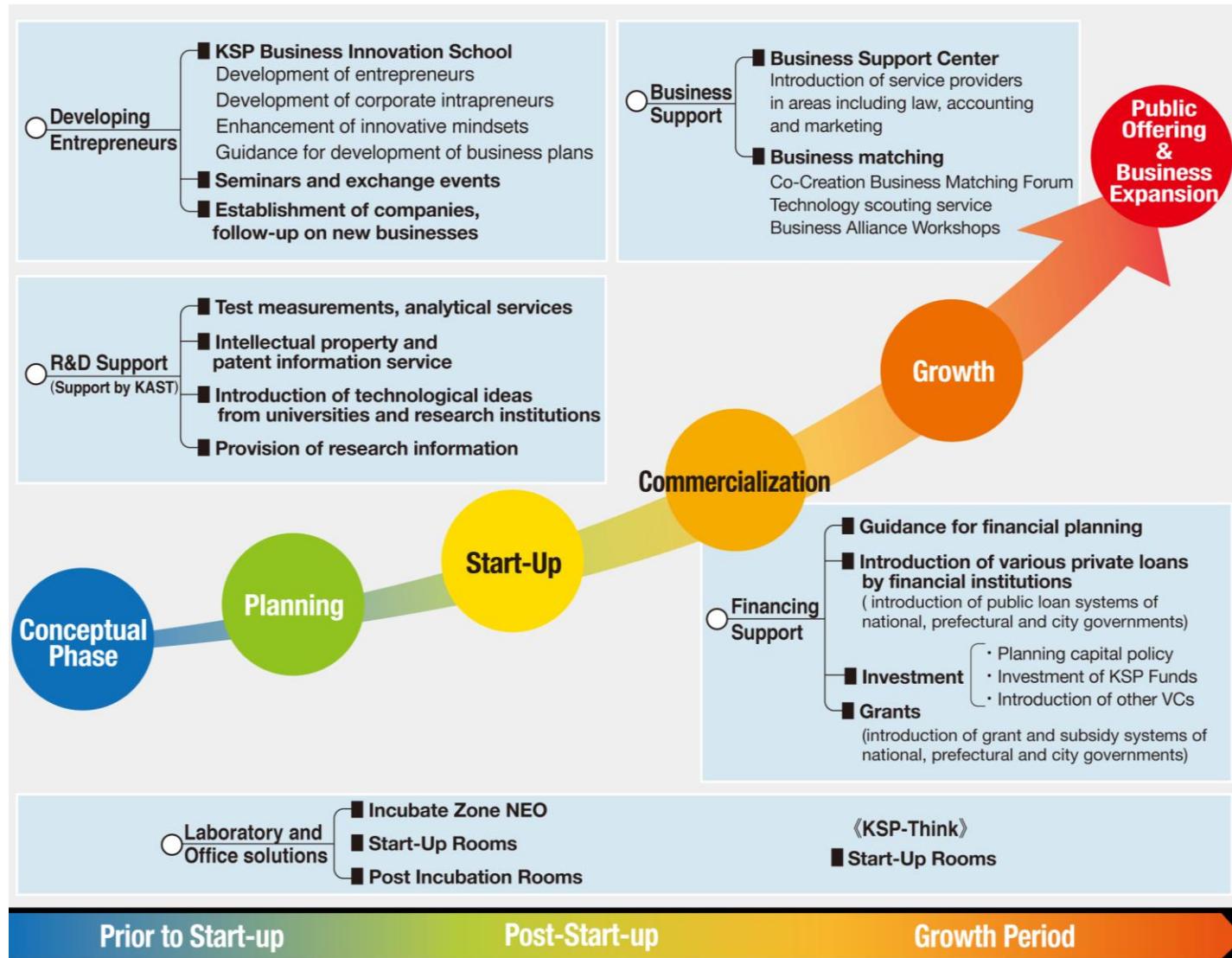
Eligibility and conditions

- Being a startup or a SME,
 - Startup must be founded for the latest during the year of application
 - SME capital amount must be of at least 100 million yen
- Companies engaged in deep tech fields such as devices, mobility, robotics, medical / life science, nursing / welfare, energy, AI, IoT, aviation, space, etc.
- Products developed can be commercialized in Kawasaki city

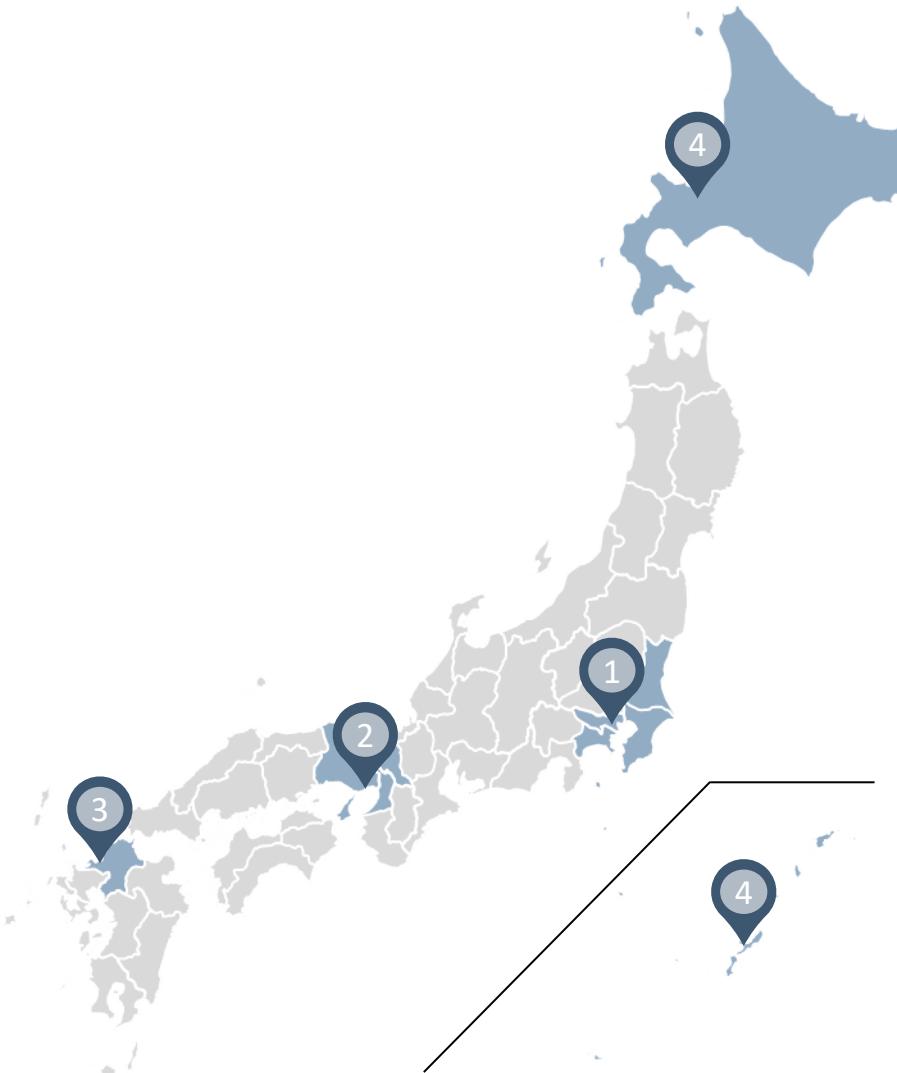
Application Guidelines

- Documents review and interviews are conducted to assess the applicant's willingness to go into business
- 10 startups are selected each years
- Application is free

Example of KSP Business Incubation Flow



Biotech/Pharma – The Most Relevant Ecosystems



Main startups' hubs (based on the location of startups, applied research institutes, large corporations (that invest in startups), VCs:

1. Greater Tokyo Area: Tokyo, Chiba, Kanagawa, and Ibaraki, gathering the most high quality startups, research institutes and investment funds.
2. Kansai: Kobe, Kyoto and Osaka with some high quality startups and base of research institutes
3. Fukuoka, with high quality startup and growing attractiveness as a startup hub
4. Okinawa (Longevity Island) and Hokkaido, with incubators and accelerators structures.

Potential Evolution For Biotech/Pharma in the next 5 years



2020 to 2025 view

Japan's citizens already are the world's oldest, with 27% of its population over age 65. The Japanese government has focused on this challenge and the opportunity, already growing at CAGR of 3.4%, the country keep pushing by implementing widespread changes in health-related policies, regulations, and laws.

Japan has eased some regulation, speed approval times, and passed laws that promote the development of biotechnology and pharmaceutical sectors, and more particularly, foreign clinical test results are recognized by the government. Non-Japanese firms are now learning from Japan's markets before the aging trend arrives elsewhere in the world.

In the Biotech/Pharma sector, the list of companies targeting expansion in Japan include for examples Germany's Bayer, Portugal's Hovione, and Finland's Orion. Superstar U.S. firms like Pfizer, Merck, and Eli Lilly also are interested and partnering with various Japanese universities.

Japan already features the world's second largest markets in pharmaceuticals, behind only the United States. The market needs being reinforced by Japan's ageing population and the depth of research being done at the universities gives Japan the raw materials to be a biotech/pharma start-up powerhouse. Japanese pharmaceutical companies are willing to make investments and the government is willing to subsidize those investments. Regenerative medicine and orphan disease cure researches are the sector attracting the most interest and investments with numerous deep tech startup with activities in DNA, RNA, nucleic acids or STEM cell engineering.

Therefore all domains related to biotechnology and pharma but also healthcare and medical devices are vowed to grow positively in Japan over the next 5 years.

Material – The Most Relevant Ecosystems



Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Current value	Funding Stream (Investors)
Kyulux	Fukuoka (Fukuoka)	Develops and sells TADF (Thermally Activated Delayed Fluorescence) and Hyperfluorescence based OLED materials and solutions to manufacturers in the display and lighting industries.	Founded in 2015 by Akira Minakuchi. Active collaborations with Center for Organic Photonics and Electronics Research (OPERA) Fukuoka i3 Center for Organic Photonics and Electronics Research(i3-OPERA) Fukuoka Industry Science Technology Foundation (Fukuoka IST). Selected for J-Startup 2018.	Total funding ¥5 billion Paid-in capital NA	WRVI, Samsung ventures, Samsung Display Solutions, LG Display, Japan Display, and OLED Info (¥3.5 billion in Series B, 2019) Same minus WRVI (¥1.5 billion in Series A, 2016)
Cyfuse Biomedica	Bunkyo (Tokyo)	3D prints tissue pieces for in vitro research mimicking in vivo conditions, aiming at human transplantation.	Founded in 2010 by Koichi Nakayama and Koji Kuchiishi. Entered into a Business Partnership Agreement with Marubeni Corporation regarding global expansion of a new Bio 3D printer S-PIKE® developed by Cyfuse.	Total funding ¥ 3.4 billion Paid-in capital ¥100 million (2019)	FUJIFILM Holdings Corporation and Dogan (¥1.5 billion in Series C, 2018) Cyberdyne, Shibuya Kyogo and Jafco (¥1.4 billion in Series B, 2015) The University of Tokyo Edge Capital, Nissay Capital, Nippon Venture Capital, and Industrial Growth Platform (¥540 million in series A, 2013)

Material – The Most Relevant Ecosystems



Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Current value	Funding Stream (Investors)
Goryo Chemical	Sapporo (Hokkaido)	Develops a fluorescent probe (designated as a navigation drug: ND) which makes visible miniature target sites with high-sensitivity and selectively.	Founded in 2010 by Kenichi Maruyama. Certified by the METI in 2011. Opened a US branch in 2015.	Total funding ¥3.4 billion Paid-in capital ¥150 million (2019)	Mitsubishi UFJ Capital, Universal Materials Incubator, QB Capital, Hokkaido Venture Capital, and The University of Tokyo Edge Capital (¥ 2.4 billion, 2016) (¥ 200 million, 2019)
JMTC Enzyme	Chuo (Tokyo)	Develops a fermentation process that necessitate less neutralizing agents during manufacturing of organic acids.	Founded in 2016 by Hiroyuki Urata and Hakuto Nakazawa. It is a JV between Asahi Glass Corporation (AGC) and Japan Material Technology Corporation (JMTC) for bio-organic acids.	Paid-in capital ¥50 million (2019)	Stakeholders: JMTC Capital (92%) AGC (8%)
SK Fine	Osaka (Osaka)	Manufactures and sells 3D printers as well as 3D printed ceramic parts based on equipment and materials formulation technology (classification, agitation and molding) developed by Shashin Kagaku.	Founded in 2018 as a subsidiary of Shashin Kagaku.	Total funding ¥78 million Paid-in capital ¥199 million (2019)	Osaka University Venture Capital (¥78 million, 2018)

Material – The Most Relevant Ecosystems



Applied Research Institute, Corporation, University	Facts and figures	Key interests	Partners
AIST-Department of Materials and Chemistry 	Founded: 2001 Location: Tsukuba (Ibaraki) AIST has invested in 147 startups and the Department of Materials and Chemistry has three open innovation laboratories with University of Tokyo, Tohoku University, and University of Tsukuba.	nanomaterials, inorganic functional materials, structural materials, computational design of advanced functional materials, sustainable chemistry, chemical process technology, catalytic chemistry, carbon nanotubes and magnetic powder metallurgy.	AIST has 129 international partners under MoUs.
National Institute for Materials Science (NIMS) 	Founded: 2001 Location: Tsukuba (Ibaraki) NIMS is Japan's sole National Research and Development Agency specializing in materials science.	Non-traditional materials, energy and environmental materials, magnetic and spintronic materials, structural materials, nanoarchitectonics, advanced measurement and characterization to accelerate materials innovation, materials data and integrated system	NIMS is proactively committed to making exchanges with international research organizations and researchers.
Hokkaido University-Research Institute for Electronic Science 	Founded: 1992 Location: Sapporo (Hokkaido) The Research Institute for Electronic Science (RIES) of Hokkaido University has more than 20 years of history during which they have worked actively under the mission of development of new interdisciplinary fields.	Photonics and Optical Science, Material and Molecular Sciences, Biology and Life Sciences, Green Nanotechnology , Mathematics for Social Creativity	For the international coalition, RIES has concluded academic exchange agreements with universities in the U.S.A., Taiwan, China, and Europe.

Material – The Most Relevant Ecosystems



Applied Research Institute, Corporation, University	Facts and figures	Key interests	Partners
Tohoku University- Advanced Institute for Materials Research(AIMR) 	Founded: 2007 Location: Sendai (Tohoku) The Advanced Institute for Materials Research (AIMR) at Tohoku University is one of nine World Premier International Research Centers Initiative (WPI) Program established with the support of the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT).	AIMR brings together leading researchers in the fields of material physics, materials, and devices from around the world, and adds Mathematical Science Group consisting of mathematicians and theoretical physicists/chemists in order to build a new form of materials sciences.	Currently 10 international partner institutions.
AGC Inc. 	Founded: 1907 Location: Tokyo (Tokyo) AGC Inc., is a Japanese global glass manufacturing company, headquartered in Tokyo. It is the largest glass company in the world and one of the core Mitsubishi companies.	AGC creates new value by combining a wide variety of technologies in the fields of Glass, Electronics, Chemicals, and Ceramics	AGC proposes a research assignment, and perform collaborative research with universities or public research institutes, etc. through a public solicitation examination method.
Mitsui Chemicals 	Founded: 1997 Location: Tokyo (Tokyo) Mitsui Chemicals is a Japanese chemicals company listed on the Nikkei with business interests in Japan, Europe, China, Southeast Asia and the USA. It is a part of the Mitsui conglomerate.	The company mainly deals in performance materials, petro and basic chemicals and functional polymeric materials.	Mitsui Chemicals has very extensive global network and is keen to promote open innovation through initiatives such as working in partnership with startup businesses, with an eye to developing new products and new businesses.

Material – The Most Relevant Ecosystems



Applied Research Institute, Corporation, University	Facts and figures	Key interests	Technologies
Shiseido Company, Limited	<p>Founded: 1872 Location: Tokyo (Tokyo) Shiseido Company, Limited is a Japanese multinational personal care company, that is a skin care, hair care, cosmetics and fragrance producer. It is one of the oldest cosmetics companies in the world.</p> 	Raw material, formulation technology	<ul style="list-style-type: none"> • Aquainpool • Micro Aqua Ball • Fit Polymer • Red color penetration powder that transmits red light • Reflector board powder that corrects contours • pH-responsive powder • High pressure emulsification tech. • Lipid shell emulsification tech. • Multiple emulsification that dramatically changes texture • thickener with light/dewy texture
Kao Corporation	<p>Founded: 1887 Location: Tokyo (Tokyo) Kao Corporation is a chemical and cosmetics company.</p> 	material design (requiring reaction system development), research into physical properties conducted at the molecular and atomic levels with an eye toward practical application.	<ul style="list-style-type: none"> • encapsulated-P/O/W emulsion • long alkyl acylated cellulose (RCE) tech. • Highly dispersed metal particles on alcohol production catalyst • proprietary sugar capsule tech. • surface-active polymer Elastomer OS • environmentally friendly cationic surfactant • Environmentally Friendly Cellulose Nanofiber Materials

Material – Incubators, Accelerators



Incubator/Cluster / University	Location	Fact & Figures	Key Technologies & Interests
AGC Material Collaborative Research Cluster   AGC Tokyo Tech	Suzukakedai (Tokyo)	<ul style="list-style-type: none"> The cluster is opened on July 1, 2019. In addition to securing 66 m² of dedicated space at Tokyo Tech's Suzukakedai Campus, AGC has agreed to dispatch collaborative researchers in an aim to promote cooperation between both organizations. 	<p>The Cluster will combine Tokyo Tech's academic knowledge in a wide range of fields including substances and materials, with the technological expertise that AGC has built up and refined over decades.</p> <p>The creation of material-based solutions through the integration and enhancement of technologies held by AGC and the Tokyo Institute of Technology.</p>
Universal Materials Incubator 	Tokyo (Tokyo)	<ul style="list-style-type: none"> UMI is established in October 2015 to contribute to growth and innovations in the Japanese material/chemical industry. 	Material/chemical
Nagoya Nano-Technology Manufacturing Cluster 	Nagoya (Aichi)	<ul style="list-style-type: none"> Their aim is working toward the advancement of plasma nanotechnology and utilization of nanomaterial technology and device technology at key moments. This will facilitate the development of surface functionalization technologies and photonic and power device material technologies. 	Environment, nanotech materials

Material – Incubators, Accelerators



Incubator/Cluster / University	Location	Fact & Figures	Key Technologies & Interests
Yamaguchi Green Valley 	Yamaguchi (Yamaguchi)	<ul style="list-style-type: none"> The goal for the cluster is to become a global R&D and industrial center for green materials by recruiting frontline researchers both domestically and overseas ; aiming to prompt the question “Ask Yamaguchi” when studying any aspect of green materials. 	high efficiency LEDs (remarkably low power consumption) and LED-related applied equipment, green materials with nano-particles dispersed
Kyoto Nanotechnology Cluster 	Kyoto (Kyoto)	<ul style="list-style-type: none"> Kyoto Environmental Nanotechnology Cluster aims to establish a center for developing environmental nanotechnology material, which can enhance the support system for business deployment. 	Environmental Nanotechnology, Environmental sensing
JMTC's Lean Open Incubation 	Tokyo (Tokyo)	<ul style="list-style-type: none"> Through the “Lean Open Incubation” which keeps down fixed cost as much as possible while cooperating with many companies and academia, JMTC challenges social implementation of material technologies which is known to take time and have a low success rate. 	Material for automotive, electronics and healthcare

Material – Funding Sources



Funding source	Description	Key Innovation Topics	Latest Funding
Universal Materials Incubator (Tokyo) 	A venture capital firm building a broad ranging network of corporations, venture companies, and academic institutions involved in the material and chemical fields.	<ul style="list-style-type: none">• Advanced Material• Recycling• Manufacturing	Participated in Advanced Material Technologies venture round in 2018 (¥1 billion)
University of Tokyo Edge Capital 	Since 2004, UTEC has invested in over 100 Deep Tech Startups in Japan and abroad and have built experience in the fields of Healthcare, AI, and Chemicals. UTEC works closely with entrepreneurs and researchers as scientific founders to co-found companies based upon innovations.	<ul style="list-style-type: none">• Software• Manufacturing (including 3D printing)• Biotech/Pharma• Robotics	Participated in SWAT Series A in 2019 (¥1.1 billion)
SMBC Venture capital (Tokyo) 	Venture from Sumitomo Mitsui Banking Corporation, its main fund investing in unlisted companies with high growth potential. Also have a fund that invests in venture companies that mainly commercialize research results at universities and research institutions.	<ul style="list-style-type: none">• Internet• Software• Information Technology• E-Commerce• Biotech/Pharma	Participated in Heartseed Series B in 2019 (¥2.8 billion)

Material – Funding Sources



Funding source	Description	Key Innovation Topics	Latest Funding
Osaka University Venture Capital  INITIATE INNOVATIONS	So far, Osaka University has established joint research courses and research laboratories with 40 companies. The investment targets are startup and early stage projects that utilize the research results of Osaka University. platform fields such as ICT, materials, and infrastructure have been set as priority investment fields.	<ul style="list-style-type: none">• Manufacturing (including 3D printing)• AI• Information Technology• Education• Biotech/Pharmaceutical	Participated in AI Samurai Series B in 2019 (¥740 million)
JMTC Capital (Tokyo) 	Founded in 2017, JMTC Capital is the venture arm of JMTC (Japanese Material Technology Corporation) A leading innovator in functional materials, continuously implementing cutting-edge technologies. Commercializes new innovative material, taking advantage of the flexibility independent startups.	<ul style="list-style-type: none">• Automotive material• Electronic material• Healthcare material	Participated in Elephantech B in 2019 (¥1.8 billion)
Mitsubishi UFJ Capital (Tokyo) 	Venture capital firm focusing on life science, ICT and high technology investments. Provides a variety of support for companies, including business advice and the introduction of potential business partners. Backed by the collective financial might of the MUFG Group.	<ul style="list-style-type: none">• Software• Internet• Healthcare• Biotech• Pharmaceutical	Participated in Phybbit Series A in 2019 (¥320 million)

What is the typical way that start-up companies engage with the VCs, incubators, angel investors?

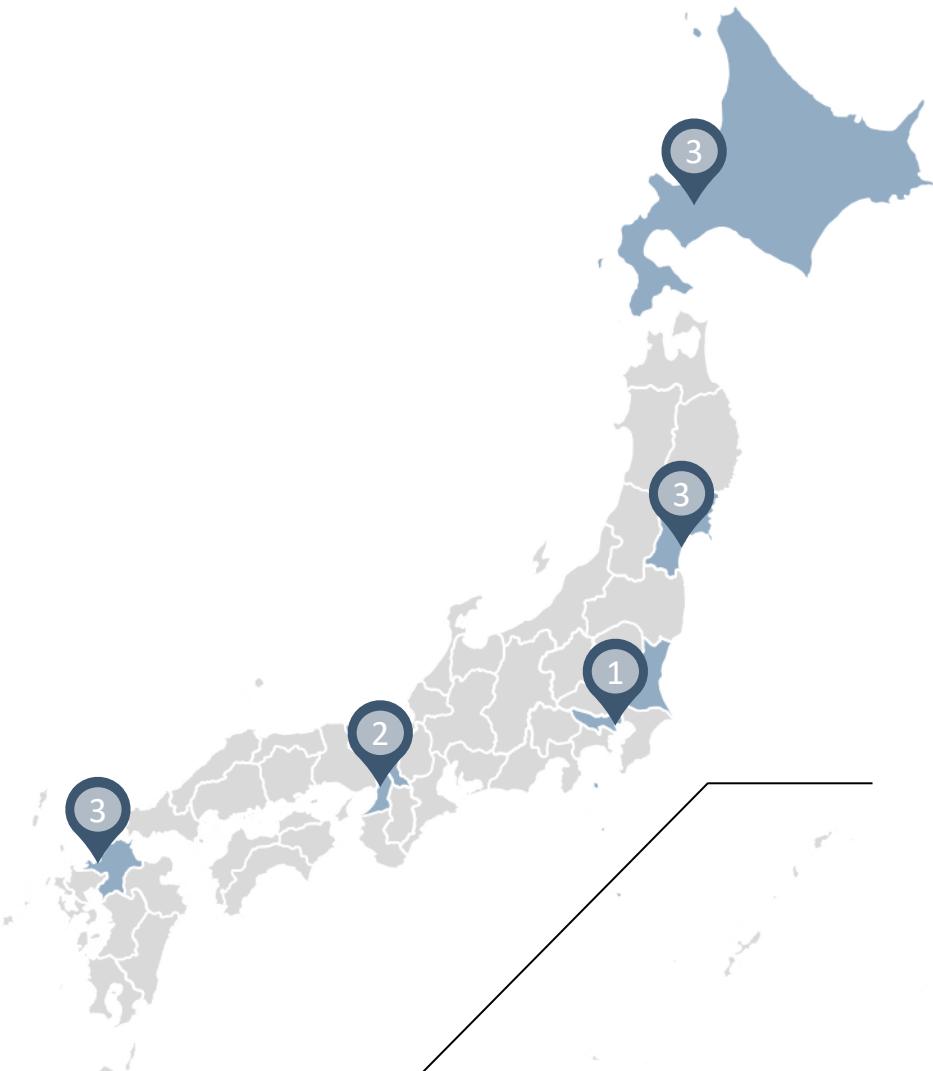


Networking and meetups: the best way to get involved with Japanese startups, to connect with founders, and for advice on how to start a startup in Japan. There are dozens of startup events of all kinds in Tokyo, the center of all startups in Japan and the place to be today for growing further a startup in Japan, was it born elsewhere in the country.

Some examples:

- Startup Weekend: a non-profit, weekend-long startup simulator, providing insight and guidance through the life of a startup.
- Business in Japan: a casual gathering of Tokyo's foreign business community also welcoming entrepreneurs from the startup world.
- Tokyo Tech Startups: a group of startup founders and aspiring founders. The sessions usually involve one or two early-stage startups pitching to the group, a bit of Q&A, and lots of conversation.
- Tech In Asia – Tokyo: one of the oldest and largest events of its kind. Thousands of attendees, hundreds of startups, multiple tracks, and dozens of speeches and panel discussions.
- Slush Tokyo: similar to Tech In Asia but on a less formal format.
- Innovation Leaders Summit: the focus of the event is Japanese startup-enterprise collaboration and networking.
- TechCrunch Tokyo: a great deep dive into the country's startups.

Material – The Most Relevant Ecosystems



Main startups' hubs (based on the location of startups, applied research institutes, large corporations (that invest in startups), VCs:

1. Greater Tokyo Area: Tokyo, and Tsukuba (Ibaraki), gathering the most high quality startups, research institutes and investment funds.
2. Kansai: Osaka, and Kyoto with some high quality startups, VC and base of research institutes
3. Fukuoka, Sapporo, and Sendai with high quality startup and growing attractiveness as startup hubs.

Potential Evolution For Material in the next 5 years



2020 to 2025 view

The Japanese chemical and material industry is the country's second largest manufacturing industry behind transportation machinery. The industry is highly relying on big companies such as Mitsui Chemical, Teijin or JSR. These global firm are leading innovation in the material and chemical domain and their power may hinder the creation of startups in this field. Yet, with their need of restructuration and the growing trend for "Open Innovation", many are investing their massive cash reserves, directly or via the creation of corporate venture capital, or even engaging in JV agreements. With the new markets expected to emerge as the auto industry barrels toward the era of fully self-driving electrified vehicles, these giants are rushing to take the pole position, which provides even more opportunity for advanced materials and innovative ideas coming from startups, often born from fundamental researches carried out in the renowned universities of the country.

The material market for 3D printing is presumed to be worth ¥29.97 billion by 2020. In early 2015, the New Energy and Industrial Technology Development Organization (NEDO), a Kanagawa-based semi-public body, announced a ¥2.5 billion fund to spur the growth of highly advanced 3D printing mechanisms for human tissue regeneration, and startups such as Cyfuse Biomedica (Tokyo) are trending in this domain.

Japan has always been known across Asia for the quality of its cosmetics from companies such as Shiseido Co., Kósé Co., and brands like P&G's luxury SK-II line, but a new surge in demand from neighboring countries is shaping cosmetics up to be an important export sector and should be key in how Japan positions itself internationally. In 2017, Japan exported 500 billion yen in cosmetics, according to government trade data, 4 times more than in 2012. This tendency will remain, with more and more open innovation and interest given to startups having potential applications in the beauty sector.

Material sector in Japan, all included, will keep growing positively in Japan over the next 5 years.

Devices – The Most Relevant Ecosystems



Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Current value	Funding Stream (Investors)
T-Vision Insight	Chiyoda (Tokyo)	Provides media research for TV, measurement and analysis service for TV commercials and programs. Shiseido's voice: <i>"I think that it is a very effective solution for buying, knowing in detail how the target of the brand sees each program, and where the CM frame reaches."</i>	Spin-off from the MIT but quickly transferred to Japan. Founded in 2014 by Guntani Yasushishi, Liu Nobeyutaka, and Yoshiaki Kawamura. Best award at Microsoft Innovation Award in 2015.	Total funding ¥1.4 billion Paid-in capital ¥97 million	Japan Finance Corporation, Mizuho Bank and Resona Bank (¥150 million in 2017) Accomplice and Jump Capital (¥1.3 billion in 2017)
HoloEyes	Minato (Tokyo)	Develops a VR device to visualize in 3D the data collected from CT scans, forming 3D human body models.	Founded in 2016 by Maki Sugimoto and Naoji Taniguchi. Awarded in 2019 from the Asian Computer Surgery Society.	Total funding ¥410 million Paid-in capital NA	Nissay Capital (¥150 million in Series A, 2017) SBI Investment, Mizuho Capital Partners, Mitsubishi UFJ Capital (¥250 million in Series B, 2019)
Xenoma	Bunkyo (Tokyo)	Develops an ultrathin and ultraflexible device using soft organic materials, "e-skin", a next-generation textile-based wearable electronics as an ideal interface between human and device.	A spin-off from Someya Group Organic Transistor Lab in the University of Tokyo and JST/ERATO Project. Founded in 2015 by Ichiro Amimori.	Total funding ¥282 million Paid-in capital NA	Beyond Next Ventures (¥184 million in seed round, 2016) UTokyo Innovation Platform, and Japan Science and Technology Agency (¥100 million in Series A, 2017)

Devices – The Most Relevant Ecosystems



Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Current value	Funding Stream (Investors)
O:	Meguro (Tokyo)	Visualizes the human circadian clock through an original IoT device to enable readjusting once way of life and therefore health.	Founded in 2016 by Jyunya Tanimoto. Won various awards related to healthcare and IoT since 2016. Mentioned by J-Startups in 2019.	Total funding ¥150 million Paid-in capital ¥151 million (2019)	DNX Ventures (¥114 million in seed round, 2017) Mitsubishi Research Institute (¥36 million in seed round, 2016)
Biomedical Solutions	Chuo (Tokyo)	Research, development and manufacturing of medical devices for neurovascular intervention.	Founded in 2012 by Kazuya Shobayashi and Yasuhiro Shobayashi. Selected for AMED in 2015 and 2016. Concluded an acquisition agreement with JIMRO, a subsidiary of Otsuka Holdings in 2017.	Total funding ¥150 million Paid-in capital NA	Medventure Partners, Jafco, Mizuho Venture Capital (¥150 million in venture round, 2014)
3R Solution	Fukuoka (Fukuoka)	Manufactures PC and smartphone-related equipment for beauty and medical care including for example microscopes for skin and scalp observation.	Founded in 2016 as a filial from 3R system.	Total funding NA Paid-in capital ¥10 million	Stakeholder: 3R system (100%)

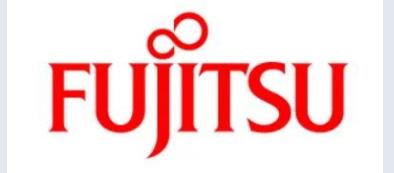
Devices – The Most Relevant Ecosystems



Applied Research Institute, Corporation, University	Facts and figures	Key interests	Partners
AIST-Department of Electronics and Manufacturing 	Founded: 2001 Location: Tsukuba (Ibaraki) AIST has invested in 147 startups and the Department of Electronics and Manufacturing has two open innovation laboratories with University of Tokyo and Nagoya University.	Nanoelectronics, electronics and photonics, advanced manufacturing, spintronics, sensing system, advanced coating system, Ubiquitous MEMS and Micro Engineering	AIST has 129 international partners under MOUs.
RIKEN-Advanced Device Laboratory 	Founded: 2006 Location: Wako (Saitama) Number of startups invested: 3 RIKEN Ventures has invested in 17 startups.	single electron devices, quantum computing devices, spintronics devices Terahertz (THz) devices and plasmonic devices	RIKEN has collaborative agreements or MOUs with more than 300 institutions overseas. Riken collaborated on MirrorCLEM with Hitachi High-Tech, a system for simplifying correlative light and electron microscopy for both SEM and visual observation of samples.
National Institute of Information and Communications Technology (NICT) 	Founded: 2004 Location: Tokyo (Tokyo) Advanced ICT Research Institute advances the R&D of new approaches to multiple innovative science areas and apply them to ICT in the future.	Applied electromagnetics, universal communication, cybersecurity, network system, advanced ICT	Singapore Advanced Research and Education Network (SingAREN) National Supercomputing Centre Singapore (NSCC)
Hamamatsu Optronics Cluster 	Hamamatsu (Shizuoka)	The Hamamatsu Optronics Cluster Initiative intends to integrate businesses, institutes, and researchers in the field of optronics.	IT, Nanotech/Materials, Life Sciences

Devices – The Most Relevant Ecosystems



Applied Research Institute, Corporation, University	Facts and figures	Key interests	Partners
Tohoku University-Medical Device Innovation Center 	<p>Founded: 2010 Location: Sendai (Tohoku) Medical Device Innovation Center matches the clinical needs raised by medical doctors or co-medical staffs with the engineering seeds possessed by the researchers in Graduate School of Biomedical Engineering and related faculties.</p>	<p>Match the clinical needs and engineering seeds Produce prototypes of medical devices Promote collaboration between academia and industry</p>	<p>The center produces the prototype of the medical device from the idea of matching of clinical needs and engineering seeds and it relays to animal experiments or clinical trials with the collaboration with Clinical Research, Innovation and Education Center, Tohoku University Hospital.</p>
Hitachi, Ltd. 	<p>Founded: 1910 Location: Tokyo (Tokyo) Hitachi, Ltd. is a Japanese multinational conglomerate company. Has its Global Centers for Social Innovation (CSI) to solve social issues around the world in various fields including energy, transportation, healthcare, urban issues, and manufacturing.</p>	<p>ICT, Social Infrastructure, High Functional Materials & Components, Financial Services, Power Systems, Electronic Systems & Equipment, Automotive, Railway & Urban Systems, Digital Media & Consumer Products, Construction Machinery and Other Components & Systems.</p>	<p>The Research & Development Group has organizational collaboration agreements with 14 major universities in Japan, and is promoting collaborative relationships with over 50 leading universities outside of Japan.</p>
Fujitsu Ltd. 	<p>Founded: 1935 Location: Tokyo (Tokyo) Fujitsu Ltd. is a Japanese multinational information technology equipment and services company. Launched "Minato Mirai Innovation & Future Center" in Yokohama, "Innovation & Future Center" in Tokyo and Osaka to accelerate open innovation.</p>	<p>Fujitsu delivers total solutions in the field of information and communication technology. Their business encompasses the development, manufacture, sales and maintenance of the cutting-edge, high-quality products and electronic devices.</p>	<p>Fujitsu partners with a range of industry leading technology vendors and other organizations</p>

Devices – The Most Relevant Ecosystems



Applied Research Institute, Corporation, University	Facts and figures	Key interests	Technologies
Shiseido Company, Limited	<p>Founded: 1872 Location: Tokyo (Tokyo) Shiseido Company, Limited is a Japanese multinational personal care company, that is a skin care, hair care, cosmetics and fragrance producer. It is one of the oldest cosmetics companies in the world.</p> 	Tool and Equipment Development, Measurement/Visualization Technology	<ul style="list-style-type: none"> Dispenser for Nozzle Opening Solidification Prevention Hand Massage Equip^t Electric Eye Massage Equip^t Finger Sensor SPF MASTER Special camera technique for measuring skin conditions Visualization of skin's moisture levels using near-infrared light Visualization of potential dark spots using UV rays Evaluation of skin's clarity level with the internal reflection light Visualization of skin inner tissue Humanoid Robots for Assembly
Kao Corporation	<p>Founded: 1887 Location: Tokyo (Tokyo) Kao Corporation is a chemical and cosmetics company.</p> 	Kao focuses on processing technologies, assembly and processing technologies, and the construction of "green" processes and intelligent manufacturing systems.	<ul style="list-style-type: none"> aging prediction technology Imaging Sebaceous Glands with Ultrasound Tomography argon sputter etching (ASE)-scanning electron microscopy Atomic force microscopy electrospray ionization mass spectrometry droplet manufacturing equipment featuring a multi-hole nozzle for hydrogel particles

Devices – Incubators, Accelerators



Incubator/Cluster / University	Location	Fact & Figures	Key Technologies & Interests
Silicon Sea Belt (SSB) Fukuoka Project  <p>FUKUOKA INDUSTRY, SCIENCE & TECHNOLOGY FOUNDATION ふくおかアイスト 公益財団法人 福岡県産業・科学技術振興財團</p>	Fukuoka (Fukuoka)	<ul style="list-style-type: none"> The concept of the SSB project is to aim to become a hub of system LSI design and development in the Asian region (“the Silicon Sea Belt,” the region linking South Korea, Kyushu (Japan), Shanghai, Taiwan, Hong Kong, Singapore, etc.) with intelligent resources and accumulation of industry in the system LSI design field. 	Advanced system LSI in major strategic fields like fundamental technology for system LSI (embedded software, information communications), application technology (automobile, biotechnology, robotics), and system LSI packaging technology (packaging, design, advanced materials)
Keihanna Open Innovation Center  <p>Keihanna Open Innovation Center @Kyoto けいはんなオープンイノベーションセンター</p>	Kyoto (Kyoto)	<ul style="list-style-type: none"> KICK is located in the Kansai Science City– a hub for innovative knowledge and research to open up the future. It aims at developing a new city model for the future, and through industry-academia-government cooperation, develop groundbreaking technology, create new industries, and promote innovative forms of culture, all while coordinating efforts with other cultural and technological research institutions around the world. 	Using ICT as a foundation, promote and encourage innovation in various areas such as energy, health and medical care, food supply, infrastructure, education, and culture.

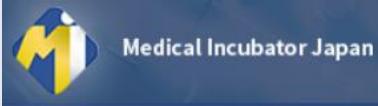
Devices – Incubators, Accelerators



Incubator/Cluster / University	Location	Fact & Figures	Key Technologies & Interests
YOXO BOX  	Yokohama (Kanagawa)	<ul style="list-style-type: none"> Yokohama's new startup growth center— YOXO BOX offers mentoring, individual consultation with specialists in startup growth, space for exchange and business events focused on creating innovation, and a special in-house accelerator program called the "YOXO Accelerator Program." 	Medical devices, health, IoT
Kashiwa-no-ha Smart City 	Kashiwanoha (Chiba)	<ul style="list-style-type: none"> Initiatives to create a city of health and longevity include proposals for the enhancement of urban lifestyles for the elderly, health businesses in collaboration with local government bodies, preventive medicine from interdisciplinary perspectives, and the concept of a model for demonstrative experiments. 	Medical devices, pharma

Devices – Incubators, Accelerators



Incubator/Cluster / University	Location	Fact & Figures	Key Technologies & Interests
Medical Incubator Japan 	Tokyo (Tokyo)	<ul style="list-style-type: none"> MIJ is a company that supports the speedy introduction of innovative pharmaceuticals and medical devices as well as healthcare-related technology (both in Japan and overseas) into Japan's growing healthcare market. 	pharmaceuticals developed based on highly advanced technologies such as genomic drug discovery and regenerative medicine and advanced medical devices and systems utilizing AI, IoT, and other information technologies.
KING SKYFRONT 	Kawasaki (Kanagawa)	<ul style="list-style-type: none"> KING SKYFRONT is an open innovation hub that creates new industry from the world's highest standard R&D 	pharmaceutical, drug discovery, drug-discovery support / contract manufacturing, chemical / fiber, environment / energy, medical / diagnosis, medical device and equipment
Kobe Biomedical Innovation Cluster (KBIC) 	Kobe (Hyogo)	<ul style="list-style-type: none"> Kobe City launched the "Kobe Medical Industry Development Project (currently KOBE Biomedical Innovation Cluster)" as part of earthquake reconstruction projects to revitalize Kobe's economy after the Great Hanshin-Awaji Earthquake that hit Kobe on January 17th, 1995. 	Innovative drug discovery, regenerative medicine & tissue engineering, and minimally invasive medical device development.

Devices – Funding Sources



Funding source	Description	Key Innovation Topics	Latest Funding
Japan Finance Corporation (Tokyo) 	As a comprehensive government-affiliated financial institution, following the national policy, provides flexible policy-based financing by utilizing a variety of financing programs and schemes to meet the needs of society, while complementing the activities of private financial institutions.	<ul style="list-style-type: none"> • Healthcare • Software • Manufacturing • AI • Information Technology 	Participated in Chikaku Series B in 2019 (¥460 million)
Makers Boot Camp (Kyoto) 	Invest and consult with IoT startups and corporate innovators so they can engage in the highest quality manufacturing in Japan.	<ul style="list-style-type: none"> • Internet of Things • Software • Hardware • Electronics • Wearables 	Participated in Mui seed round in 2019 (¥200 million)
Nissay Capital (Tokyo) 	Investing in unlisted companies in a wide range of industries and stages, with the basic policy of “continuing to challenge with investee companies”. Fields are IT, manufacturing, medical / bio, distribution / retail, etc. Also investing in university-based venture companies with high technical capabilities.	<ul style="list-style-type: none"> • Software • Internet • E-Commerce • Advertising • Healthcare 	Participated in Heartseed Series B in 2019 (¥2.8 billion)
Mitsubishi UFJ Capital (Tokyo) 	Venture capital firm focusing on life science, ICT and high technology investments. Provides a variety of support for companies, including business advice and the introduction of potential business partners. Backed by the collective financial might of the MUFG Group.	<ul style="list-style-type: none"> • Software • Internet • Healthcare • Biotech • Pharmaceutical 	Participated in Phyabit Series A in 2019 (¥320 million)

Devices – Funding Sources



Funding source	Description	Key Innovation Topics	Latest Funding
Real Tech Fund (Tokyo)  REAL TECH FUND™	<p>Real Tech Fund is a venture capital fund certified by both METI and NEDO (New Energy and Industrial Technology Development Organization). Invest heavily in the seed-early stage in the real-tech field.</p>	<ul style="list-style-type: none"> • Manufacturing • Robotics • Product Design • Medical device • Healthcare 	<p>Participated in Challenergy venture round in 2019 (¥100 million)</p>
Mizuho Capital Partners (Tokyo) 	<p>An affiliate of the Mizuho Financial Group, one of Japan's top three financial service groups and one of Japan's leading firms serving for private equity specialized in proprietary deals.</p>	<ul style="list-style-type: none"> • Information Technology • Virtual Reality • Wearables • E-Commerce • Internet 	<p>Participated in Pixie Dust Technologies Series B in 2019 (¥3.9 billion)</p>
Medventure Partners (Tokyo) 	<p>Invests in seed to early stage projects and start-ups in the life science field focusing mainly on medical devices.</p>	<ul style="list-style-type: none"> • Medical devices • Medical • Robotics • Biotech/Pharma • Clinical Trials 	<p>Participated in Sonomotion Series B in 2019 (¥1.1 billion)</p>
Beyond Next Venture (Tokyo) 	<p>Provides continuous financial support from the technical seeds stage, making advantage of a high-quality network with investors and operating companies.</p>	<ul style="list-style-type: none"> • Electronics • Medical • Manufacturing • Market Research • Wearables 	<p>Participated in Aillis venture round in 2019 (¥1.3 billion)</p>

What is the typical way that start-up companies engage with the VCs, incubators, angel investors?



New Energy and Industrial Technology Development Organization (NEDO) is active in a wide variety of areas, including biotech/pharma, as one of the largest public research and development management organizations in Japan. Energy is the main focus of this institute according to its name but its fields of interest have been expended over the year and Life Sciences have also become an important part of its activity.

Support Startups with grants such as Seed-stage Technology-based Startup (STS) grant, and Startups in Corporate Alliance (SCA) grant.

Seed-stage Technology-based Startup

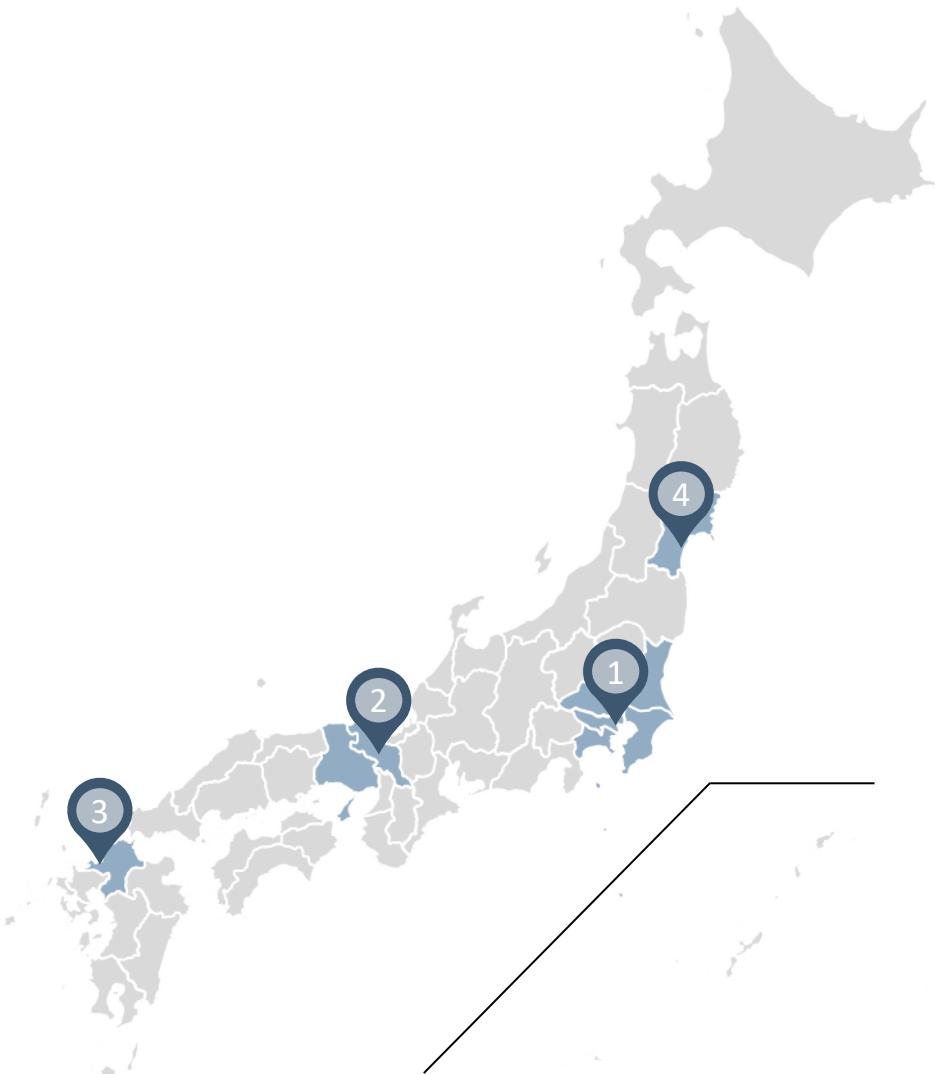
Applicant startups for STS grant must justify of a funding intention from a VC or other investment organism certified by NEDO, higher than 1/3 of the grant value.

SCA is a subsidy for R&D-type venture with a business concept that uses specific technology seeds and conducts joint research with medium-sized and large Japanese companies. The grant can go up to ¥100 million, but must be less than 2/3 of the target expenses of the startup.

Other governmental organizations such as the Japan Agency for Medical Research and Development (AMED) have their own grant program to which startups can apply according to their sector of activity and if they fulfill the requested criteria set by these organisms.



Devices – The Most Relevant Ecosystems



Main startups' hubs (based on the location of startups, applied research institutes, large corporations (that invest in startups), VCs:

1. Greater Tokyo Area: Tokyo, Chiba, Kanagawa, and Ibaraki, gathering the most high quality startups, research institutes and investment funds.
2. Kansai: Kyoto, and Kobe, with some high quality startups and base of research institutes and incubators
3. Fukuoka, with high quality startup and growing attractiveness as a startup hub
4. Tohoku, with active research

Potential Evolution For Devices in the next 5 years



2020 to 2025 view

Japan is the second largest industry for medical devices, and is well-acknowledged for its high-tech and high-quality medical device products, especially in the categories of diagnostic imaging, dental products, and medical optician technologies. In recent years, the Japanese government has also developed policies to further the industry and helped facilitate the R&D of innovative medical devices and regenerative products. The Japanese medical device market is set to reach from \$54.5 billion in 2018 to \$74.7 billion in 2025, growing at a compound annual growth rate (CAGR) of 4.6%. Top Japanese medical device companies, in terms of sales, include Terumo, NIPRO, Olympus Medical Systems, Toshiba Medical Systems, Hitachi Medico, Nihon Koden, and Fukuda Denshi.

IoT applications began in Japan at a slow grind, with minimal hype. Today, there are more than 3.17 million individual IoT (SIM card) subscriptions in Japan. It is expected to explode in sectors such as telemetering, transportation management, e-payment, surveillance, digital signage, and data backup. This brings huge business opportunities by creating new potential growth areas in an already saturated Japanese mobile market. In 2018, the internet of things (IoT) applied consumer and home electronics market was estimated to reach almost 1.8 trillion Japanese yen. Driven by the increased use of smart devices, such as smart speakers, the market was forecast to almost double in size in 2025 to approximately 3.6 trillion Japanese yen.

Additionally, the Medical Technology Association of Japan (members between 250 and 300 companies) acknowledge that technologies, including AI and IoT, will bring new effects and values beyond the conventional concept of medical devices.

Electronic and connected devices will therefore keep growing positively in Japan over the next 5 years.

Top 3 Applications - India



Top 3 applications selected for India

These are based on Frost & Sullivan research findings and discussions with L'Oreal team



01



Environment / Sustainability / Waste Management

This application covers the following:

- Plastics recycling, mixed waste plastics from consumer, industrial and agricultural waste streams to hydrocarbon fuels.
- Water harvesting from air, plastic cleaning technology to produce recycled granules.
- Biowastes to biogas, Decentralized Water Treatment Systems for Recycling Domestic. Packaged waste to usable products.

02



Algorithms & Data Analytics

This application covers the following:

- Big Data / Advanced analytics/ Algorithms/ Image Analysis & Pattern Recognition (Medtech & Facial), Simulations & Virtual Lab
- “Low-cost” diagnostics & Sensors (in IoT and other applications)

03



Ingredients & Materials

This application covers the following:

- Plant biotechnology, genetics and genomics, marker-assisted selection (MAS), and transgenic crops.
- Biomaterials, Chemical/Bio chemicals, Agriculture technology /Biotech molecules/API molecular discovery

Disruptive innovations and innovators; Accelerators and Incubators, Investors in the ecosystem



Overview

- The Indian government has concentrated mostly on a broad ecosystem of emerging technologies, and the government has brought in new initiatives and opportunities to bring out the best in these companies and support them in innovation and nurturing. The Indian government has supported multiple projects to develop the new technological innovation and create an environment of innovation among young start-up companies.
- Central and state governments in India are playing an active role in the growth of the deep-tech start-up ecosystem by stimulating entrepreneurial activity to promote job creation, develop an environment by decreasing the regulatory burden and formulating new policies, infrastructure design and training, provide funding support and fiscal incentives and assist all members of the deep-tech start-up ecosystem to collaborate and connect.
- There are several research/mentor organizations and groups such as National Association of Software and Services Companies (NASSCOM), T-Hub aims to foster a energetic deep tech ecosystem for the establishment and growth of enterprises.
- IIT Madras Incubation Cell, Shriram Institute – Technology Business Incubator (SRI-TBI), Venture Center, T-Labs, Khosla Labs, Technology Business Incubator for Medical Devices & Biomaterials (TiMed) are some of the key incubators and accelerators in India. Sometimes a few incubators also support in financing start-ups for technological developments. There are also many angel investors and venture capitals such as Green India Venture Fund – II (GIVF-II), pi Ventures.
- India is focussing on providing a green environment by innovating various methods such as Plastics recycling, industrial and agricultural waste streams to hydrocarbon fuels, harvesting water from air, Biowastes to biogas, Decentralized Water Treatment.
- India is in the nascent stage in developing AI based products and are keen on focussing big data analytics for medical diagnostic applications.
- Biomaterials research is currently growing in India, with several laboratories working on drug delivery systems and innovations for tissue regeneration.

Environment / Sustainability / Waste Management – Ecosystem Overview



Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Current value	Funding Stream (Investors)
Polycycl Limited	Private Haryana	PolyCycl's patented technology converts mixed waste plastics from consumer, industrial and agricultural waste streams to hydrocarbon fuels.	Founded in 2016. Amit Tandon, Founder & CEO	\$1.25M	White Field Ventures
Uravu Labs	Bengaluru	By utilizing the sun's power, Uravu labs have developed an aquapanel called EVA that harvests water from thin air. The patent-pending technology combines the material sciences and solar thermal energy. The device is modular, scalable and simple device which works efficiently even in dry and arid areas.	Founded in 2017. Swapnil Shrivastav, Product Architect & CEO	Self-funded	Self-funded
Banyan Nation	Hyderabad, Telangana	Banyan's patented plastic cleaning technology removes inks, coatings and other contaminants using environmentally friendly detergents and solvents to provide brands with recycled granules of almost virgin performance.	Founded in 2013. Mani Vajipey, CEO	\$800k	Artha Capital
Chakr Innovation	Haryana	For diesel generators, the company has invented and developed retrofit emission control tools. Over 90 percent of particulate matter emissions from diesel generator exhaust can be collected by the technology without having any adverse impact on the diesel engine.	Founded in 2016. Kushagra Srivastava, CEO	\$3.4M	IDFC-Parampara Fund, IAN Fund, Globevestor, Siddharth Anand, Akshay Saxena
Protoprint	Pune	The initiative Protoprint is structured as a social enterprise to empower the waste picker communities by providing low-cost technology to produce 3D printer filament from the waste plastics such as high-density polyethylene (HDPE).	Founded in 2013. Sidhant Pai, CEO	\$190k	Echoing Green

Source: Crunchbase, Venture Radar, Local Governments, Company websites

Environment / Sustainability / Waste Management – Ecosystem Overview



Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Current value	Funding Stream (Investors)
Sparkle Innovations	Gujarat	The company has developed all-natural sanitary pads made from banana fiber, bamboo fiber and corn starch. There are no synthetic or harmful chemicals in Sparkle's sanitary pads.	Founded in 2018. Hetal Virani, Cofounder	Self-funded	Self-funded
GPS Renewables Pvt Ltd	Bengaluru	The GPS's Biourja system is a high-rate dry anaerobic digestion system that metabolises biowaste and generates clean bioCNG (biogas containing high methane percentage). The gas can be used directly for cooking thermal, and Chakraborty, for power generation applications by using gas engine. As a fertilizer, the post digested liquid is used.	Founded in 2010. Mainak	\$146.8k	Department of Biotechnology, Centre for Innovation Incubation and Entrepreneurship, i2india
Indra Water (Inphlox Water Systems Pvt. Ltd.)	Mumbai	<p>The company has developed Decentralized Water Treatment Systems for Recycling Domestic & Industrial Wastewater for reuse in non-potable applications.</p> <ul style="list-style-type: none"> Flow Series (F) Electrocoagulation based system for treatment of residential, commercial & municipal wastewater. Activated Flow Series (AF) - Activated Flocculation and Activated Treatment process coupled with Flow Series for Industrial Effluent Treatment. Electrox Series (E) - Advanced treatment for high COD wastewater, combines Activated Flow Series with Electrochemical oxidation technology. 	<p>Founded in 2018. Amrit Om Nayak, self-funded CEO</p>	\$1M	IIT-B's Department of Science of Technology
GEM Enviro Management	Delhi	GEM collects both pre- and post-consumer packaging waste from factories, offices, hotels, motels and institutes. The collected waste is then recycled into goods like t-shirts, caps and bags. The products are sold under their ' Being Responsible ' brand.	Founded in 2013.	Self-funded	Self-funded
Namo Ewaste Management Limited	Delhi	Namo E-Waste Pvt. Ltd., an e-waste recycling startup, collects all kind of electronic waste and recycles them into different usable products. Services Asset Refurbishment, Data Destruction, Reverse Logistics, PRO Service for EPR implementation and Recycling certification.	Founded in 2014. Akshay Jain, Founder	Self-funded	Self-funded

Source: Crunchbase, Venture Radar, Local Governments, Company websites

Environment / Sustainability / Waste Management – Ecosystem Overview



Applied Research Institute (including Large Corporations that invest in Startups/spin-offs)	Facts and figures	Key interests
 openwater.in <small>anyone. anywhere.</small> (Bengaluru)	<p>Openwater.in is a spinoff from the Flexible Electronics Lab, Indian Institute of Science, Bangalore. The technology provides high performance and can accommodate higher levels of TDS easily. With reduced maintenance, the treatment can be performed without any membranes. Without wasting, the innovative technology can transform highly contaminated water into clean water.</p>	Water treatment and wastewater management
 ESTPL <small>Committed to the Planet</small> (Nagpur)	<p>ESTPL is a company incorporated in February 2014. It started as a spinoff company of Center for scientific & Industrial Research promoted by a senior scientist of a national organization. It is founded by a scientist of the CSIR-National Environmental Engineering Research Institute (NEERI) under the Research Entrepreneurship Scheme of the Council of Scientific and Industrial Research (CSIR). Phytod Technology, Municipal Solid Waste to Biogas, Arsenic removal from water, NEEM seed based bio pesticides, Bioenergy Mission Cell are the technologies developed by the company.</p>	Wastewater Treatment, sewage treatment, solid waste management, air pollution monitoring and control
 CSIR- National Environmental Engineering Research Institute	<p>The Water Technology & Management Division (WTMD) was formed to resolve water issues and carry out research and development activities related to water quality control and monitoring, water treatment, water safety plan, water safety plan, contaminant transport studies, hydrogeological research and water audits.</p>	<ul style="list-style-type: none"> • Water Quality Monitoring and Surveillance • Water Treatment • Groundwater Quality Assessment and Management • Hydrogeological and Geophysical studies • Development of onsite water quality monitoring kits • Quantitative Chemical Risk Assessment(QCRA) • Quantitative Microbiological Risk Assessment(QMRA) • Development of localized water treatment technologies for potable water supply • Water safety and security plans • Sanitation safety plan

Source: Company websites

Environment / Sustainability / Waste Management – Ecosystem Overview



Applied Research Institute (including Large Corporations that invest in Startups/spin-offs)	Facts and figures	Key interests
 Mumbai	<p>National Solid Waste Association of India (NSWAI) is the leading professional non-profit organization in the field of Solid Waste Management in India. It supports the Ministry of Environment and Forests (MoEF) to control solid waste in various fields and makes plans for strategies and actions.</p>	<ul style="list-style-type: none"> Municipal solid waste Bio – medical waste Hazardous waste E-waste Construction & demolition waste
 Bengaluru	<p>"Not-for-Profit" organisationas a project of the Ministry of Science and Technology at Bhopal, Founded in 2009</p>	<p>Solid and liquid waste management. All waste management facets like Hazardous waste, Bio-medical waste, Non-Hazardous Industrial Waste, Municipal waste, Construction & Demolition waste, E-Waste, Sewage and Effluent from industries.</p>
 Chennai	<p>Sathyabama Institute of Science and Technology with the joint initiative of the National Solid Waste Association of India (NSWAI) has established the Centre for Waste Management.</p>	<ul style="list-style-type: none"> Microbial Biomass Cultivation for the Extraction of Bio-oil. Food Waste for Biohydrogen Production.

Source: Company websites

Environment / Sustainability / Waste Management – Ecosystem Overview



Incubator/Accelerators	Location	Fact & Figures	Key Technologies & Key Interests
Ashoka -ISB –Microsoft Ventures	Sonipat, Haryana	The accelerator has been established by Indian School of Business and Ashoka University in association with Microsoft Ventures for early stage start-ups.	<ul style="list-style-type: none"> • Health • Sanitation • Waste Management • Waste to energy • Waste to compost • Waste segregation
IIT Madras Incubation Cell	Chennai	IITM Incubation Cell established in 2013 manages and leverages the synergies at IIT Madras, consisting of cutting-edge science, industrial interactions, in various areas of excellence driving innovation and entrepreneurship.	<ul style="list-style-type: none"> • Waste Management • Water treatment • Indoor smart air purifier • Generate power from biomass and bio-waste • IoT based water distribution & treatment systems
Startup Oasis	Jaipur	Startup Oasis is an incubation center located in Jaipur that creates an ecosystem in Rajasthan to inspire and support students, aspiring entrepreneurs and start-ups to solve persistent problems, build revolutionary technologies and create world-class businesses. Startup Oasis was set up at IIM Ahmedabad on the joint initiative of RIICO, Rajasthan's leading organization for industrial development, and the Center for Innovation, Incubation and Entrepreneurship (CIIE).	<ul style="list-style-type: none"> • Waste Management • Water treatment • Zero waste Recycling • sustainable urban water management
SIDBI Innovation & Incubation Centre (SIIC), IIT Kanpur	Kanpur	The SIDBI Innovation & Incubation Center (SIIC) at IIT Kanpur was established in cooperation with the Small Industries Development Bank of India (SIDBI) to promote innovation, research and entrepreneurship in technology-related areas.	<ul style="list-style-type: none"> • Water and wastewater treatment • Organic fertilizer • Degradable bioplastic products

Source: Company websites

Environment / Sustainability / Waste Management – Ecosystem Overview



Incubator/Accelerators	Location	Fact & Figures	Key Technologies & Key interests
Technology & Action for Rural Advancement (TARA)	New Delhi	The Society for Rural Advancement Technology & Action (TARA) is a social enterprise founded in 1985. It is the Development Alternatives Group's "incubation engine" that has provided development strategies and generated large-scale sustainable livelihoods to mobilize collective action to eradicate poverty and restore the environment.	<ul style="list-style-type: none"> Renewable energy, Water management, Sustainable agriculture, Waste management, Recycling. Water and soil purification systems, Recycled Paper
Shriram Institute – Technology Business Incubator (SRI-TBI)	New Delhi	Since 1950, the Shriram Institute for Industrial Research has been at the forefront of the area by setting up a Technology Business Incubation (TBI) center at its premises under the sponsorship of the Department of Science and Technology (DST), Ministry of Science and Technology, Government of India. The SRI-TBI provides plastics, rubber, specialty chemicals and waste management services by converting new ideas into technologies and incubating entrepreneurs to transform technology into successful business ventures.	Plastics, rubbers, specialty chemicals and waste management <ul style="list-style-type: none"> Plastics and chemical recycling Electronic waste
Entrepreneurship Development Center (Venture Center) Venture Center	Pune	Established in 2007, the Venture Center is an innovation business incubator that focuses on technology projects that help products and services that leverage scientific expertise in the fields of materials, chemicals and biological science and engineering. Venture Center is currently funded by Department of Science and Technology, Government of India.	WASH (waste, sanitation, hygiene)
Vel Tech Technology Incubator (Vel Tech TBI)	Chennai	Founded in 2010, with funding, infrastructure, mentorship, industry networking, resources and training, Vel Tech TBI (Technology Business Incubator) enables embedded technology and innovation-driven start-ups to survive and scale across a wide range of thrust areas.	E-Waste / Plastic waste management. e-waste, Solid waste, factory waste, waste oil.
IITMS Rural Technology and Business Incubator (RTBI)	Chennai	The Rural Technology and Business Incubator (RTBI) of IIT Madras is a registered non-profit corporation. Established in 2006 as a formal business incubator with the initial support of the Department of Science and Technology (DST), the Government of India and the Infodev arm of the World Bank, RTBI aims to support rural and social inclusive start-ups, primarily those that allow scalable products and services for the under-served and under-served market.	Water, Waste management/Environment

Source: Company websites

Environment / Sustainability / Waste Management – Ecosystem Overview



Funding source name / can be VC, public program	Description	Key Funding Areas
Green India Venture Fund – II (GIVF-II)	Invests in companies setting up Clean Development Mechanism (CDM) projects and other commercially viable projects/ business.	<ul style="list-style-type: none">• Water infrastructure & technologies• Pollution reduction• Waste recycling and management• Environmental support services
Infuse Ventures	Infuse Ventures is an early stage venture catalyst headquartered at IIM Ahmedabad's Centre for Innovation Incubation and Entrepreneurship (CIIE), focusing on ecosystem such as sustainability and clean energy sector in India.	Water & waste
Unifi Capital Pvt. Ltd.,	Unifi Green Fund operate primarily in the renewable energy, clean technology and environmental technology space.	<ul style="list-style-type: none">• Water infrastructure & technologies• Pollution reduction• Waste recycling and management• Environmental support services

Source: Company websites



What is the typical way that start-up companies engage with the VCs, incubators, angel investors? (1/2)

Global Innovation & Technology Alliance (GITA)

A specific organization to provide market-driven business solutions through a competitive process through organizational & international alliances. A one-stop shop to forge global technology partnerships for Indian companies to achieve dominance in international and domestic markets. A groundbreaking process between the Govt of India and the Indian industry to draw innovation investment from the Indian industry by mapping technology gaps, Evaluating technology offerings worldwide suitability from a techno-economic perspective for India, Connecting software designers, suppliers, advertisers, Financing the latest technology development phase that links the sector. Focus areas are Water Purification / Waste Water Treatment, Treatment of Municipal / Industrial / Bio-hazardous Waste.

Shell E4 Accelerator Programme

Shell E4 seeks to co-create strategies to speed up the energy change and make India and the environment more sustainable. The Accelerator Program is based in Shell Technology Centre, Bengaluru, offering selected entrepreneurs six months of co-operative space, 20 K seed funding, access to research labs and prototyping laboratories, product development bootcamps, industry mentors and experts, and new markets and stakeholders. The startups will gain access to Shell's global partners network at several industry events and collaboration initiatives planned for the program during the Accelerator phase. Focus areas are solid waste management, waste water and energy.

Source: Company websites



What is the typical way that start-up companies engage with the VCs, incubators, angel investors? (2/2)

CleanEdge
Accelerator
program

With rigorous evaluation 15 start-ups will be shortlisted to participate in this program. Key offerings under this program are

- 1) High quality intensive mentorship by Start-up Experts, Functional Strategy Experts, domain related technical & sector specific experts.
- 2) Access to State-of-the-Art pilot lab facility at SRI-TBI in Delhi & Co-working facility at Aspirelabs.
- 3) Access to 'Appropriate' Technology, Opportunity to raise Seed-Capital upto 25 lakhs.
- 4) Access to Impact investors and Potential Customers. 5) Post acceleration support.

Open Innovation
Challenge
Reimagine Plastic

Reimagine Plastic, an Open Innovation Challenge, gives innovators around the world the opportunity to make a difference in the way plastic is available. They promote the use of Circular Economy and Material Thinking concepts to take a step towards solving the hard to reuse plastic-Multi Layer Plastic (MLP). A circular economy theory refers to a product's regeneration. Once the material is used, it is disposed of in linear economy. While the material is returned to its initial constituents for reuse in the circular economy. The end product is processed, reused and returned to use as a fresh or virgin product in order to create a circular economy.

Source: Company websites

Environment / Sustainability / Waste Management – Ecosystem Overview



Main startups' hubs (based on the location of startups, applied research institutes, large corporations (that invest in startups), VCs:

1. Bengaluru (Waste water treatment)
2. New Delhi (Industrial waste, e-waste recycling)
3. Pune (Waste plastics recycling)
4. Hyderabad (Plastic cleaning technology)

Potential Evolution For Environment / Sustainability / Waste Management in the next 5 years



- Solid waste generation currently amounts to 42 MMT / day in Indian cities due to population growth. It is a disturbing fact that, despite claiming to make Indian cities clean and green, due to its unchecked dumping and burning, solid waste tremendously affects the environment. The rate of waste generation in India is much lower than that in low-income countries, but The Institute of Energy and Resources (TERI) has estimated that by 2047 these figures will exceed 260 MT per year, more than five times the current levels.
- The maximum amount of solid waste generation is contributed by Delhi, Mumbai, Kolkata, Chennai, Bengaluru and Hyderabad. There are efforts being made in some mega cities to collect solid waste from door to door. Setting more stringent rules and door-to-door waste collection has gained momentum with Solid Waste Management Rules, 2016. With Swachh Bharat Mission providing financial support for sanitation, various urban areas / towns have begun to concentrate on isolated waste collection from door to door. Additionally, the 2016 Solid Waste Management Rules made it compulsory to segregate waste at source and assigned its sole responsibility to waste generators. The law also specifies that in the event of non-compliance, the waste generators are penalized.
- It is possible to implement community-centered PPP models in smaller cities. Although such models are not completely mechanized due to manual labor participation, there is potential to include advanced intervention(s) in engineering that can reduce human population health hazards.
- Smart waste management principles can be seen as one of the municipal authorities' effective and viable choices for building transparency through value chains. The use of smart technologies in the era of artificial intelligence would allow greater efficiency in waste management, logistics and strategic planning. Using technology could help with vehicle tracking synchronization to ensure better system performance.
- India is the country where most e-waste is processed by an unorganized sector, the development of minimal-cost, eco friendly recycling and disposal infrastructure is necessary to avoid future e-waste problems. Investment in R&D should be made in environmentally friendly waste management technologies that can be deployed on a small scale throughout India with minimal capex.

Algorithms & Data Analytics – Ecosystem Overview



Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Current value	Funding Stream (Investors)
Cardiotrack	Bengaluru	Cardiotrack is a Bangalore based AI startup that has developed an intelligent platform which offers diagnostic capabilities for cardiovascular and other related diseases. The sensors developed by the company will give accurate reading of 12-lead ECG, peripheral capillary oxygen saturation or SpO2 and blood pressure. All the reading can be displayed on a mobile phone or tablet using Bluetooth. Clients of Cardiotrack include reputed health organizations such as Columbia Asia, Gramin Healthcare, ProMedic of Mexico and Healthcare at Home.	Founded in 2014. Ashim Roy, Cofounder	\$1M	Bud Biswas, Frontline Strategy, Ravindran Govindan.
SigTuple Technologies Private Limited	Bengaluru	SigTuple creates smart screening tools to assist with diagnosis by AI-powered visual medical data analysis. Manthana helps to accurately interpret visual medical data. Manthana enables the healthcare industry to work with five major high-volume screening processes – peripheral blood smear analysis, urine microscopy, semen, fundus & OCT scans, and chest x-rays.	Founded in 2015. Rohit Pandey, Co-founder and CEO	\$40.8M	Accel, Chiratae Ventures, IDG Ventures, Trifecta Capital Advisors, Axilor Ventures, Venture Highway, Binny Bansal, Kris Gopalakrishnan, Endiya Partners, Sachin Bansal, Pi Ventures, Trifecta Capital, iLabs Capital, Accele Venture Partners, Amit Singhal, Trusted Insight, S.D. Shibulal.
Niramai Health Analytix	Bengaluru	NIRAMAI Health Analytix is a deep-tech startup based in Bangalore with automated solutions to critical healthcare problems. Thermalytix, a computer-aided diagnostic engine powered by Artificial Intelligence, is the core of NIRAMAI solution. For analyze thermal images, the system uses a high resolution thermal sensing tool and a cloud-hosted analytics solution.	Founded in 2016. Geetha Manjunath, Co-founder and CEO	\$6.1M	Dream Incubator, Pi Ventures, Axilor Ventures, BEENEXT, Ankur Capital, Binny Bansal, Google Launchpad Accelerator, 500 Startups.

Source: Crunchbase, Venture Radar, Local Governments, Company websites

Algorithms & Data Analytics – Ecosystem Overview



Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Current value	Funding Stream (Investors)
Oncostem diagnostics	Bengaluru	This startup uses machine learning algorithms to assist in personalized cancer treatment. OncoStem uses tools focused on Proteomics and Genomics and predicts cancer recurrence with the aid of a tumor's molecular fingerprint. Understanding cancer recurrence will also contribute to the development of new drugs.	Founded in 2011. Manjiri Bakre, CEO and Cofounder	\$7M	Sequoia Ventures Capital and Artiman
Onward Health	Hyderabad	This healthtech start-up is building a portfolio of diagnostic tools in the form of classifiers and analytical tools using predictive analytics and machine learning. Through offering deeper, more detailed information from available specimens, these methods help pathologists identify more cases every day. Onward Health also uses computer vision methods and ML algorithms to provide machine pathology and mammography tools.	Founded in 2016.	Self-funded	Self-funded
TEG Analytics	Bengaluru	TEG Analytics is a data science as a service company that helps companies make decisions at the crossroads of industry, technology and applied mathematics. TEG's HealthWorksTM, a tableau-driven platform and publicly available healthcare data, helps payers develop the ability to forecast in-market quality and reads the entire industry environment to help them understand their products' competitiveness. The process involves comprehensive data planning, a sensible combination of conventional and modern machine learning approaches, and visual evaluation.	Founded in 2008	Self-funded	Self-funded

Source: Crunchbase, Venture Radar, Local Governments, Company websites

Algorithms & Data Analytics – Ecosystem Overview



Applied Research Institute (including Large Corporations that invest in Startups/spin-offs)	Facts and figures	Key interests
 (Bengaluru)	<p>The Data Science Research Institute was founded as an organization that focuses on data science and big data. The Institute is aimed at promoting data science growth and prosperity in India and abroad. The Institute works with industry partners to develop the internship program for the industry.</p>	Big Data Analytics
 <small>ROBERT BOSCH CENTRE FOR DATA SCIENCE AND ARTIFICIAL INTELLIGENCE IIT MADRAS</small> (Chennai)	<p>The Robert Bosch Centre for Data Science and Artificial Intelligence (RBC-DSAI) was founded in August 2017, in IIT Madras with a vision to expand and further the research, education and outreach activities in the areas of Data Science and Artificial Intelligence.</p>	Data Science Artificial Intelligence
 <small>Department of Computational and Data Sciences</small> (Bengaluru)	<p>Department of Computational and Data Sciences (CDS) is an interdisciplinary engineering department spanning the broad research areas of computational science & engineering and scalable computer & data systems.</p>	Big Data platforms & applications, Computer Aided Design, Database Systems, Distributed Systems & Cloud Computing, High Performance Computing, Image & Video Analytics, Machine learning, and Middleware & Runtime Systems.

Source: Company websites

Algorithms & Data Analytics – Ecosystem Overview



Incubator/Accelerators	Location	Fact & Figures	Key Technologies & Key Interests
IIT H Foundation	Hyderabad	In 2008, IIIT Hyderabad began to fund start-ups with the goal of promoting the technologies developed in its research centres. Department of Science & Technology, Government of India approved the incubation facility as an incubator for technology business in 2012, after which the Foundation opened its doors to start-ups outside the institute. Through seed money, it has funded over 200 start-ups.	<ul style="list-style-type: none"> Artificial Intelligence Big Data Machine Learning Cloud Computing IoT AR/VR
Pitney Bowes India Accelerator	Noida	Initiated in 2014, the Pitney Bowes Startup Accelerator Program has incubated 18 start-ups in India. In collaboration with Nasscom, Pitney Bowes initiated the accelerator program to provide safest-care to start-ups and online solutions for small and medium-sized enterprises.	<ul style="list-style-type: none"> Artificial Intelligence Health-tech IoT
T-Labs	Bengaluru	TLabs, established in 2011, is a start-up accelerator and an early stage seed-fund for Internet and mobile technology start-ups in India. The organization has launched numerous accelerator programs that ambitious startups in the country have been nourishing and honing. Through multiple rounds and eventually demo months, the company makes daily partnerships to early stage VCs and angels.	<ul style="list-style-type: none"> Machine Learning Data Analytics
Khosla Labs	Bengaluru	Khosla Labs was established in 2012 and is an incubator that provides seed funding to Indian startups. The prototypes were prototyped by teams of in-house design and technology. Such models were tested on the ground in order to obtain reviews and evaluation of the market.	<ul style="list-style-type: none"> Machine Learning Data Analytics
Rainmatter	Bengaluru	Rainmatter is a global investment company that provides groundbreaking fintech services and offers start-up funding. The incubator offers workspaces, mentorship and funding (USD 100-500 K) in return for minority stakes to fintech & investment tech startups.	<ul style="list-style-type: none"> Analytics Digital technology

Source: Company websites

Algorithms & Data Analytics – Ecosystem Overview



Incubator/Accelerators	Location	Fact & Figures	Key Technologies & Key interests
Zone Startups India	Mumbai	Established in 2014. Zone StartupsIndia is part of the Ryerson Futures Network where projects around the globe are growing. Zone Startups India is collaborating with the Risk Accelerator of Barclay, Gateway91 and Lodha Group. The accelerator offers tactical and strategic hands-on support to start-ups seeking to accelerate market recognition and customer acquisition, as well as exposure to investors, corporate partners and advisors.	<ul style="list-style-type: none"> • Data Analytics • IoT
Global Incubation Services	Bengaluru	Established in 2010. Global Incubation Services (GINSERV) is a Technology Business Incubator (TBI) and a business accelerator providing early-stage start-ups with strategic support, technology, operations and service.	<ul style="list-style-type: none"> • Artificial Intelligence • IoT • Cyber Security • Data Analysis • Cloud Computing
India Accelerator	Haryana	India Accelerator is a seed-stage accelerator program that helps startups grow. It is an Incubator & Accelerator for Technology, Internet, Software, Mobile, Gaming, E-Commerce, SaaS, Physical Applications, Web-based and Cloud start-ups in India. It has a three-month accelerator program focused on technology-driven and transformative ideas	<ul style="list-style-type: none"> • Data Analytics
Innovation Center - IIIT Bangalore	Bengaluru	Established in 2009, the Innovation Center – IIIT is an incubation center in Bangalore's Electronics City, located within the IIIT-B University Campus, the IIIT-B Innovation Center is a hub for ICT4D research, innovation and entrepreneurship.	<ul style="list-style-type: none"> • IoT • Healthcare • Data Analytics

Source: Company websites

Algorithms & Data Analytics – Ecosystem Overview



Funding source name / can be VC, public program	Description	Key Funding Areas
Nexus Venture Partners	Early-stage VC firm where investment size ranges from USD 500K to 10 million in early-growth stage companies.	<ul style="list-style-type: none">• Big Data Analytics
pi Ventures	pi Ventures is an early stage venture fund based out of Bengaluru. Founded in 2016	Artificial Intelligence, Machine Learning and IoT (Internet of things)
India Nivesh Venture Capital Fund	IndiaNivesh is a full-fledged financial services firm with over 11 years of existence. The firm provides customised and innovative financial solutions while managing internal and external risks and challenges.	<ul style="list-style-type: none">• Big Data Analytics• Cybersecurity

Source: Company websites



What is the typical way that start-up companies engage with the VCs, incubators, angel investors?

5ideas

5ideas is an accelerator that fuels India's tech start-ups. To accelerate the performance of the start-ups, 5ideas provides them with human capital, financial capital and social capital. They bring 30+ years of operating experience and capabilities to support founders in scaling their start-ups. This accelerator provides investment starting from Rs 25lakh (USD 50K) to Rs 15crore (USD 300K) and if required they could go up to Rs. 25crore (USD 500k) in follow-up rounds usually pre series A.

Z Nation Lab Accelerator program

Z Nation Lab Accelerator program enables start-ups in scaling up globally with the focus on India – US Corridor. This accelerator not only invests seed capital but also provides strategic and technological support to the start-ups to help them accelerate in the right direction and take them to the next level. They provide start-ups with a world class ecosystem at their collaborative work space in Mumbai and affiliate centers in Pune, Udaipur, Jaipur, Kolkata, Chandigarh and Indore. Also partnerships and connects help the Indian start-ups in accelerating their growth.

Microsoft Accelerator

Microsoft Accelerator is a global initiative empowering entrepreneurs around the world. They work with later-stage start-ups and provide them the necessary tools, resources, connections, knowledge and expertise that they require to become successful. Microsoft Accelerator offers a 4-6-month tailor-made program for later-stage start-ups looking to go beyond the development of their product by scaling their business. They provide the support and resources necessary to build a sustainable company and to achieve scaling up of every aspect of the business.

Source: Company websites



Main startups' hubs (based on the location of startups, applied research institutes, large corporations (that invest in startups), VCs:

1. Bengaluru (Machine learning algorithm, Data analytics)
2. Hyderabad (Predictive analytics, machine learning)

Potential Evolution For Algorithms & Data Analytics in the next 5 years



- Companies will continue to concentrate on innovative technology and will incorporate innovations such as artificial intelligence and machine learning to deliver a better customer experience. The technology ecosystem will also be turned into an API-based environment with more pervasive AI and analytics.
- The move to real-time analytics is spurred by the increase in the number of connected devices, which has pushed companies towards real-time edge analytics that are helpful in finding similarities and hidden trends. The rapid development of connected devices and IoT devices has pushed the edge of centralized cloud computing.
- India will see the advent of cognitive technologies that go beyond computer vision automation, deep learning and language technologies that include speech recognition, sense and text evaluation, natural language processing and generation.
- Customization powered by AI and the increasing use of analytics and AI will help businesses to deliver personalized communications and services.

Ingredients & Materials – Ecosystem Overview



Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Current value	Funding Stream (Investors)
Spectralite	Bengaluru	The company produces biocompounds that are suitable for the manufacture of products such as vehicle interiors, houseware, consumer products, toys, packaging and disposables. BioPur biocompound levels allow clients to develop products that will naturally biodegrade after use in a compost. BioDur levels of biocompounds help clients reduce plastic, and like any other material, the items clients produce are easily recycled.	Founded in 2016,	Self-funded	Self-funded
EnNatura Technology Ventures	New Delhi	EnNatura is a company dedicated to the production of sustainable feedstock-based specialty chemicals. The company designs and engineers printing inks that ensure reduced consumption of hydrocarbons, reduced costs of compliance with the environment, high performance and efficient recycling of printed paper.	Founded in 2006	\$200k	Navam Capital
Nanospan	Hyderabad	Nanospan Inc. is a pioneer in manufacture, supply and application of Graphene related materials. It provides analytical testing & engineering services for emerging Nano and Micro technology based products.	Founded in 2015	Self-funded	Self-funded
Log 9 Materials	Bengaluru	Log 9 Materials is a nanotechnology company specializing in Graphene. Log 9 Materials seek to create and produce in the purest of their types new and innovative materials while improving rapid marketing technologies.	Founded in 2014	\$3.9M	Exfinity Venture Surge Ahead, Partners, GEMS, Metaform Ventures, GEMS
QTLomics Technologies Pvt. Ltd.	Bengaluru	QTLomics is an agri-genomics company that combines the influence of conventional and Marker Assisted Breeding Programs with state-of - the-art genomic methods to catalyze the hybridization of desirable plant traits. Committed to helping plant breeders to boost crop quality and productivity and to carry the crops of the next generation.	Founded in 2013	Self-funded	Self-funded

Source: Crunchbase, Venture Radar, Local Governments, Company websites

Ingredients & Materials – Ecosystem Overview



Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Current value	Funding Stream (Investors)
Sea6 Energy Pvt. Ltd.	Bengaluru	Sea6 Energy envisions a future where the abundant oceans will be our biomass farms of tomorrow. Ocean Agriculture, Bioconversion, Animal Feed, Agri Inputs, and Biofuels. It has developed patented technologies which can facilitate large-scale cultivation of selected sea plants.	Founded in 2010	Self-funded	Self-funded
BioPrime AgriSolutions Pvt. Ltd	Pune	Build creative and revolutionary next-generation Agri Biological engineering solutions that will prove to be a game-changer for farmers, help them fight climate change, battle various pressure conditions, increase yield. Agri Biologicals, Agri Biotechnology, and Contract Research	Founded in 2016	Self-funded	Self-funded
Yaathum Biotech	Chennai	Yaathum Biotech is a molecular biotech company specializing in the development of Real-time quantitative PCR (qPCR) assays for rapid and affordable diagnosis of various infectious diseases and research in life sciences.	Founded in 2012	Self-funded	Biotech Ignition Grant from BIRAC-DBT
Kopran Ltd.	Mumbai	Kopran is currently an integrated Pharmaceutical Company manufacturing a large range of products. It manufactures both Active Pharmaceutical Ingredients and Finished Dosage Forms.			Public company
Puritan Labs	Hyderabad	Puritanlabs is a research-based, innovation-driven organization offering a comprehensive range of Contract Research, Medicinal Chemistry, Custom Synthesis & Analytical Services. their global customers span a diverse origin varying from Pharmaceutical, Agrochemicals and Biotech developers and manufacturers, to Academic Research organizations. they work with a wide range of small molecules including active pharmaceutical ingredients, pharmaceutical intermediates, drug intermediates, drug metabolites, drug analogs, analytical standards, reference standards and certified reference materials, chemical intermediates, chemical standards, and pharmaceutical impurities.	Founded in 2017	Self-funded	Self-funded

Source: Crunchbase, Venture Radar, Local Governments, Company websites

Ingredients & Materials – Ecosystem Overview



Applied Research Institute (including Large Corporations that invest in Startups/spin-offs)	Facts and figures	Key interests
 SARJAN BIOTECH PVT. LTD. (Gujarat)	The Most Advanced Plant Tissue Culture Company In India, Established In 2005.	Having Ultra-Modern Plant Tissue Culture Laboratory To Develop Tissue Culture Plants, Precious Plant Tissue Culture Research & Testing Equipment For Continuous Development, Huge Modern Poly Houses For Primary Hardened Plants (Ex-Agar Or Net Pot Plants) & Secondary Hardened Plants (Poly Bag Plants), And All Required Infrastructure, For Providing The Great Precious Fruits, Crops & Vegetables.
 A KUMAR - FLORIST (HOLLAND) JOINT VENTURE (Pune)	KF Bioplants Pvt Ltd is India's largest plant biotech company. A joint venture of Kumar Properties and Florist Holland B.V., Holland, it is global provider of quality plants and various ornamental flowering species along with fruit plants supplying over 60 million plants annually for commercial cultivation all over India and to 30 countries around the world.	Plant molecular biology, Genetic Engineering
 BIOTECHNOLOGY (Cochin, Kerala)	L.J. International Ltd., a part of the A.V. Thomas Group of Companies, is the pioneer in Commercial Plant Biotechnology in India.	The company ventured into Plant Biotechnology in order to increase the productivity on its own plantations by selecting & mass propagating elite clones of plantation crops.
 BIOTECH PVT.LTD. An ISO 9001 - 2015 Certified Company (Pune)	Rise n' Shine is one of the leading plant tissue culture company and has an ultra-modern tissue culture laboratory and hi-tech equipments. Production of multiple crops like Banana, Gerbera, Carnation, Spathiphyllum, Lily, Cordyline, Alpinia, Potato, Ranunculus, Anthurium, Orchid, Limonium and Strawberry.	Biotechnology, Floriculture, Horticulture and Exotic Plant Nursery.

Source: Company websites

Ingredients & Materials – Ecosystem Overview



Applied Research Institute (including Large Corporations that invest in Startups/spin-offs)	Facts and figures	Key interests
 AGbiotech Laboratories (India) Limited (Hyderabad)	<p>AG Biotech is established by Scientists of National and International repute having practical experience in the Biotechnology. It has established Eco-friendly commercial "Modern Plant Biotechnology Unit". The only Biotechnology Company in India having wide variety of Tissue cultured products</p>	Plant Biotechnology, Organic Farming, Botanical and Bio Products.
 CONCORD BIOTECH <i>Biotech for Mankind...</i> (Gujarat)	<p>Vertically integrated, R&D driven biotechnological powerhouse that manufactures Active Pharmaceutical Ingredients through fermentation & semi-synthetic process and Finished formulations.</p>	Fermentation and semi-synthetic complex niche API's in the area of Immunosuppressant, antibiotic, oncology, antifungal segments and Veterinary products.
 SUN PHARMA (Mumbai)	<p>Sun Pharma is an international, integrated, specialty pharmaceutical company. It manufactures and markets a large basket of pharmaceutical formulations as branded generics as well as generics in India, US and several other markets across the world. In India, the company is a leader in niche therapy areas of psychiatry, neurology, cardiology, diabetology, gastroenterology, orthopedics and ophthalmology. The company has strong skills in product development, process chemistry, and manufacturing of complex API, as well as dosage forms.</p>	Formulations, API, US Generics, Speciality brands, and Technically complex formulations
 HETERO (Hyderabad)	<p>Hetero is one of India's leading generic pharmaceutical companies and the world's largest producer of anti-retroviral drugs. Portfolio includes 300 plus products encompassing major therapeutic categories such as HIV/AIDS, Oncology, Cardiovascular, Neurology, Hepatitis, Nephrology, Urology, Diabetes, Ophthalmology, Hepatology and Immunology etc.</p>	Active pharmaceutical ingredient, Custom Pharma Services, biosimilars, and Generic medicine

Source: Company websites

Ingredients & Materials – Ecosystem Overview



Incubator/Accelerators	Location	Fact & Figures	Key Technologies & Key Interests
Venture Center	Pune	A CSIR Initiative for technology businesses (inventors and scientist entrepreneurs). The Venture Center is a technology business incubator specializing in technology startups offering products and services exploiting scientific expertise in the areas of materials, chemicals and biological sciences & engineering.	Materials, chemicals and biological sciences & engineering.
Amity Innovation Incubator	Noida	The Amity Innovation Incubator is a pioneering concept in the context of Indian Universities. Supported by DST, Ministry of Science & Technology, GOI, 'Amity Innovation Incubator' has in a very short time of its existence earned an enviable position for itself with start-ups which have regularly been on top of the innovation curve	Biotechnology and Life Sciences, Nanotechnology and Material Sciences.
Technology Business Incubator for Medical Devices & Biomaterials (TiMed)	Kerala	SCTIMST-TIMed is the first of its kind to focus solely on the field of medical devices and biomaterials.	Medical devices, biomaterials, healthcare
Society Innovation Development (SID)	Bengaluru	The SID works closely with IIS-B and provides its expertise to the institution's associated researchers and scientists and also supports industrial tie-ups. They incubate start-ups based on IP.	Materials
Sri Ramakrishna Engineering College	Chennai	SREC-BI is an initiative supported by Ministry of Micro, Small and Medium Enterprise, Government of India. SREC-BI aims to nurture technology- and knowledge-based entrepreneurs, right from ideation stage to starting a business venture.	Nanotechnology, composite material,

Source: Company websites

Ingredients & Materials – Ecosystem Overview



Incubator/Accelerators	Location	Fact & Figures	Key Technologies & Key Interests
TIDES Incubation Centre	Uttarakhand	TIEDS owns and operates a business incubator called Technology Innovation & Development of Entrepreneurship Support (TIDES) Business Incubator based at the Indian Institute of Technology, Roorkee. TIDES promotes the incubation of new companies with advanced technologies by inviting them to its Incubation Center and offers support and services for physical, technological, financial and networking.	Materials
Zonal Technology Management – Business Planning and Development Unit	Delhi	The startup incubators' ZTM & BPD unit's main objective is to provide IP protection, showcasing, transferring, and commercialising the ICAR institutes innovations. They also act as an agri-business incubator to incubate new startup businesses.	Mass propagation of seeds, hybrids, planting material, biofertilisers/biopesticides/ vermicomposting, biotechnological tools and techniques including methods of mass multiplication/isolation of novel genes, precision farming, and agricultural implements.

Source: Company websites

Ingredients & Materials – Ecosystem Overview



Funding source name / can be VC, public program	Description	Key Funding Areas
Forum Synergies (India) PE Fund	<p>The vision and mission of the company is to be a unique, ethical model of private equity fund management in India that provides a best-in-class private equity model to investors.</p>	Healthcare, Automotive, Electronic Hardware, Electrical Equipment, Chemical Engineering, Medical Devices, Pharmaceuticals, Biotechnology, IT
Ah! Ventures	<p>ah! Ventures is a growth accelerator that brings together promising businesses and investors in India by creating wealth creation opportunities for both.</p>	Indian telecom, technology, packaging, alternate energy, chemicals, infrastructure, oil services, retail, and real estate sectors.
Gujarat Biotechnology Venture Fund	<p>Gujarat Biotechnology Venture Fund was launched in 2005 at initiative of Gujarat State Biotechnology Mission. The Fund is a 12 year close Fund.</p>	Bio-Pharma, Agri-Biotech, Contract Research, Industrial Biotechnology and other potential areas in Biotechnology.

Source: Company websites



What is the typical way that start-up companies engage with the VCs, incubators, angel investors?

Punjab Biotechnology Incubator

Punjab Biotechnology (PBTI) founded in 2005 is a component of Agri Food Biotechnology Cluster focussing on technology transfer, collaborative research, exchange of scientific manpower and company-to-company business relationship in agricultural and environmental biotechnology and bioprocessing.

Bejo Sheetal Bio-science Foundation (Jalna)

Encourages R&D in agriculture, provides training in the field of agricultural biotechnology, disseminate knowledge of tissue culture and molecular biology. It also organizes contract research and produce tissue culture plant materials for the industries.

NCL Innovations (Pune)

NCL Innovations was founded in 2007 as a new resource centre of the National Chemical Laboratory, located in Pune city, to champion the cause of technology innovations within the organization.

BLS Acceleration Program

BLS Accelerator, which started in 2018, allows enthusiastic entrepreneurs to develop their start-ups into solid, scalable and successful businesses. The accelerator does not mentor start-ups but also assist them with the business strategy, product design, marketing strategy, global market access, and financing through its accelerator and market access services designed for both local and international start-ups.

India Accelerator's S2019

The program is conducted around four months where, along with intensive mentoring, 5-10 targeted start-ups will be provided with technology professional services and facilities for incubation. The initiative is not only about mentoring, but start-ups are also earning INR 15 Lakhs to INR 25 Lakhs in benefits and services, with the opportunity to score after the demo day on follow-up funding. Additionally, from 200 + GAN affiliates, incubated start-ups receive large quantities of external incentives.

Source: Company websites

Ingredients & Materials – Ecosystem Overview



Main startups' hubs (based on the location of startups, applied research institutes, large corporations (that invest in startups), VCs:

1. Bengaluru (Biocompounds, Nanomaterials, agri-genomics)
2. Hyderabad (Agrochemicals and Biotech developers)
3. Mumbai (Plant Biotechnology, Active Pharmaceutical Ingredients and Finished Dosage Forms)

Potential Evolution For Ingredients & Materials in the next 5 years



- Several Indian seed companies and public sector research institutions are developing genetically engineered (GE) crops (approximately 85 plant species), primarily for pest resistance, herbicide tolerance, abiotic stress tolerance (e.g. drought, salinity and depletion of soil nutrients), nutritional enhancement, and nutritional, medicinal or metabolic phenotypes. Developers of GE products produced in India are pursuing distribution in other countries because they can't get it through India's regulatory system.
- In India, genetically modified crops are grown on more than 11.5 million hectares of land, most of which is Bt cotton. India has the potential to become a major transgenic rice producer and a number of GM or engineered vegetables.
- Work on biomaterials is currently growing in India, with several laboratories working on drug delivery systems and tissue regeneration technologies. Biomaterials work is increasing in India, developing innovations that could be potential platforms for new applications such as developing new materials for orthopaedics, develop vegetable oil-based polymers develop micro-environments for drug testing. In the future, patient-specific disease model systems by 3D bioprinting can be developed.
- The growth of the Indian pharmaceutical industry was based on its unique capabilities in key areas of the value chain, such as production, product development and process innovation. Promoting government-sponsored health-care initiatives and focusing on chronic medical care can allow widespread access to drugs. Pursuing developments in new classes of products such as biosimilars, gene therapy and specialty medicines.
- India's stem cell research has made considerable progress and is well positioned to leverage growing capacity in this area. Global pharmaceutical players can use a variety of options to maximize their investment in India. As many pharmaceutical companies turn to more collaborative business models, Indian businesses are likely to play a partnering role that is increasingly important.

India region – Analysis on Low-cost diagnostics & Sensors (in IoT and other applications)



In India, low-cost sensors and medical diagnostics are set to witness a boom as a wide range of user-friendly and cost effective devices are ready for roll-out.

1. The Indian Medical Research Council (ICMR) has developed TrueNat, an indigenous device capable of detecting TB and MDR-TB, cost-effective and sensitive.
2. A startup led by IIT-Delhi associate professor Ravikrishnan Elangovan, Valetude Primus Healthcare is developing two low-cost and low-maintenance diagnostic tools namely SeeTB that minimize by one-tenth the specimen processing time and iMC2, or immune-Magnetic cell Capture blood culture testing for typhoid in 6 hours.
3. Module Innovations, a startup based in Pune, has created U-Sense, a small, credit card-sized tool that can result in 30 minutes of urine testing.
4. Septiflo has been developed by NanoDx, which determines whether a blood sample is bacteria-infected by a color change in 10 minutes.
5. OmiX Labs and SpotSense from Bengaluru have developed a device for diagnosing neonatal sepsis, assessing its severity and guiding antimicrobial treatment.
6. For rural doctors, Biosense developed low-cost medical diagnostic devices. The company targets physicians in Tier-2 and Tier-3 cities and has a spectrum of nine products that test blood, urine and other test results rapidly.
7. EzeRx, a medtech company based in Kolkata, is developing affordable, non-invasive solutions for early chronic disease diagnosis. The first product of the startup, AJO, which stands for anaemia, jaundice, and oxygen saturation, is a non-invasive, IoT-enabled device that monitors for anaemia, liver, and lung-related medical issues without blood tests for less than Re 1.
8. Researchers at IIT Kharagpur have developed low-cost blood testing instruments that can conduct pathological testing.
9. Ambee, a company based in Bengaluru and Oizom based in Ahmedabad, are in the race to build low-cost sensors across towns to solve the problem of air quality monitoring in India.

Top Applications

ASEAN: Singapore, Indonesia, Thailand, Malaysia and Vietnam



Top 3 applications selected for Singapore

01



Artificial Intelligence

- Smart city applications (not vehicles)
- Potential emergence of AI startups focusing on areas related to skin care, cosmetics, and beauty

02



Med Tech (Health & Wellness)

- Sensors: Wearable medical devices that tracks heartbeats, breath rate, and body temperature.
- Remote diagnostics is to enable patients monitoring outside of conventional clinical settings .
- Remote evaluation allows healthcare providers to track healthcare data for a patient outside the care facilities For example telehealth and remote patient monitoring (RPM), and mobile health (mhealth).

03



Biotech

- Extraction of Raw Materials (from plants)
- Nanoencapsulation is the technology of packaging nanoparticles of solid, liquid, or gas, nanocapsules.
- Synthetic biology is the design of new biological parts, devices and systems or re-design of existing natural biological systems.

To additionally look into trends and rising players in applied institutes and centers as well.

Overview



- AI SG is a national programme initiated by Singapore government to leverage the nation's AI capabilities. Through this program, up to USD150 million, will be invested over five years, by the National Research Foundation (NRF).
- Most smart nation AI related startups in Singapore are focusing on safety and security, transport and logistics, smart cities and estates, healthcare, and education.
- Smart Nation Singapore, a government led initiative introduces telehealth for enhancing the healthcare system in Singapore. Through telehealth, rehabilitation and monitoring of patients by therapist are expected to be easily achieved. Patients can conveniently book the rehabilitation centers remotely through online platform. Moreover, therapist also can monitor the well-being of their patients through sensor in the wearable devices.
- As Singapore's population ages, the government's annual healthcare spending has doubled over the last five years, with enhanced subsidies and expanded services bringing the total to S\$10 billion last year.
- Healthcare expenditure is projected to rise by S\$900 million, up 9.6% mainly to cater for higher patient subsidies as capacity, patient numbers and services expand. EDBI, the government's dedicated investment arm, has a strong portfolio of health tech firms.
- Synthetic biology program is launched by the government, through National Research Foundation. Around USD 19 million is allocated for 5 years for synthetic biology related research and development program. In addition, grants and investment are also provided to qualifying researchers who collaborate with Chinese peers.
- The national synthetic-biology strategy prioritizes three areas: developing synthetic cannabinoids, producing rare fatty acids and developing new strains of microorganisms that can be used to create products.

Artificial Intelligence – the most relevant ecosystems



Major Relevant startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Funding Stream (Investors)
Visenze	Ayer Rajah Crescent	<ul style="list-style-type: none"> • Artificial intelligence based visual search • Image recognition solutions 	<ul style="list-style-type: none"> • Founded: 2012 • Founders: Roger Yuan, Oliver Tan. • Over 1 billion users worldwide 	<ul style="list-style-type: none"> • Gobi Partners • Sonae IM • 31VENTURES
Near	3 Temasek Avenue	<ul style="list-style-type: none"> • Near Platform has the world's largest data set of people's behavior in the real-world, and uses powerful artificial intelligence and machine learning models in a privacy-led environment to power self-serve SaaS products. 	<ul style="list-style-type: none"> • Founded: 2013 • Founders: Shobhit Shukla. • 1.6 billion user worldwide and used in 44 countries. 	<ul style="list-style-type: none"> • One undisclosed investors.
SoundEye	Heng Mui Keng Terrace	<ul style="list-style-type: none"> • Developed sensor for detecting abnormal sound recognition for emergency such as to detect gun shoot and explosion sound. 	<ul style="list-style-type: none"> • Founded date : 2017 • Founders: Ashish, Sam. • Has expanded to Japan, Thailand, Malaysia, and other Asia countries. 	<ul style="list-style-type: none"> • NUS enterprise • ASTART CENTRAL • raiSE Singapore

Artificial Intelligence – the most relevant ecosystems



Major Relevant startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Funding Stream (Investors)
Vi Dimensions	Ayer Rajah Crescent	<ul style="list-style-type: none"> Vi Dimensions is a smart surveillance system powered by machine learning and big data analysis to protect cities and enterprises. Goals: It developed ARVA technology for a better way to mine thousands of surveillance cameras for information autonomously in real-time. 	<ul style="list-style-type: none"> Founded date: 2015 Founders: Raymond Looi Total funding: USD1 million. Partnered with Nvidia to improve the abnormality detection in major areas in Singapore. 	<ul style="list-style-type: none"> DeCloud Ventures Tembusu ICT Fund
Seventh Sense AI	Ayer Rajah Crescent	<ul style="list-style-type: none"> Developed power efficient and low cost computer vision systems by optimizing compute-constrained embedded or edge silicon for real-time computer vision tasks. 	<ul style="list-style-type: none"> Founded date : 2017 Founders: Ashish, Sam. 7th Sense has filed patents related to proprietary architecture, video analytics, and inference search optimization. 	<ul style="list-style-type: none"> 500 startups Block 71 incubator program by NUS Enterprise

Artificial Intelligence – the most relevant ecosystems



Applied Research Institute (including Large Corporations that invest in Startups/spin-offs)	Facts and figures	Key interests	Partners
A*Star, Singapore	<ul style="list-style-type: none">Human-Centric AI: seamless, intuitive human-robot, human-machine interactions in homes and at workplaces.Next Generation Deep: Learning development of algorithms which will make technological leaps towards learning with fewer labelled samples, compression of neural networks, incorporating knowledge graphs, and white-box deep learning such as real-time video, audio and image processing.	<ul style="list-style-type: none">IIoTArtificial Intelligence (AI)CybersecurityData, Image & Video AnalyticsInternet-of-Things (IoT)Modelling & Simulation, andNatural Language Processing (NLP)	<ul style="list-style-type: none">NUSNTUIBM
Singtel-NTU AI Lab	<ul style="list-style-type: none">Singtel has partnered with NTU and the National Research Foundation (NRF) to establish the Singtel Cognitive and Artificial Intelligence Lab for Enterprises (SCALE@NTU) to develop applications for use in the areas of public safety, smart urban infrastructure, transportation, healthcare and manufacturing.	<ul style="list-style-type: none">AISecurity and surveillancevision and speech intelligenceHealthcare technology	<ul style="list-style-type: none">A*StarRolls Royce

Artificial Intelligence – the most relevant ecosystems



Applied Research Institute (including Large Corporations that invest in Startups/spin-offs)	Facts and figures	Key interests	Partners
EY Foundry Program	Invested in four AI-based startups in Singapore : 1. Narus Knowledge, 2. Notarum, 3. Regit, and 4. Staple AI	<ul style="list-style-type: none">• AI based fund management• Technology• Interesting applications	n/a
Tencent	<ul style="list-style-type: none">• Partnering with NUS in the development of cloud based solutions• NUS's startups can access to Tencent's artificial intelligence (AI) lab, which is dedicated AI services, and other means to create apps and features.• They will also get other ecosystem support from the Chinese firm, along with opportunities to obtain investments, and receive leads and build connections with global ecosystem partners.	<ul style="list-style-type: none">• AI• Cloud services• Video games• E-commerce	<ul style="list-style-type: none">• NUS

Artificial Intelligence – Incubators, Accelerators



Incubator/Accelerators	Location	Fact & Figures	Key Technologies/Key Interest
SGInnovate	Carpenter Street	<ul style="list-style-type: none">Supporting deep tech	<ul style="list-style-type: none">AI, health and biomed sciences, urban solutions and sustainability.
Enterprise Singapore	Bugis Junction	<ul style="list-style-type: none">Supporting deep start ups at the initial stage.	<ul style="list-style-type: none">Artificial intelligenceAIE-commerceBiotech
Zeroth.AI	Central Region	<ul style="list-style-type: none">Supports the development of early stage AI based startups in Hong Kong, India, and Singapore	<ul style="list-style-type: none">AIMachine learning
NUS Grip	Lower Kent Ridge Road	<ul style="list-style-type: none">Organizes investment pitch dayProvides incubation support.	<ul style="list-style-type: none">Various technologies including AI, Biotech, blockchain



Artificial Intelligence – funding sources

Funding source name / can be VC, public program	Description	Key Innovation Topics	Latest Funding
NUS Enterprise	<ul style="list-style-type: none">Funds startups by organising many funding programs such as Startup SG Founder Grant, Innovation and Entrepreneurship Practicum, and Lotus-NUS Fund.	<ul style="list-style-type: none">HealthcareAI in healthcareFintechAI in language learning	<ul style="list-style-type: none">SoundEyeSeventh Sense Ai
Infocomm and Media Development Authority	<ul style="list-style-type: none">Offered grants and sponsorships for AI based startups.Sponsors university graduate apprentices in deployment of the nation's AI based infrastructure.	<ul style="list-style-type: none">Human assisted AIIndustrial AISafety and security AI	n/a
Red Dot Ventures	<ul style="list-style-type: none">Supports seed stage deep technology startups and pre-seed stage technology startups.Made over 30 investments with total investment value of USD450 million.Supported over 500 startups.	ICT, IoT, artificial intelligence, medical technology & advanced healthcare solutions, financial technology, education technology, advanced industrial materials & manufacturing.	MedSafe

Artificial Intelligence – funding sources



Funding source name / can be VC, public program	Description	Key Innovation Topics	Latest Funding
Soft Bank Ventures	<ul style="list-style-type: none">Softbank has opened a new office in Singapore with the aim in investing in AI related startups in Singapore.	<ul style="list-style-type: none">AI related technologies such as image recognition	Klook
AI Singapore	<ul style="list-style-type: none">A national AI programme launched by the National Research Foundation (NRF) to anchor deep national capabilities in Artificial Intelligence (AI) for creating social and economic impacts, grow the local talent, build an AI ecosystem in this region.Focuses on two key topics: AI for Industry and AI for Individual.Launched 100 experiments (100) programs to supports companies in deploying AI in a co-investment model by providing them with access to talent from AISG's AI Apprenticeship Programme. AISG has undertaken more than 38 AI projects with company partners, of which 10 have had AI deployed into production.	<ul style="list-style-type: none">HealthcareData ScienceData VisualisationSafety and SecurityLanguage	A*Star

Artificial Intelligence:

Typical way that start-ups engage with VCs, incubator, and angel investor



- 100 Experimentation program is conducted by AI Singapore to fund and incubate AI technology in companies. Through this, AI Singapore will provide 1:1 funding of up to SGD\$250,000 per 100E project for the Principal Investigators (PI) from Singapore's autonomous universities and A*STAR research institutes to work on the organisations.
- SGInnovate and Microsoft together organizes accelerator programs for startups to scale-up their businesses.
- Some organizations conduct programs for startups to pitch their business proposals for receiving funding opportunities from investors.
- Most of the accelerators focus on the AI based deep technology (for smart city applications) and show interest in early stage deep tech startups.
- The AI ecosystem is largely driven by government agencies and VCs. SG Innovate and NUS Enterprise has invested in many AI-based startups such as Taiger and Seventh Sense Ai.
- Startups can apply funding assistance and other types of support from VCs by applying directly on the VCs websites. The VCs generally have online forms for startups to explain about their businesses. If the startups get selected, they will be called for an interview to present their business proposal.
- Government agencies in Singapore organize many private networking events for startups to network with potential investors which consist from leading companies and research institutes' foundations.

Potential Evolution of Artificial Intelligence in the next 5 years: 2020 to 2025 view



- Smart city nation initiatives by Singapore government will lead to technology enhancement in safety and security based AI technologies. New innovation related to security systems will proliferate in this region. For example facial recognition, other biometric recognition, and the sensors for homeland security improvements.
- As the smart nation initiatives is also focuses on the initiatives on the application of AI technology among its residents such as in education and at enterprises. AI will be used in scheduling meetings and in offices and automated marking systems and personalised learning systems in schools.
- AI driven technologies in skin care and cosmetics will be driven by large multinational cosmetic corporations such as P & G and Unilever in Singapore. Skin care tools more on skin analysis for choosing the right products to the consumers without of the assistance of beauty experts.
- AI based skin analysis will evolve with more sophisticated features such as providing personalized insights to the consumer. The innovation in this application scope is expected to lead by large cosmetics corporations.

Med Tech (H&W) – the most relevant ecosystems



Major Relevant startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Funding Stream (Investors)
uHoo	Anson Rd, Singapore	uHoo is a smart indoor air quality sensor, that detects allergens and toxins in the to help prevent asthma, rhinitis and allergies through practical and personalized alerts, insights and recommendations delivered on your smartphone.	<ul style="list-style-type: none"> Founded year: 2014 Won IBM Global Entrepreneur award in 2016 Some of the clients are Ricola, Government of Netherlands, and The Linde Group. Most customers are based in US and Canada. Raised total 7 figures of funding as in September 2018. 	<ul style="list-style-type: none"> Wavemaker Partners East Ventures AIA Konita Minolta Digital Accelerators
MyDoc	Market St, Singapore	Nanyang Technological University spinout, operates a digital platform that integrates healthcare players and gives users access to healthcare services, including doctor consultations, online prescriptions and long-term disease management programs.	<ul style="list-style-type: none"> Founded year: 2014 advanced data analytics, corporate digital health services, health insurtech, and access to network of health professionals in Asia. Total Funding: USD6.8 million 	<ul style="list-style-type: none"> Series A funding led by UST Global fund and past investors such as spring Seeds. Wavemaker Partner



Med Tech (H&W) – the most relevant ecosystems

Major Relevant startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Funding Stream (Investors)
Attune Technologies	International Business Park Rd	Attune is a cloud based software provider for healthcare delivery organizations.	<ul style="list-style-type: none"> • Founded year: 2008 • Founders: Anand Gnanaraj, Arvind Kumar • Total Funding: USD17 million. 	<ul style="list-style-type: none"> • Norwest Venture Partners • Qualcomm
Tricog Health	Central Region	<ul style="list-style-type: none"> • Developed cost-effective ECG for disease diagnosis using AI technology. 	<ul style="list-style-type: none"> • Founded year: 2014 • Founders: Dr. Charit Bhograj, Udayan Dasgupta. • Total Funding: USD4.5 million 	<ul style="list-style-type: none"> • University of Tokyo Edge Capital. • Microsoft Accelerator, Bangalore. • Blume Ventures • Inventus India
Healint	Pasir Panjang Rd	Developed a migraine tracking app on Google Play. Migraine Buddy has access to huge data-sets that enable patients, doctors and researchers to diagnose the real-world causes and effects of neurological disorders.	<ul style="list-style-type: none"> • Founded year: 2013 • Founders: Ali Elgamal Francois Cadiou • Total Funding: USD1.4 million • Has over 10 million patients registry. 	<ul style="list-style-type: none"> • National Research Foundation • Strive • Wavemaker Partners • JFDI.Asia

Med Tech (H&W) – the most relevant ecosystems



Major Relevant startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Funding Stream (Investors)
Biofourmis	Regus-Singapore, Vision Exchange	<ul style="list-style-type: none"> Developed Biovitals™ Analytics Engine for remote patient monitoring by detecting personalized patterns predictive of patient's health deterioration 	<ul style="list-style-type: none"> Founded date : 2015 Founders: Kuldeep Singh Rajput, Wendou Niu, PhD Total funding: USD41.6 million Biofourmis' Biovitals™ Analytics Engine Receives FDA Clearance for Ambulatory Physiologic Monitoring 	<ul style="list-style-type: none"> SingHealth SGInnovate Sequoia Capital



Med Tech (H&W) – the most relevant ecosystems

Applied Research Institute (including Large Corporations that invest in Startups/spin-offs)	Facts and figures	Key interests	Partners
Fitbit	<ul style="list-style-type: none">A US based healthcare company that partners with Health Promotion Board (HPB), Singapore to support mhealth in Singapore.	<ul style="list-style-type: none">Telehealth, platform designed to offer coaching and support for healthcare providers, employers and others using mHealth devices in connected health programs.	<ul style="list-style-type: none">Health Promotion Board (HPB) Singapore
Siemens Healthineers	<ul style="list-style-type: none">Leading medical technology company with over 120 years of experience and 18,500 patents globally, over 70 countries	<ul style="list-style-type: none">Focuses in digital health such as diagnostics IT, AI, and e-health solutions.	<ul style="list-style-type: none">A*StarNUS
National University of Singapore	<ul style="list-style-type: none">Developed microfiber sensors for monitoring heart rate, blood pressure and stiffness in blood vessels.	<ul style="list-style-type: none">Sensors for wearable devices.	Had partnered with Fujitsu Asia Pte Ltd and Fujitsu Laboratories of Europe Ltd in 2012

Med Tech (H&W) – Incubators, Accelerators



Incubator/Cluster / University	Location	Fact & Figures	Key Technologies/Key interests
The Digital Health Accelerator by AIA and Konica Minolta	1 Robinson Rd, AIA Tower	<ul style="list-style-type: none"> 12-week program in Singapore to select 8 start-ups. 	<ul style="list-style-type: none"> Digital technologies in diagnostics and treatments using sensors, data and imaging.
Enterprise Singapore	Bugis Junction, Victoria St	<ul style="list-style-type: none"> Partnered with Blue Chili, a Australia based startups to incubate healthcare based startups in Singapore. Developed healthcare startups program to accelerate startups. 	<ul style="list-style-type: none"> Healthcare AI biomedical
GE Accelerator Program	1 Maritime Square	<ul style="list-style-type: none"> Partnered with Startup SG Accelerator. Has organised Pitch-off Challegence program. 	Within the healthcare, the key interests are: Health IT, Health Services, and Medical Technology
Catalyst	110 Robinson Rd	<ul style="list-style-type: none"> Provides workspace for healthcare startups to develop and grow their business, 	<ul style="list-style-type: none"> Healthcare

Med Tech (H&W) – funding sources



Funding source name / can be VC, public program	Description	Key Innovation Topics	Latest Funding
SingHealth	<ul style="list-style-type: none">Actively investing in healthcare based startups and thereLargest healthcare cluster in SingaporeHas partnered with NUS-Duke Medical School	<ul style="list-style-type: none">Infectious diseasesinflammation & immunologyNeurosciencesHealth services research	<ul style="list-style-type: none">Biofourmis
JFDI.Asia	<ul style="list-style-type: none">Organises startups accelerator programs in Singapore.Provides working space for startups in Singapore.	<ul style="list-style-type: none">Supply chain managemententerprise data searchbig data marketplacesmedical analytics.	<ul style="list-style-type: none">Healint
Wavemaker Partners	<ul style="list-style-type: none">Has invested in over 300 portfolio companiesHeadquartered in both US and Singapore	<ul style="list-style-type: none">Healthcare technologiesRemote tracking applications	<ul style="list-style-type: none">HealintuHoo



- Singapore has become a center for incubators and accelerators to invest in healthcare technologies. The country is now moving towards a new digital healthcare model by moving healthcare information to the cloud. A cloud based project named hCloud, will cost \$37 million in the first 10 years of operations. Moreover, data and analytics will be also made available to assist in decision for strategic national planning.
- Government agencies such as Enterprise Singapore have started a healthcare programs to foster startups in healthcare technologies focusing on the remote record tracking and online based patients' health record monitoring.
- Leading companies from various industries such professional services and major MNCs are also actively accelerating and incubation in healthcare technology based startups such as providing workspace and various mentorships and investment pitching programs.
- Multinational companies are leading the innovation in medical technology. These companies are partnered with government based research institutes to explore new innovation such as sensors and healthcare application platforms.
- Singapore's government unveiled a \$13 billion USD five year R&D plan in 2016 with a major emphasis on innovation in health and biomedical sciences. Health tech innovation is promoted strongly by government agencies by having close partnerships with private sector organizations.
- The strategic partnerships between healthcare MNCs and government agencies such as A*Star enable startups in Singapore to access to the MNC's laboratories conveniently. This initiative has further accelerates the growth of healthcare technology of startups.



- Startups typically engage with VCs through online applications. The startups even can submit any relevant inquiry through via email available on the VCs' webpage.
- In Singapore, large foreign corporations organize programs to accelerate startups focusing in healthcare technologies. Startups can participate in the programs by contacting via email which is directly available on the companies' website.
- Government organizations which usually accelerate and incubate startups often partner with large healthcare companies to increase the interaction of the startups with companies to increase the probability for the startups to get funding.

Potential Evolution For Med Tech (H&W) in the next 5 years

2020 to 2025 view



- Healthcare ecosystem will evolve to more remote based systems such as remote patient tracking and remote diagnostics of patients.
- Medical records will be stored virtually for sharing the patients' health records to health institutions across Singapore to leverage healthcare solutions for residents in Singapore.
- The healthcare technology ecosystem is moving towards personalised health care solutions. This is achieved through wearable sensors and online platforms. Sensors are developed to be implemented in the wearable devices for monitoring heartbeat rate, breathing rate, and body temperature. In addition, sensors will be innovated into micro sized sensors that can be embedded into human body to track essential parameters.
- Remote patient monitoring and diagnostics enables the patients to connect with their therapists and doctors more conveniently at any part of the nation and is expected to improve productivity of the operations of healthcare institutions.
- Large companies and government agencies are expected to spearhead the evolution of these applications. This partnership is expected to accelerate the local healthcare service providers by allowing them to access to the laboratory of the large companies for testing and experimentation.

Biotech – the most relevant ecosystems



Major Relevant startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Funding Stream (Investors)
ACM Biolabs	Nanyang Drive, NTU Innovation Centre	<ul style="list-style-type: none"> Spin-off from A*Star. It is a synthetic biology company specializes in providing customized membrane protein products, services and expertise for drug discovery, diagnostics, and biomedical applications. The start-ups is backed up by team of international scientists. 	<ul style="list-style-type: none"> Founded year: 2013 Founders: Dr. Madhavan Nallani, Dr. Peter Moran. 	<ul style="list-style-type: none"> NTUitive Erber Group Nagase
RWDC Industries	Woodlands Industrial Park	<ul style="list-style-type: none"> Developed multiple bio-based polymers and developed Solon, a 100% biodegradable material. 	<ul style="list-style-type: none"> Founded year: 2015 Founders: Roland Wee, Dr. Daniel Carraway. RWDC Ranks 2nd In Singapore Business Review Hottest Startups 2019 	<ul style="list-style-type: none"> WI Harper Group Energy Vickers Ventures
Lion TCR	Ayer Rajah Crescen	<ul style="list-style-type: none"> Developed TCR Cells, a propriety technology to combat chronic HBV infection-related hepatocellular carcinoma. 	<ul style="list-style-type: none"> Founded year: 2015 Founders: Antonio Bertoletti, Lietao Li Total funding amount: USD 20 million 	<ul style="list-style-type: none"> West Lake Venture Partners Yashang Capital

Biotech – the most relevant ecosystems



Applied Research Institute (including Large Corporations that invest in Startups/spin-offs)	Facts and figures	Key interests	Partners
A*Star's Genome institute of Singapore (GIS).	<ul style="list-style-type: none">Researches in the relationship between genetic variation and disease phenotype on a population scale.	<ul style="list-style-type: none">Synthetic biologyRegenerative medicineInfectious diseases	<ul style="list-style-type: none">NovogeneAIT Singapore
NUS Synthetic Biology for Clinical and Technological Innovation (SynCTI)	<ul style="list-style-type: none">Established in Jan 2015 as the focal research program for synthetic biology	Chemical- and cell-based therapeutics development in the treatment of human diseases.	<ul style="list-style-type: none">National Research Foundation (NRF) Singapore
National Research Foundation (NRF) Singapore	<ul style="list-style-type: none">NRF will invest an initial USD25 million over five years into the Synthetic Biology R&D Programme	<ul style="list-style-type: none">Synthetic Cannabinoid Biologythe production of rare fatty acids, which have important applications in the pharmaceutical industry.	<ul style="list-style-type: none">MITUniversity of Stanford

Biotech – Incubators, Accelerators



Incubator/Cluster / University	Location	Fact & Figures	Key Technologies/Key interests
Temasek Life Sciences Accelerator	1 Research Link, National University of Singapore	<ul style="list-style-type: none"> a joint venture between Temasek Life Sciences Laboratory and Vertex Venture Holdings, is a company that incubates, nurtures and grows life sciences innovations into early stage companies . 	<ul style="list-style-type: none"> Industrial & Synthetic Biology Human & Veterinary Sciences Agri-Food Technology
NSG BioLabs	Biopolis Rd	<ul style="list-style-type: none"> Support growing life sciences companies by providing a conducive R&D environment with scalable laboratory and office infrastructure. Strategically partnered with Nest.Bio Ventures, US 	<ul style="list-style-type: none"> Synthetic Biotechnology Nanotechnology
A*Star	1 Fusionopolis Way	<ul style="list-style-type: none"> Provides working space for startups in Singapore. 	<ul style="list-style-type: none"> Molecular biology Synthetic biology

Biotech – funding sources



Funding source name / can be VC, public program	Description	Key Innovation Topics	Latest Funding
NTUitive	<ul style="list-style-type: none">Incubates and funds technology based startups in Singapore.Supports the startups in terms of costs of R&D developments and expansion into international markets.	<ul style="list-style-type: none">BiotechnologyBiomedical	ACM Biolabs
Vickers Ventures	<ul style="list-style-type: none">Founded in 2005 and has planned to invest USD500 million in technology startups particularly in Asia.	<ul style="list-style-type: none">BiotechnologyNanotechnologyArtificial Intelligence	RWDC Industries
Enterprise Singapore's SEEDS Capital	<ul style="list-style-type: none">Established Startup SG Founder and Startup SG Tech, programs for funding, mentorships, leveraging business networks for startups.	<ul style="list-style-type: none">Health & Biomedical Sciences	n/a



- A*Star through Biopolis research institute houses many biotech startups. In order to secure a working space at A*Star research institutes, startups can apply via application forms online on A*Star's websites.
- Most of the startups in the application scope approach VCs through online applications forms and through networking events organized by government agencies and universities' organizations.
- Some of the VCs are based in countries other than Singapore. These VCs are approached by the startups through email with business plan on market opportunity, marketing, distribution, and revenue plans. If the proposal is appealing to the VC, further interview will be conducted before finalizing the investment decision in the startup.
- The angel investors who are high net worth individuals in Singapore usually invests directly into the company and also in VCs which in turn invest in startups. Singapore Angel Investor Network, an organization that connects angel investors to startups by submitting online application.
- Incubators in Singapore typically engage startups through online applications and by organizing networking events with investors and industry leaders.

Potential Evolution For Biotech in the next 5 years

2020 to 2025 view



- The startups in Singapore are generally focusing on the synthetic biology than other application areas. Synthetic biology is expected to grow rapidly in Singapore. Synthetic biology has been being used to modify molecules to enhance the natural biology molecule functions.
- Key focus areas of synthetic biology ecosystem will be enhanced biological molecules and the creation of synthetic biology based materials to treat diseases and to combat viruses, more effective than traditional treatments.
- Nanobiotechnology and nanoencapsulation is still at nascent stage in Singapore with only publications of researches that are led by universities.
- More research will be conducted on nanoencapsulation technologies by universities and research institutes. It is expected that there will be slow penetration by startups in this application area.
- With the support from venture capitalists, incubator, and accelerators, startups can easily access to funding programs, working facilities, and industry networking more conveniently in Singapore. This accelerates the growth of startups for the next 5 five years.

Top 3 applications selected for Indonesia

These are based on Frost & Sullivan research findings and discussions with L'Oreal team

01



Biotech/Agriculture

This application covers the following:

- Raw materials/Ingredients for Cosmetics; Processing;
- Price differentiating points of these startups; how they process their material

02



Environment/ Sustainability/ packaging

This application covers the following:

- Biodiversity Materials
- Bio materials that can be processed
- Rice husk; Bagasse, Sugar cane, Algae, Other materials

03



Traditional medicinal plants for cosmetics

This application area covers the following:

- Where the ecosystem is moving?

To additionally look into trends and rising players in applied institutes and centers

Biotechnology/Agriculture: Overview

- The Government of Indonesia (GOI) has made clear its intentions to develop biotechnology. However, as of date, apart from the large corporations and some research institutions, there are very few startups in the country in the Biotech space.
- Indonesia mostly uses plant products as ingredients for its cosmetic industry. The extraction of raw materials from plants is mainly carried out by the large corporations. A large portion of the ingredients are also imported.
- The country produces plants for perfumery, medicaments or insecticidal purposes. A small portion of this is exported. The country also produces vegetable saps and extracts. Again a small portion is exported to other countries.
- Most of the initiatives in agriculture is for food production. Start-ups are geared towards food or food supply services.
- Since Indonesia has a huge demand for cosmetics, global cosmetic firms are expanding their presence in Indonesia. Unilever Indonesia, one of the oldest establishments in the country has a very popular local brand. L'Oréal has established its largest factory in West Java. However, local companies such as PT Mandom Indonesia Tbk, PT Mustika Ratu and PT Martine Berto are also very successful in the market.
- Most of these local companies are family-run businesses. Surveys indicate that Indonesians seem to prefer local brands over foreign brands for cosmetics. Another survey indicated that 58% of Indonesian women would prefer to use halal cosmetics. With the rise of halal cosmetics, local companies may have an edge over foreign companies.
- Herbal cosmetic is growing rapidly as most women prefer natural products rather than chemicals products for their personal care. Herbal cosmetic contains natural nutrients to improve and provide consumers satisfaction due to relatively fewer side effects compared to synthetic cosmetics. Indonesia is one of the biggest supplier's countries for herbal raw materials in cosmetic products.
- The Research Center for Biotechnology (LIPI) collaborated with Shiseido to conduct research on around 200 plant species native to Indonesia. The research identified that some plant extract possess unique biological active compound which is suitable for cosmetic industry.

Raw materials/ingredients for cosmetics

- Many plants can be made as basic ingredients for cosmetic preparations, such as onion dayak bulb, kemuning leaf, pegagan, kecombrang, red betel, pecan, and sweet root. Many plants in Indonesia based on the phytochemicals contents can be formulated into various categories of cosmetic preparations, such as skin care, hair care, anti-aging, skin whitening, and antioxidant.
- Indonesia's Halal Law requires many products and services related to consumer to be Halal-certified beginning from October 2019. This means for any products that enter Indonesia and subsequently distributed and traded, the products require halal certification. As a result, companies have to perform laboratory tests on all raw materials that are used to make the products. This regulation creates opportunity for local players in Indonesia since big players might not be familiar in this niche market.
- Indonesia has established a reputation globally as a manufacturer of quality cosmetic products. As a result, the export value of Indonesian cosmetic products reached USD 818 million in 2015. On the other hand, its import value of cosmetic products in 2015 stood at USD 441 million.
- In terms of growth, the cosmetic industry is among the fastest growing sectors in Indonesia, recording a double-digit growth in recent years. The government has selected cosmetic industry as a priority since it employs more than 75 000 direct labors and 600 000 indirect labors. About 60% of cosmetic products sales in Indonesia are from imported goods, where products imported from ASEAN countries account for around 5%. Europe, China, USA and others own around 55% of sales.
- One of the challenges faced by the industry is the country imports more than 90% of its non-herbal raw materials. The Ministry of Industry is looking into integrating the upstream and downstream sectors of Indonesian cosmetic industry and increasing raw material production in order to reduce imports.
- The start-ups in the cosmetic industry are geared towards e-commerce rather than developing breakthrough technology. Given the enormous potential for halal and herbal cosmetics, Frost & Sullivan anticipates future startups to be in this area.

Biotech/Agriculture – Major companies in Biotech and Cosmetics

Major Companies	Location	Description - Key products/services	Year Established
Evergen Resources	Central Java	Cultivates freshwater microalgae that can generate natural astaxanthin.	2019
PT Unilever Indonesia Tbk (UNVR)	Surabaya	The company is engaged in the manufacturing of soaps, detergents, dairy based foods, ice cream, and tea based beverages and cosmetic products.	1933
PT Mandom Indonesia Tbk (TCID)	Bekasi	Joint venture between Mandom Corporation, Japan and PT The City Factory. It owns several brands such as PIXY and Bifesta.	2001
PT Mustika Ratu Tbk (MRAT)	Jakarta	Uses traditional herbal ingredients for its cosmetics products	1975
PT Martina Berto Tbk (MBTO)	Jakarta	Manufacturer of cosmetic products and herbal medicine. Recently reached an agreement to assist Clariant in biodiversity ingredients for personal care portfolio.	1977
L'Oreal	Central Java	Cosmetics; opened manufacturing facility in 2013	1979

Biotech/Agriculture – the most relevant ecosystems



Applied Research Institute (including Large Corporations that invest in Startups/spin-offs)	Description
SMART Biotechnology Center	An innovation hub focuses on improving tissue culture in order to have better seed stock quality. This will lead to higher productivity per hectare.
Research Center for Biotechnology LIPI	Involve in preparation of plans, programs and implementation of research in the fields of microbiology and others.
Daewoong Pharmaceutical Biotech Research Center	Conduct study on biopharmaceutical products namely epidermal growth factor, Caretropin and Novosis. Collaborates with Universitas Indonesia (UI) located in Depok, Indonesia

Biotech/Agriculture – Incubators, Accelerators

Incubator/Accelerator	Location	Description
Bionest	Jakarta	BioNest goal is to develop an ecosystem that can support the development of biotech startups in Indonesia.
GK-Plug and Play	Jakarta	The accelerator is active globally. It has offices in the US, China, Indonesia, Germany and many others.
Jakarta Founder Institute	Jakarta	Provides training program for a duration of four months per batch.

Biotech/Agriculture – funding sources



Funding source name / can be VC, public program	Description
Sovereign's Capital	Focuses on early and growth-stage startups. The firm allocates between \$250,000 to \$2M per company.
East Ventures	The VC is based in Indonesia and focuses primarily on early stage startups.
Skystar Capital	The VC is backed by leading corporate groups. It provides funding, consultation and assistance to help startups scale the businesses.

Typical way Startups Interact with VCs and Incubators



Skystar Capital

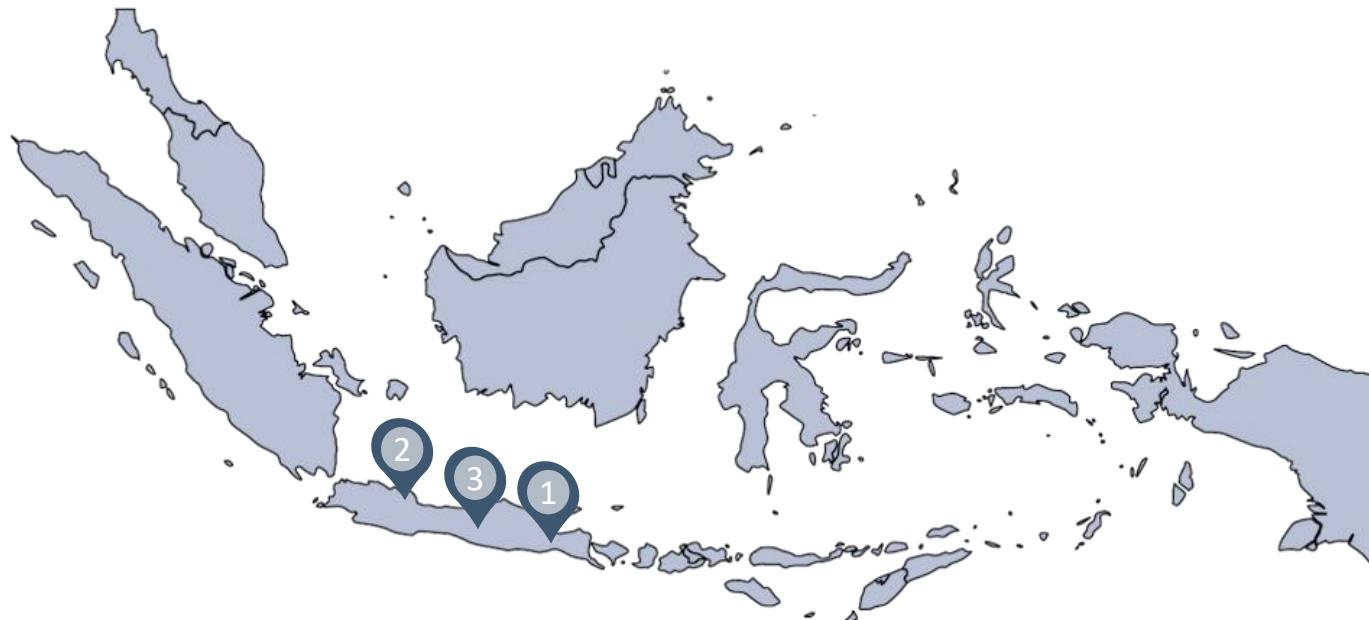
1. Skystar Capital invests in startups in the Asia Pacific countries, particularly in Indonesia. The startups are eligible to apply for fund if they are in their early growth phase.
2. Skystar Capital assists founders by handing out capital assistance. Additionally, they also offer business advices that are customized according to current startups situation.
3. Founders are also eligible to have access to Skystar Ventures which is the largest state of the art incubator as well as co-working space located in Indonesia.

Biotech/Agriculture – the most relevant ecosystems



Locations of Biotech Companies and cosmetics manufacturers;

1. Surabaya {PT Unilever Indonesia Tbk (UNVR)}
2. Jakarta and West Java {PT Mandom Indonesia Tbk (TCID), PT Mustika Ratu Tbk (MRAT), PT Martina Berto Tbk (MBTO), L'Oreal}
3. Yogyakarta and Central Java {PT Evergreen, PT Akasha Wira International Tbk (ADES)}



Potential Evolution For Biotech/Agriculture in the next 5 years

2020 to 2025 view

- The Industry Ministry is eyeing an annual growth rate of nine percent growth for the cosmetics industry.
- Indonesia has a high potential for beauty products that is attractive to foreign companies and domestic companies. Startups are expected to increase in the marketing of the cosmetic products.
- Around 90% of the non-herbal ingredients are imported, putting local companies at a severe disadvantage. Hence, they would prefer to focus on herbal and halal cosmetics.
- Halal regulations have brought about new opportunities for the cosmetics industry in Indonesia. Besides giving local cosmetic manufacturers a competitive edge over global brands in the domestic market, halal-certified local cosmetic companies can also grow their market share in overseas markets.
- Herbal cosmetics are showing a growing trend. Many herbal ingredients are locally produced and hence local cosmetic companies can have a price advantage.
- Frost & Sullivan expects more startups in the next 5 years in the halal cosmetics and herbal cosmetics space.
- The local companies are able to sustain and grow their market share only because of the local preference for Indonesian brands. The local companies also have the advantage of getting halal certification relatively easily.

Environment/Sustainability/Packaging: Overview

- Indonesia is a very biodiverse nation. Environment, sustainability are major areas of concern. Several government policies are in place to drive sustainability and protect the environment. Similar to many other countries, sustainable packaging or eco-friendly packaging is more of the norm in Indonesia. The options are now moving to plant based products instead of plastic.
- Government policies such as the ban on single-use plastic and styrofoam are in place. Indonesia has set an ambitious national plan to reduce marine plastic debris by 70% by 2025.
- Public awareness towards the harmful effect of plastics is increasing in recent years. Opportunities exist for using sustainable packaging for all products including cosmetic packaging. There is a slow but steady growth of interest from startups to develop and market sustainable packaging.
- Startups related to sustainable packaging typically located in Jakarta and Bali. This is due to the fact that Jakarta is the most dense city in Indonesia and the city generates high amount of daily plastic waste.
- On the other hand, Bali is a focal point for expatriates and therefore finding talents to commercialize ideas is relatively easy.

Environment/Sustainability/Packaging – the most relevant ecosystems

Startups Identified by Frost & Sullivan	Location	Description - Key products/services	Year Established
Evoware	Jakarta	Evoware develops cups and containers from farmed seaweed that is chemical-free. This biodegradable materials are an alternative to plastic packaging, thus reducing contamination of the environment.	2016
Avani Eco	Bali	Avani offers wide choices of sustainable packaging and hospitality products that are made from renewable and natural ingredients. Additionally, the ingredients are certified biodegradable and compostable.	2014
Gringgo	Bali	Utilizes artificial intelligent to create a platform that can improve waste management in Indonesia. The targets are to reduce ocean plastic pollution in South East Asia by 25% by 2020 and to increase recycling rates by 50% by 2022.	2014

Environment/Sustainability/Packaging – the most relevant ecosystems

Startups Identified by Frost & Sullivan	Location	Description - Key products/services
Osem	Jakarta	Osem is a sustainable fashion brand which only uses the natural color that is produced from <i>Indigofera Tinctoria</i> plant. The brand's products also use only natural fibers, such as cotton, linen, hemp, etc. As well as designed with the zero-waste or less-waste planning. Osem collaborates with other labels to recycle the fabric waste. In addition to minimize the waste, Osem is not using zippers and buttons made from plastic.
Haku	Jakarta	Shoe brand contributes to the eco-friendly lifestyle by producing vegan shoes. The main concept is basically cruelty-free shoes which made of vegan suede, vegan leather, or other substitute leather.
OWELLNESS	Jakarta	An original Indonesian brand that was created to answer society's needs for health and a healthy lifestyle. All OWELLNESS products are made of natural ingredients, non-synthetic, packed in environmental-friendly packaging with effective household waste management.

Environment/Sustainability/Packaging – the most relevant ecosystems

Applied Research Institute (including Large Corporations that invest in Startups/spin-offs)	Description
Indonesian Agricultural & Environment Research Institute , Pati, Central Java	The objective of Indonesian Agricultural & Environment Research Institute is to assist Indonesian Center for Agricultural Land and Resources Research and Development in its duties, functions and studies.
SMERU Research Institute, Jakarta	SMERU Research Institute is an independent institution that conducts research and public policy studies.
Indonesian Energy and Environmental Institute, Jakarta	Focuses on addressing concerns related to global warming. To date, a number of activities have been carried out. One of the examples is beach clean-ups across the country that involved students. Furthermore, the institute is also working with Indonesian ministry of Environment and Forestry to speed up Social Forestry Program where the goal is to have better land management.

Environment/Sustainability/Packaging – Incubators, Accelerators

Incubator/Accelerator	Location	Description
Batavia	Jakarta	<p>It has been operating since 2011. The incubator targets seed stage start-ups and provide seed funding capital to bridge to series A funding.</p>
Kolaborasi	Bandung, Jakarta	<p>The incubator assists start-up founders in validating products, creating solid team, ensure business model is scalable and finally develop impactful innovation. Additionally, it offers boot camp, workshops, connection and community.</p>
Start Surabaya	Surabaya	<p>Established in 2015, Start Surabaya receives full support from the government of Surabaya. It provides 3-month accelerator program with co-working space and also network of mentors.</p>

Environment/Sustainability/Packaging – funding sources

Funding source name / can be VC, public program	Description
DBS Foundation	DBS Foundation has provided over 100 social enterprises located in Asia in the form of grant funding since 2012.
500 Startups	500 Startups is an accelerator that originated from Silicon Valley. The accelerator targets startups that focus on research, social and mobile platform.
Mountain Kejora Ventures	Formerly known as Mountain SEA Ventures, Mountain Kejora Ventures is an Indonesian affiliate of the Zurich-based Mountain Partners. It has established a well-known accelerator known as Ideabox.

Typical way Startups Interact with VCs and Incubators

ImpactAim Indonesia by 500 Startups and United Nations Development Program

1. The selection process will be conducted nationwide by ImpactAim Indonesia. The target is to recruit from eight to ten startups.
2. Among the criteria to be selected are:
 - The product or service has to solve at least one Sustainable Development Goals
 - Product-market fit and the startup's business model is prepared to scale
 - Core management team is in place
3. The program's duration is 10 weeks. It enables participants to connect to global stakeholders that could potentially enable business growth.

Environment/Sustainability/Packaging – the most relevant ecosystems

Main startups' hubs (based on the location of startups, applied research institutes, large corporations (that invest in startups), VCs:

1. Jakarta(Environment/Sustainability/Packaging)
2. Bali (Environment/Sustainability/Packging)

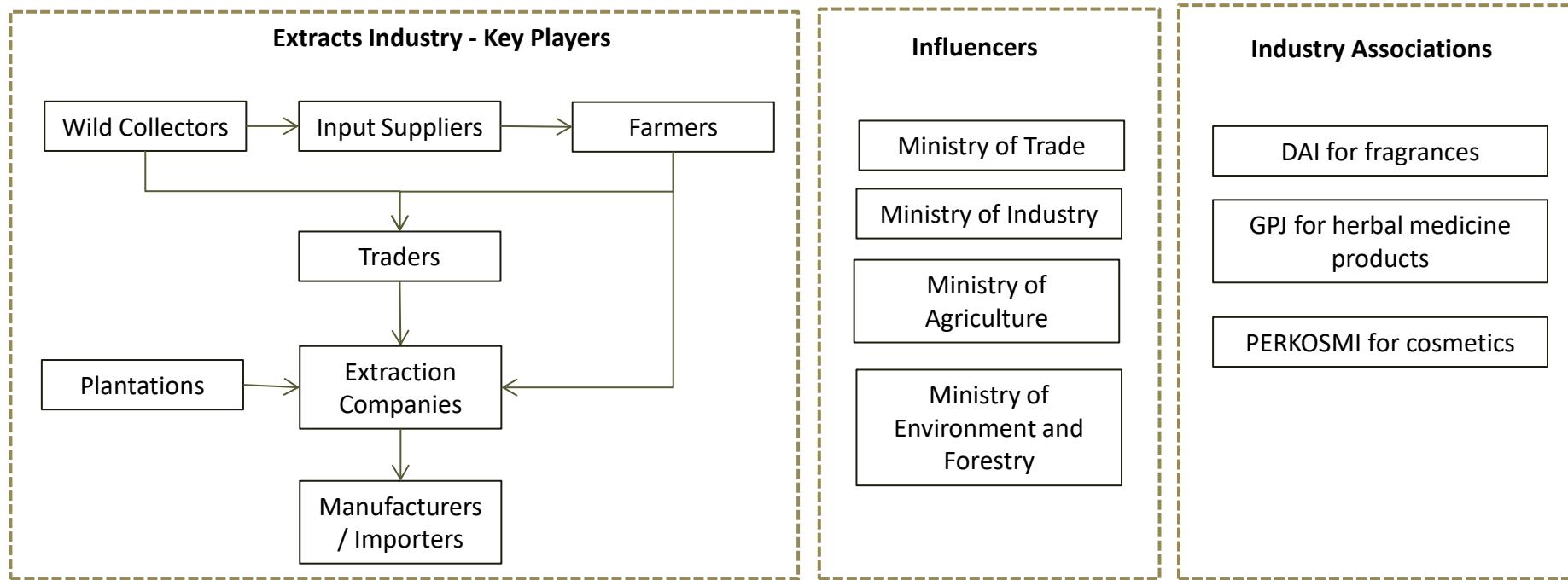


Potential Evolution For Environment/Sustainability/Packaging in the next 5 years

2020 to 2025 view

- Sustainability packaging is an important focus area in Indonesia. The rich biodiversity offers many options for material selection.
- Government policies are in place to drive the adoption of sustainable packaging.
- There are startups that are using natural ingredients that are obtained from the country itself or imported. Most of the ingredients are expected to be from Indonesia itself. As of now, the startups are more focused on better business models or innovative solutions.
- In the next 5 years, the tech and deep tech startups are expected to grow as the ecosystem also develops further.

Traditional Medicinal Plants for Cosmetics - Ecosystem



Input Suppliers: Availability of quality seeds and seedlings differs between different extract crops. There will be more availability of main commodity crops than minor crops used for extracts, which may be an issue for some raw materials used as traditional ingredients. Many however are produced in large scale in Indonesia, including local varieties of ginger and turmeric. Providing superior seeds and seedlings to farmers is a key focus area in the Strategy Sector of the Ministry of Industry.

Agricultural inputs such as fertilisers, pesticides and herbicides are easily available in Indonesia, but knowledge about their application is limited. There is also little knowledge about what pesticides and herbicides are permitted under specific standards and certifications and which ones are acceptable for buyers.

Traditional Medicinal Plants for Cosmetics – Ecosystem

Wild Collectors: Several raw materials for extracts are collected in the wild, for example dragon's blood resin. Collection is done throughout Indonesia wherever relevant species are available. Collectors, who for the most part are women, also live in the poorest communities, having little alternative income.

Training of collectors on sustainable collection practices is very limited in scope in Indonesia, even though it is mandated by Indonesian legislation. How and when collection takes place depends on how collectors are linked to traders and distributors connected to the internal and international markets. For collectors operating in the value chain of herbal medicine and pharmaceutical industries, business relations are usually quite strong and in several cases extraction companies indicated that they trained communities on good collection practices. For collectors without such a connection, the value of plant material is low. Collectors are often involved in initial post-harvesting procedures. Communities sometimes organize storage in local collection centers, while waiting for collectors to pick up the materials.

Farmers: In terms of volume, raw materials for extracts mostly originate from cultivation — in number it is likely that wild resources play a more important role. For several crops, extract production is only one of the uses: ginger and turmeric, for example, are also used as a spice or essential oil. Other products, in contrast, are produced exclusively for the extract industry, such as gotu kola (culinary vegetable and as a medicinal herb).

Some farmers are organized in farmer groups or cooperatives. Farmers usually engage in initial processing, mostly drying, although when required for extraction, some plants are used fresh. The scale of production is generally very low, leading to a strong fragmentation of production and high costs. The application and knowledge of modern agricultural practices for a particular crop is often limited, but higher for spice crops. This is both due to the weak extension services provided by the private sector and government institutions, as well as to the lack of remuneration for quality.

Traders: Traders operate at different levels in the extracts value chain. Local traders collect raw plant materials at farms and collection communities, then pass them on to larger traders. In addition to connecting producers to markets in Java, these larger traders often perform other tasks, such as additional drying, repacking or providing documentation. Dried raw materials then move up to larger wholesalers of medicinal and aromatic plants, which are mostly based in Java and supply processors as well as export markets. The more levels involved, the more traceability is at risk. However, traceability is better assured in the value chains of pharmaceuticals and herbal medicine companies.

Traditional Medicinal Plants for Cosmetics – Ecosystem Extraction Companies

There are around 29 extraction companies in Indonesia.

- Of these 26 are based in Java
 - Eleven are in West Java;
 - Six in East Java;
 - Six in Central Java;
 - Two in Jakarta;
 - One in Banten
- Two companies are located in North Sumatra;
- One company is located in Bali



This sector is not well organized, and spread under three industry associations: DAI for fragrance products, GPJ for herbal medicine products and PERKOSMI for cosmetics.

Some companies also produce essential oils, especially those focusing on commodity products. Some companies are part of pharmaceutical, herbal medicine, supplements or cosmetics companies. The vast majority of the companies in the sector are privately owned, although some of the largest ones are publicly traded, as they are part of larger pharmaceutical conglomerates. All companies are mostly owned by Indonesian interests. In the essential oils industry and the seaweed industry, fewer companies are family businesses.

None of these companies is using 100% of their capacity, some producing well under their production capacity. Most extraction companies depend on suppliers for their raw material needs. Nine companies buy all their ingredients from producers or traders, while four produce part of their raw materials on their own plantations, which are often strategic ingredients with a strong need for control. Those supplying partly into the herbal medicine and the pharmaceutical sector need better control of raw materials, so several companies provide training to farmers and collectors on agricultural and collection practices. Some raw materials are used fresh and are sourced direct from producers in the region.

In contrast to essential oil exporters and seaweed processors, extraction companies buy directly from producers more often. Traders also play an important role. Some of Indonesia's extraction companies actually source all of their extraction needs from traders, but all companies will source at least part of their raw material needs through this channel.

Traditional Medicinal Plants for Cosmetics – Major Companies

Major companies	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)
1. Mustika Ratu	Jakarta	<p>List of brands:</p> <ul style="list-style-type: none"> ▪ Mustika Ratu (cosmetics, jamu, body care, hair care products for woman) ▪ Mustika Puteri (cosmetics, jamu, body care, hair care products for woman and teenagers) ▪ Bask (body care and hair care products for man) ▪ Ratu Mas (body scrub for woman) <p>Wellness and Spa brands:</p> <ul style="list-style-type: none"> ▪ Taman Sari ▪ House of Mustika Ratu ▪ Java Princess Dry Spa and Shop 	<ul style="list-style-type: none"> ▪ Founded in 1975 by Madam Mooryati Soedibyo ▪ Making use of the natural and cultural wealth of Indonesia through its beauty and healthy products ▪ Listed in Indonesia Stock Exchange in 1995 ▪ In 1996, Mustika Ratu obtained several quality certifications, namely ISO 14001 and ISO 9002. ▪ In 2000, started to expand product distribution and offer spa franchise opportunities to Southeast Asian and East Asian countries. ▪ In 2018 market penetration in countries such as Canada, USA, China, Iraq, New Zealand, Bulgaria, and many others.

Traditional Medicinal Plants for Cosmetics – Major companies

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2. Martha Tilaar Group	Jakarta	<p>List of brands:</p> <ul style="list-style-type: none"> ▪ Sariayu, which is Indonesia's oldest brand in this market, and which boasts the largest number of in-store counters (decorative products, cosmetics, skincare, body care, hair care and jamu), ▪ Biokos (anti-aging skincare), ▪ Caring Colours (decorative, cosmetics), ▪ Belia (splash colognes for teenagers), ▪ Berto Tea, ▪ Dewi Sri Spa (holistic spa products), ▪ Professional Artist Cosmetics (decorative and make-up base), ▪ Jamu Garden (jamu, skincare, body care, and health care), ▪ Mirabella (decorative), and ▪ Rudy Hadisuwarno Cosmetics (hair care) ▪ Eastern Garden Spa, Martha Tilaar Salon & Day Spa and Dewi Sri Spa are internationally franchised chains of spa and beauty treatments based on the traditional Indonesian concept 	<ul style="list-style-type: none"> ▪ Founded in the early 1970s as a beauty salon ▪ The company has grown into an integrated, world-class, total beauty provider with an annual turnover of around Rp600 billion (US\$75 million), which exports its products all over the world. ▪ Many of its products and treatments feature the ancient wisdom of traditional Indonesian herbal ingredients (jamu) and other natural plant extracts

Traditional Medicinal Plants for Cosmetics - Trends



There is a general shift in processing to countries of origin. Producing extracts can add considerable value to products when compared to exporting raw materials. Exporters can also add value to their products by improving standardization, which requires appropriate technological improvements, such as meeting local capacities. Quality and food safety management are of the utmost importance.

Buyers place special trust in Indonesia when it comes to the supply of basic extracts. In one survey conducted by Center for Promotion of Imports, a buyer mentioned that Indonesia had 'some of the highest quality extraction companies in Asia'.

Value addition increases along the research chain. As suppliers invest in various R&D steps, they may add intellectual property value to their product, resulting in much higher prices for their extracts and USPs among the competition.

Research costs depend on the type of indication and efficacy that needs proof, as well as what kind of evidence is required for the particular market segment, such as clinical tests. Costs do go up when moving from cosmetics to food supplements and medicine. Testing in general is considered prohibitively expensive for producers of medicines in developing countries.

The 'traditional food window' and the 'traditional herbal medicine track' use of a product for a particular indication can be proven through documentation and can result in the possibility of making claims on the product. As Indonesia's legislation for food supplements currently does not allow claims, producers have little experience with efficacy research. Plus, herbal medicine producers mostly base their claims on traditional heritage and only in rare cases substantiate it with pre-clinical data or clinical data. Local R&D capacities in this area are also limited.

Pre-clinical cosmetic research can be conducted in Indonesia in partnership with universities, but is often performed in-house by cosmetic companies, which would make it possible for the development of extracts with sufficient efficacy data to interest foreign buyers or partners.

Traditional Medicinal Plants for Cosmetics – Strengths and Weakness

Strengths

- Documented traditional knowledge: Traditional use of plants and plant extracts for food supplements, herbal medicine and beauty rituals is well documented in Indonesia.
- Many raw materials available: Indonesian extraction companies can tap into a large production of different raw materials for extraction, except for organic raw materials.
- High-quality extraction companies: Indonesia counts several high-quality extraction companies that can deliver products according to international market expectations or local pharmaceutical and herbal medicine standards.
- Strong local market: As opposed to seaweed extracts and essential oils, Indonesian extraction companies have a strong local market where they generate their turnover.

Weakness:

- Low quality of raw material;
- Lack of R&D capacity on efficacy
- High costs of raw materials due to fragmentation in production;
- Non-standardisation of extracts;
- Weak food safety standards of SMEs;
- High and costly requirements of international markets;
- Low knowledge of international market requirements to develop suitable products;

Traditional Medicinal Plants for Cosmetics – Opportunities

New cosmetic extracts related to Jamu

This sector scores high on demand and export capacity, and very high on trends and value addition opportunities, but low on market access requirements.

There are several obstacles in the value chain, but most can be resolved in the short to medium term once the business case is understood, benefiting a large group of companies which will add value to their products.

Other obstacles can be resolved in the medium to long term without requiring much further external support. Once certain processes have been set into motion, value chain actors, influencers and supporters in the value chain are expected to be able to continue to develop the sector in a sustainable way and have a big impact on Indonesia's plant extract exports.

Extracts as traditional ingredients for international food supplement markets

This sector scores high on production and demand, and very high on export capacity, trends and value addition opportunities, but low on market access requirements.

There are several obstacles in the value chain, but most can be resolved in the short to medium term once the business case is understood, benefiting a large group of companies which will add value to their products.

Other obstacles can be resolved in the medium to long term without requiring much further external support. Once certain processes have been set into motion, value chain actors, influencers and supporters in the value chain are expected to be able to continue to develop the sector in a sustainable way and have a big impact on Indonesia's extract exports.

Potential Evolution For Traditional Medicinal Plants for Cosmetics in the next 5 years

2020 to 2025 view

- Indonesia is ranked as the second largest in terms of biodiversity, with 30 000 flowering plant species. About 7000 of these species are recognized as medicinal plants, with 950 known to have medicinal properties; 283 species are registered, being cultivated and used by traditional medicinal industries and another 250 species directly harvested from forests as raw material by these industries.
- The global trend towards the use of herbal and natural medicines for cosmetics has been increasing in recent years and expected to continue in the next 5 years. More attention from the world community has been given to the tropical rainforest, which is believed to contain 50% of the world's biodiversity.
- A growing trend in the use of halal cosmetics which associated with plant based is observed in Indonesia in the past few years and expected to remain strong in the next 5 years. . It is because a significant number of working Muslim women has now generated more income and thereby are more halal conscious in their purchases. These middle-class Indonesian women feel that wearing halal cosmetics is part of their religious duties. A study has shown that 58% of women in Indonesia now will choose halal cosmetics over the others. As a result, they are more concern on halal status of their cosmetics over price, design, packaging or other attributes. Similar trends is also observed in other populous Muslim community in other countries in Asia eg. Malaysia, Thailand, and India.
- Indonesia population expected to reach 270 million in 2020, the prospects for the cosmetic industry is still very bright for the coming years. The Ministry of Industry forecasts that the value of the Indonesian cosmetic industry will soon reach 100 trillion IDR from the current 46.4 trillion IDR. Indonesia also expected to be the fastest growing cosmetics market in Asia in the next few years.
- Halal regulations have brought about new opportunities for the cosmetics industry in Indonesia. Besides giving local cosmetic manufacturers a competitive edge over global brands in the domestic market, halal-certified local cosmetic companies can also grow their market share in overseas markets too.

Top 2 applications selected for Thailand

These are based on Frost & Sullivan research findings and discussions with L'Oreal team

01



Biotech/Agriculture

This application covers the following:

- Raw materials/Ingredients for Cosmetics; Processing;
 - To check for Price differentiating points of these startups; how they process their material

02



Environment/ Sustainability/ packaging

This application covers the following:

- Biodiversity Materials
- Bio materials that can be processed
- Rice husk; Bagasse, Sugar cane, Algae, Other materials

To additionally look into trends and rising players in applied institutes and centers as well



Overview

- The government of Thailand has been supporting startups through the National Innovation Agency (NSTDA). NSTDA provides government and organizational support through the operation of four national research centers, including BIOTEC, MTEC, NANOTEC, and NECTEC, and a technology management center (TMC).
- Other support for startup includes tax incentives for companies investing in Thailand - an 8-year corporate income tax holiday and exemption of import duties on machinery and raw materials used for manufacturing of export products.
- For the top 2 applications selected for Thailand, namely Biotech/Agriculture and Environment/Sustainability/packaging, Bangkok and Chiang Mai houses most of the research institutes (private and public), startups and VCs. Parthum Thani houses Thailand Science Park where many research institutes are located including BIOTEC and NANOTEC.
- Currently there are very limited number of deep tech and tech startups for the 2 applications. However, there are significant number of R&D in those fields done by various research institutions in Thailand for example Kasetsart Agricultural and Agro-Industrial Product Improvement Institute (KAPI) of Kasetsart University, Mahidol University, Chulalongkorn University, Silpakorn University etc.
- Most startups in these fields are mainly spinoff from research institutions' R&D and private companies collaboration with universities.
- Incubator and accelerators are mainly government related bodies eg. NIA and BIOTEC, although recently there are private bodies eg. SPRINT, SPARK, TIPCO and DEPA are venturing into these 2 applications in Thailand.
- VCs for the 2 applications are still very limited to government related fund because most VCs are focusing on fintech and ecommerce for Thailand. However recently, the VCs such as 500 startup and Kejora Ventures are more open to invest in the 2 applications as well.

Biotech/Agriculture – the most relevant ecosystems

Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Funding Stream (Investors)
1. Zenostic	Bangkok	<ul style="list-style-type: none"> ▪ Developed proprietary microbial testing technology (MicroCheck Array) to detect bacteria before they become harmful. ▪ MicroCheck Array is a solution combining speed and performance in an easy-to-use, with competitive price. ▪ Results can be obtained in as little as 24 hours following a single enrichment step. 	<ul style="list-style-type: none"> ▪ Founded by a group of students in Material Science and Engineering at the Faculty of Science, Mahidol University. ▪ Founder: Kawin Nawattanapaiboon ▪ Founded in 2017 	<ul style="list-style-type: none"> ▪ SPRINT is the accelerator for this startup ▪ Funder includes ALS Thailand, Intertek Thailand, NSTDA Thailand and Mahidol University.
2. X-Zell Biotech	Bangkok	<ul style="list-style-type: none"> ▪ High-flow cell separation technology. ▪ Core technologies for early cancer detection 	<ul style="list-style-type: none"> ▪ A spin-off from Mahidol University. ▪ Founder: Sebastian Bakhdi ▪ Founded in 2009 ▪ X-Zell Biotec (Thailand) merged into X-Zell Inc (USA) in 2017, and its original patent now forms part of X-Zell Inc's. 	<ul style="list-style-type: none"> ▪ Mahidol University ▪ Y Combinator (USA) ▪ A*STAR (Singapore)

Source: National Innovation Agency, e27, Local Governments, VC websites, Crunchbase

Biotech/Agriculture – the most relevant ecosystems

Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Funding Stream (Investors)
3. Quality Plus Aesthetic	Bangkok	<p>Deep tech R&D for cosmetic industry includes:</p> <ul style="list-style-type: none"> ▪ Purified xanthone from mangosteen peel extract ▪ Anthocyanin extract from purple corn ▪ Bromelain Extract from pineapples ▪ Extract from mango seed which rich in substances that contain antioxidant components ▪ Extract from Betel nut as a bioactive substance to combat acne ▪ Mahaad Tree extract ▪ Organic mushroom extract 	<ul style="list-style-type: none"> ▪ Founded in 2010 ▪ Collaboration with Kasetsart Agricultural and Agro-Industrial Product Improvement Institute (KAPI) of Kasetsart University and Fresh and Friendly Farm 	<ul style="list-style-type: none"> ▪ Kasetsart University ▪ Office of Technical Education Development of King Mongkut's University of Technology North Bangkok (ITED) ▪ Thai-Nichi Institute of Technology ▪ Japan Institute of Research I.T.O. ▪ Provitamin Co., Ltd. ▪ Fuji-Sangyo Co., Ltd. ▪ Rangsit University
4. Juicelnnov8	Bangkok	<ul style="list-style-type: none"> ▪ Deep tech startup in the food biotechnology ▪ Sugar reduction technology platform that uses natural, non-genetically modified microbes and proprietary sugar conversion processes - Healthier juice that has less sugar & lower calories 	<ul style="list-style-type: none"> ▪ Co-founder and CEO - Sean Chonchayong Trairatkeyoon ▪ Founded in 2015 ▪ Technology was extracted from a research by Thailand's top food biotech professor at Food Technology Department at Chulalongkorn University 	<ul style="list-style-type: none"> ▪ 500 Startups - US\$500k pre-Series A round ▪ Seed round of US\$500K led by Intania Open Innovation Club ▪ Chulalongkorn University

Source: National Innovation Agency, e27, Local Governments, VC websites, Crunchbase

Biotech/Agriculture – the most relevant ecosystems



Applied Research Institute (including Large Corporations that invest in Startups/spin-offs)	Facts and figures	Key interests	Partners
National Science and Technology Development Agency (NSTDA)	<ul style="list-style-type: none"> ▪ An agency under the Ministry of Higher Education, Science, Research and Innovation ▪ Founded in 1991 ▪ Involved in science & technology manpower development in Thailand, creating infrastructure 	<ul style="list-style-type: none"> ▪ Main mission is to conduct R&D and support R&D in universities and other institutions, using in-house national technology centres and granting mechanisms ▪ Working with the private sector in support of national socio-economic goals 	<ul style="list-style-type: none"> ▪ ASEAN Committee on Science and Technology (COST) ▪ APEC Centre for Technology Foresight ▪ Various private and public sectors agencies
Center for Genetic Engineering & Biotechnology (BIOTEC), Khlong Neung	<ul style="list-style-type: none"> ▪ Founded in 1983 ▪ Member of NSTDA ▪ Established 16 distinct research units for conducting research and providing technical services. Some laboratories act as stand-alone research centers in their own right, while others are collaborative ventures set up jointly with government agencies and universities. 	<ul style="list-style-type: none"> ▪ Healthcare services, modern biotechnology, education, training, biotechnology business and intellectual property rights 	<ul style="list-style-type: none"> ▪ NSTDA ▪ Various private and public sectors agencies

Biotech/Agriculture – the most relevant ecosystems



Applied Research Institute (including Large Corporations that invest in Startups/spin-offs)	Facts and figures	Key interests	Partners
Thailand Bioresource Research Centre, Khlong Neung (TBRC)	<ul style="list-style-type: none">▪ Founded in 2015▪ Has established strong network with more than 60 departments from leading universities and companies in Thailand, ASEAN and international	<ul style="list-style-type: none">▪ Coordination of exchange of biological information and resources and development mechanism	<ul style="list-style-type: none">▪ BIOTEC Thailand▪ NSTDA Thailand▪ ASEAN Economic Community▪ Various private and public sectors agencies
Faculty of Science, Mahidol University	<ul style="list-style-type: none">▪ Founded in 1958▪ Consists of 13 departments: Biochemistry, Biology, Biotechnology, Microbiology, Pathobiology, Pharmacology, Plant Science etc.	<ul style="list-style-type: none">▪ Biomedical science, biotechnology and genetic engineering▪ Diagnosis, prevention and treatment of tropical diseases in humans and animals,▪ Medical substances for man and animals from indigenous natural materials▪ The control and improvement of the environment.	<ul style="list-style-type: none">▪ ASEAN institutions▪ Japan institutions▪ Various private and public sectors agencies

Biotech/Agriculture – Incubators, Accelerators



Incubator/Accelerators	Location	Fact & Figures	Key Technologies and Interests
SPRINT Accelerator Thailand	Bangkok	<ul style="list-style-type: none">Thailand's first accelerator specializing on startup in science and technologyCo-founded by SCG Chemicals, Houston Technology Center Asia, SASIN, KX and TCELS	<ul style="list-style-type: none">BiotechnologySustainability and green technologyIndustrial IoTAdvance materialHealthcare and medical device
SPARK Accelerator	Bangkok	<ul style="list-style-type: none">Supported by Thailand's National Innovation Agency (NIA)	<ul style="list-style-type: none">Supports high-potential Thai startups in early-stage through intensive mentoring sessions with regional and international experts to guide and improve startups' capabilities, products and solutions to reach the global market's needs.
National Innovation Agency (NIA) Thailand	Bangkok	<ul style="list-style-type: none">Established by the Ministry of Science and Technology in 2003	<ul style="list-style-type: none">Bio-BusinessEco-IndustryDesign & Solutions
Thailand Tech Startup Association	Bangkok	<ul style="list-style-type: none">Established in 2014	<ul style="list-style-type: none">Supports tech start-ups in Thailand by conducting research and development for the Thai startup ecosystem

Biotech/Agriculture – Incubators, Accelerators

Incubator/Accelerators	Location	Fact & Figures	Key Technologies and Interests
Center for Genetic Engineering & Biotechnology (BIOTEC) (Incubator)	Khlong Neung, Pathum Thani	<ul style="list-style-type: none">▪ Founded in 1983▪ Member of NSTDA▪ Established 16 distinct research units for conducting research and providing technical services. Some laboratories act as stand-alone research centers/incubators in their own right, while others are collaborative ventures set up jointly with government agencies and universities.	<ul style="list-style-type: none">▪ Healthcare services, modern biotechnology, education, training, biotechnology business and intellectual property rights
TIPCO Ventures	Bangkok	<ul style="list-style-type: none">• By TIPCO Foods Public Company Limited, a leading company in Thailand's food and beverages (F&B) sector	<ul style="list-style-type: none">• Cellular agriculture biomaterials, biochemicals, sustainability etc.
DEPA Accelerator x Techsauce	Bangkok	<ul style="list-style-type: none">• Jointly organized by the Digital Economy Promotion Agency (depa) and Techsauce Media. Depa was established in 2017 to promote and support Thailand's digital industry	<ul style="list-style-type: none">• For startups that want to work with the Thai government• Focus on agritech & foodtech, etc.

Biotech/Agriculture – funding sources

VCs and Funding Sources



Funding source	Description	Key Innovation Topics
NIA Venture Fund	<ul style="list-style-type: none">Established by the Ministry of Science and Technology in 2003Target for Thailand to have 1,000 startup by 2021	<ul style="list-style-type: none">Bio-BusinessEco-IndustryDesign & Solutions
Tech Fund	<ul style="list-style-type: none">Split between ICT and Finance Ministries of ThailandTotal fund USD57 million	<ul style="list-style-type: none">Any tech startup
500 Startup	<ul style="list-style-type: none">U.S. startup investor/accelerator with a reputation for backing startups across the worldLaunched a \$10 million fund (500 Tuk Tuks II) for Asia focusing on Thailand in 2018	<ul style="list-style-type: none">Biotech, agritech, foodtech, fintech, IoT, deep tech etc.
Kejora Ventures	<ul style="list-style-type: none">Founded in 2015One of Southeast Asia's most active private venture-capital firmsOpened in Thailand in 2019	<ul style="list-style-type: none">Focuses on venture building, investment, accelerator program, and technology companies

What is the typical way that start-up companies engage with the VCs, incubators, angel investors?



Spark Accelerator Program in collaboration with NIA Fund



The program

- Typically lasts for 12 weeks
- Intensive lecture classes
- 1-on-1 mentoring sessions with global mentors
- 3 unique workshops during the program
- Weekly coaching sessions with startups' veterans
- Connection with Thai local startups' ecosystem and industry
- Investment opportunities with AGW and partners
- Exposure and Experience Overseas visits
- Access to a co-working space

Eligible startups

- Thai startups with at least one (1) founder/c-level Thai member. additional International members are welcome
- Startups with existing revenues at a growth stage, which are looking to expand
- Requires English proficiency

What you will get?

- **Toolbox for your future success**
Lecturing sessions, 1-on-1 mentoring sessions, Unique workshops, Pitching perfection and more
- **Strengthen your startup with global complimentary technology**
Brought to you by our international mentors & experts
- **Personal coaching**
Let our coaches guide you through the whole process and be part of your success
- **Fast track process for NIA grant application**
Additional financial support from NIA up to 3MB with shorter processing time.

Biotech/Agriculture – the most relevant ecosystems



Main startups' hubs (based on the location of startups, applied research institutes, large corporations (that invest in startups), VCs:

1. Bangkok (Biotech, Agri-Tech, and Food-Tech)
2. Chiang Mai (Biotech, Agri-Tech, and Food-Tech)
3. Pathum Thani (Biotech, Cosmetic & Beauty)

Potential Evolution For Biotech/Agriculture in the next 5 years

2020 to 2025 view

- The global cosmetics industry is highly competitive in nature and requires continuous innovation and development, especially in case of the ingredients used in beauty products.
- There is an increasing demand of herbal/plant base cosmetics products owing to the rising consumer awareness regarding harmful effects of the chemical added to the cosmetics products.
- Currently many universities, research institutions and private companies in the country are working on R&D to extract various components from herbal and exotic plants for the use in cosmetics industry.
- It is expected for **R&D trend to further increase in the next 5 years with collaboration and funds from local and international companies as to meet the global cosmetics consumer demand.**

Price differentiating points

- Thailand is a country that has many **indigenous plants which are unique for the country** and have yet to be fully explored in terms of its benefits for health and beauty.
- Any attempt to extract the beneficial components from the indigenous plants as well as new technology related to extraction would be the price differentiating points for startup/company involved in this field.
- In addition, Thailand has its own Halal certification body which could provide **Halal certification for cosmetics and cosmetics ingredients** that will be another price differentiating point for Thai's product in this application.

Environment / Sustainability / packaging – the most relevant ecosystems



Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Funding Stream (Investors)
Universal Biopack	Nakhon Pathom	<ul style="list-style-type: none"> ▪ 100% natural biodegradable packaging, made from starch and natural fiber ▪ Product structure are foam-like but more rigid and available in various shape and size with multi-purpose application 	<ul style="list-style-type: none"> ▪ Using cassava starch call "KU-Green" based on R&D from Kasetsart University ▪ Commercialized since 2010 ▪ Thai Patent No. 8057, issue date May 25th , 1998 ▪ US Patent No. 7,067,651 B2, issue date June 27th , 2006 	<ul style="list-style-type: none"> ▪ National Science and Technology Development Agency (NSTDA) ▪ National Innovation Agency (NIA) Thailand
Fang Thai	Bann Samkha in Lampang province	<ul style="list-style-type: none"> ▪ Rice straw paper and packaging materials manufacturer ▪ Environmental friendly, zero waste and 100% biodegradable products 	<ul style="list-style-type: none"> ▪ Co-Founder and CEO - Jaruwan Khammuang ▪ Won the Global "Waste Beneficiation" Category award of the Cleantech Open Global Forum 2018, Los Angeles, California, and the Startup Thailand Pitching Challenge 2018 	<ul style="list-style-type: none"> ▪ National Science and Technology Development Agency (NSTDA) ▪ National Innovation Agency (NIA) Thailand ▪ Material ConneXion

Source: National Innovation Agency, e27, Local Governments, VC websites, Crunchbase

Environment / Sustainability / packaging – the most relevant ecosystems



Major startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Funding Stream (Investors)
Bio-Eco	Samut Prakan	<ul style="list-style-type: none"> 100% compostable single-use bioplastic packaging materials made from Cassava, Corn, and Sugarcane 	<ul style="list-style-type: none"> Established in 2017 A joint venture between Thai KK Industry Co., Ltd and TPBI Public Company Limited 	<ul style="list-style-type: none"> Thai KK Industry Co., Ltd and TPBI Public Company Limited
Total Corbion	Rayong	<ul style="list-style-type: none"> Luminy polylactic acid (PLA) bioplastics resins which are biobased and, in some cases, biodegradable as well 	<ul style="list-style-type: none"> Established in 2018 in Thailand 50:50 joint venture between the French energy giant Total and Dutch biochemicals company Corbion 	<ul style="list-style-type: none"> French energy giant Total and Dutch biochemicals company Corbion
PTT Global Chemical (GC)	Rayong	<ul style="list-style-type: none"> Bioplastics used to produce packaging in various forms GC is comprised of diversified and comprehensive petrochemical businesses, including manufacturing and distribution of upstream, intermediate, and downstream petrochemical products. 	<ul style="list-style-type: none"> GC works on bioplastics projects with various partners, including Benjarong BioPBS Coated Cup, Chulalongkorn University's Zero Waste Cup, and Silpakorn University's Be Smart Be Green Bioplastic straws. 	<ul style="list-style-type: none"> Public and private investors

Source: National Innovation Agency, e27, Local Governments, VC websites, Crunchbase

Environment / Sustainability / packaging – the most relevant ecosystems



Applied Research Institute (including Large Corporations that invest in Startups/spin-offs)	Facts and figures	Key interests	Partners
Kasetsart University, Bangkok	<ul style="list-style-type: none">▪ Established in 1943▪ A public research university▪ It was Thailand's first agricultural university▪ Recognized as Green University	<ul style="list-style-type: none">▪ R&D in environmental sustainability, agriculture, biotechnology and energy and environmental engineering	<ul style="list-style-type: none">▪ Universal Biopack
Chulalongkorn University, Bangkok	<ul style="list-style-type: none">▪ Established in 1917▪ A public research university▪ No 1 university in Thailand and 45th in Asia	<ul style="list-style-type: none">▪ R&D in environmental sustainability, agriculture, biotechnology and energy and environmental engineering	<ul style="list-style-type: none">▪ PTT Global Chemical (GC)
Silpakorn University, Bangkok	<ul style="list-style-type: none">▪ Established in 1943	<ul style="list-style-type: none">▪ R&D in engineering and industrial technology, agriculture and sustainability	<ul style="list-style-type: none">▪ PTT Global Chemical (GC)

Environment / Sustainability / packaging – the most relevant ecosystems



Applied Research Institute (including Large Corporations that invest in Startups/spin-offs)	Facts and figures	Key interests	Partners
Thai KK Industry Co., Ltd	<ul style="list-style-type: none">▪ Established in 1978▪ Manufacturer in bioplastic paper coating▪ Thai KK is a market leader in Label Industry, Adhesive Tapes, Melamine and Urea moulding compounds. Thai KK Group consists of 5 different subsidiaries, including, Thai KK (Vietnam), Thai KK (Malaysia), Thai KK Tech, Alfredo, and Bio-Eco Co., Ltd.	<ul style="list-style-type: none">▪ Ecofriendly packaging materials and processes	<ul style="list-style-type: none">▪ TPBI Public Company Limited▪ Bio-Eco
TPBI Public Company Limited	<ul style="list-style-type: none">▪ Manufacturer of plastic bags and different types of food packaging▪ Formerly known as Thai Plastic Bags Industries Co., Ltd and has 5 different subsidiary groups under TPBI Group, including T.A.K. Packaging, Minima (Thailand), TMP, TGRT, and TPBI International Company Limited.	<ul style="list-style-type: none">▪ Ecofriendly packaging materials and processes	<ul style="list-style-type: none">▪ Thai KK Industry Co., Ltd▪ Bio-Eco

Environment / Sustainability / packaging

– Incubators, Accelerators



Incubator/Accelerators	Location	Fact & Figures	Key Technologies and Interests
SPRINT Accelerator Thailand	Bangkok	<ul style="list-style-type: none"> Thailand's first accelerator specializing on startup in science and technology Co-founded by SCG Chemicals, Houston Technology Center Asia, SASIN, KX and TCELS 	<ul style="list-style-type: none"> Biotechnology Sustainability and green technology Industrial IoT Advance material Healthcare and medical device
SPARK Accelerator	Bangkok	<ul style="list-style-type: none"> Supported by Thailand's National Innovation Agency (NIA) 	<ul style="list-style-type: none"> Supports high-potential Thai startups in early-stage through intensive mentoring sessions with regional and international experts to guide and improve startups' capabilities, products and solutions to reach the global market's needs.
National Innovation Agency (NIA) Thailand	Bangkok	<ul style="list-style-type: none"> Established by the Ministry of Science and Technology in 2003 	<ul style="list-style-type: none"> Bio-Business Eco-Industry Design & Solutions
Thailand Tech Startup Association	Bangkok	<ul style="list-style-type: none"> Established in 2014 	<ul style="list-style-type: none"> Supports tech start-ups in Thailand by conducting research and development for the Thai startup ecosystem

Environment / Sustainability / packaging

– Incubators, Accelerators



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TIPCO Ventures	Bangkok	<ul style="list-style-type: none"> • By TIPCO Foods Public Company Limited, a leading company in Thailand's food and beverages (F&B) sector 	<ul style="list-style-type: none"> • Cellular agriculture biomaterials, biochemicals, sustainability etc.
DEPA Accelerator x Techsauce	Bangkok	<ul style="list-style-type: none"> • Jointly organized by the Digital Economy Promotion Agency (depa) and Techsauce Media. Depa was established in 2017 to promote and support Thailand's digital industry 	<ul style="list-style-type: none"> • For startups that want to work with the Thai government • Focus on agritech & foodtech, environment etc.

Environment / Sustainability / packaging – funding sources

VCs and Funding Sources



Funding source	Description	Key Innovation Topics
NIA Venture Fund	<ul style="list-style-type: none">Established by the Ministry of Science and Technology in 2003Target for Thailand to have 1,000 startup by 2021	<ul style="list-style-type: none">Bio-BusinessEco-IndustryDesign & Solutions
Tech Fund	<ul style="list-style-type: none">Split between ICT and Finance Ministries of ThailandTotal fund USD57 million	<ul style="list-style-type: none">Any tech startup
500 Startup	<ul style="list-style-type: none">U.S. startup investor/accelerator with a reputation for backing startups across the worldLaunched a \$10 million fund (500 Tuk Tuks II) for Asia focusing on Thailand in 2018	<ul style="list-style-type: none">Biotech, agritech, environment, foodtech, fintech, IoT, deep tech etc.
Kejora Ventures	<ul style="list-style-type: none">Founded in 2015One of Southeast Asia's most active private venture-capital firmsOpened in Thailand in 2019	<ul style="list-style-type: none">Focuses on venture building, investment, accelerator program, and technology companies

What is the typical way that start-up companies engage with the VCs, incubators, angel investors?



SPRINT Accelerator Thailand

- Thailand's accelerator and incubator that focuses on science and technology
- 3-months accelerating program for business strategy, marketing strategy, financial, IP and pitching skill
- 1-on-1 mentoring with expert in various field
- Networking with entrepreneurs and industrial expert
- Opportunity to pitch with our VC and investment network
- Free access to co-working space and laboratory
- Technology trial in industrial environment
- No equity taken from the company joining our program



Requirements:

- Team of innovator/ business/ marketing (maximum 5 people)
- Good English communication/ writing skills
- Potential IP protection on technology

WHO WE ARE LOOKING FOR?

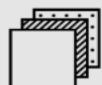
A startups at early or seed stage in the following industries:



Sustainability &
Green Technology



Industrial IoT
& Inspection



Advance
materials



Healthcare &
Medical device

Awards:

- Boot Camp at HTC, Rice University, Houston University
- Startup Trip to Tech Innovation 2019 Singapore
- Startup Booth at Techsauce
- 2-years Office Space

Environment / Sustainability / packaging – the most relevant ecosystems



Main startups' hubs (based on the location of startups, applied research institutes, large corporations (that invest in startups), VCs:

1. Bangkok (Environment / Sustainability / packaging)
2. Chiang Mai (Environment / Sustainability / packaging)

Potential Evolution For Environment / Sustainability / packaging in the next 5 years



2020 to 2025 view

- Thailand ranks as the sixth worst globally for dumping plastic waste in the sea, amounting to 1.3 million tonnes per year, following China, Indonesia, the Philippines, Vietnam and Sri Lanka.
- The Pollution Control Department reports the country produces more than 2 million tonnes of plastic waste annually, amounting to 12% of total waste.
- As a result, the government introduced a measure in 2018 to reduce plastic use as part of a policy to cut waste volume in the country.
- The sub-committee on plastic waste management considered an action plan for reducing and banning the use of seven types of single-use plastic between 2019 and 2025.
- Thailand's thriving agriculture industry has led the country to pursue a bio-based solution to its plastic waste problem by turning to bioplastics derived from local plant products like cassava starch and sugarcane to manufacture new options that decompose completely after a few weeks.
- Currently many universities and research institutions in the country are working on R&D for sustainable packaging materials.
- It is expected for **R&D trend to further increase in the next 5 years with collaboration with local manufacturing companies that have to shift to producing environmental friendly packaging products as to abide with the government's new policy.**
- Apart from that, **startup to commercialised R&D technology from local universities with funding from government funds and private VC will also be expected to bloom in the next 5 years.**

Top applications selected for Malaysia and Vietnam

These are based on Frost & Sullivan research findings and discussions with L'Oréal team

Top 2 applications selected for Malaysia



01



Biotech/Agriculture

This application covers the following:

- Raw materials/Ingredients for Cosmetics; Processing;
- Price differentiating points of these startups; how they process their material

02



Environment/ Sustainability/ packaging

This application covers the following:

- Biodiversity Materials
- Bio materials that can be processed
- Rice husk; Bagasse, Sugar cane, Algae, Other materials

Top application selected for Vietnam



01



Digital (AI, AR, VR, Big Data, Cloud)

- Potential emergence of AI startups focusing on areas related to skin care, cosmetics, and beauty

To additionally look into trends and rising players in applied institutes and centers



Overview

- Malaysia views biotechnology and bioeconomy as an engine of economic growth to utilize the abundance of natural resources and biodiversity. The public sector has taken the lead to develop the sector. Various incentives are in place for the private sector to be actively involved and to forge collaboration with the public sector.
- The country launched its National Biotechnology Policy in 2005 and later in 2010 launched its National Bioeconomy Program becoming the first country in South East Asia and second in Asia after China to have such an initiative.
- BioNexus status is one of the Incentive structures offered to attract global biotechnology firms to invest in Malaysia. It is awarded by Bioeconomy Corp to companies that provide value to the industry. BioNexus companies receive 10 years of tax exemption on statutory income. Additionally, the companies also are allowed to raise capital abroad.
- Current issues that slow down development of biotech industry in Malaysia are related to innovation and venture capital. Currently Malaysia lacks talent pool that are equipped with necessary research knowledge as well as confidence to venture into entrepreneurship. To address this issue, the industry is focusing on attracting global companies to invest first. For example, BioXCell park has attracted Biocon and Stelis Biopharma, global India-based companies, to invest in Malaysia. To date, Biocon hires 85% of its 700 employees from local talent.
- These global biotech players will assist in development of local talent in terms of experience and skill. The target is to establish an environment that will spur local entrepreneurs to launch their own start-ups. In addition, global biotech players will help in increasing the number of talents available for hire.
- Collaboration between global players and local research institutions is also one of the strategies to improve the ecosystems. Biocon has pilot facility and is exploring on how to work with local scientists in the research area.
- Local venture capitalists are not quite ready to take advantage of the commercial potential of innovative biotech ideas. This could be due to lack of past success stories in this area. Thus, one of the plans to overcome this issue is by setting up a permanent base for Bioeconomy Corp in San Francisco, since investors over there are more willing to take risks and invest in the ideas. The base will also help to connect US-based venture capitalists with Malaysian biotech start-ups.



Biotech/Agriculture : Overview

- Trade volume of personal care and cosmetics products for Malaysia in 2015 stood at US\$2.24 billion. More than half of the demand, worth of around US\$1.3 billion, were imported from China, Thailand, France, the European Union, the United States, South Korea and Japan.
- In Malaysia, there are more than 200 cosmetics manufacturers that follow the Good Manufacturing Practices, which is a requirement based from the ASEAN Guidelines for Cosmetics.
- However, raw materials for cosmetic ingredients are typically imported and the local trading activities are operated by players such as YKL Personal Care, Beauty 360°, InterMed, BF1, A&T Ingredients, DKSH and many others.
- Report from 2015 Global Economic Summit states that Malaysia is one of the countries that has high Muslim consumers' expenditure, with an estimated figure of US\$ 2.6 billion. This gives indication that there is huge potential market for Halal cosmetic products.
- In Malaysia, cosmetics and personal care products must comply with the Malaysian Standard MS 2200:2008, where it requires Halal certification. Additionally, the products must be safe and non-hazardous to consumers.
- Malaysia also views Halal cosmetic as an important industry for Malaysia to become the global Halal-hub. As result, many Halal cosmetics and personal care products are having high promotion activities in order to spur and increase programs related to Halal industries.
- Additionally, a research on Malaysia's cosmetic industry was conducted and it was found that consumers prefer premium brands and thus prefer imported cosmetics products.

Biotech/Agriculture – the most relevant ecosystems



Major startups/companies	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)
Biotropics Malaysia Berhad Manufacturing arm: Phytes Bitek	Shah Alam, Selangor	<ul style="list-style-type: none"> ▪ Key products are food supplements for man and woman from active ingredients of indigenous plants such as tongkat ali and kacip fatimah. ▪ They also have develop extraction technology for various indigenous plants from Malaysia rainforest for the use of various industries such as cosmetics and pharmaceutical. 	2007
Natural Wellness Biotech	Kuala Lumpur	Natural Wellness Biotech, the research arm of Natural Wellness, is a Bionexus status company, identifying and developing new entities including natural, pharmaceutical and biotechnology products for commercialization in the healthcare market.	2004

Biotech/Agriculture – the most relevant ecosystems



Major startups/companies	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)
Zelcos Laboratory	Pulau Pinang	Involves in cosmetic research and manufacturing. Products include head care, skin care and body care. Provides OEM and ODM service to clients.	2006
Ivy Beauty Corporation	Selangor	Produces multiple products related to body care, hair care, skin care, baby care, men's toiletries and cosmetics.	1999
De Cosmetics Malaysia	Perak	Focuses on developing and producing high-quality products suitable to meet women's needs. Products are more in the area of skin care.	1999

Biotech/Agriculture – the most relevant ecosystems



Applied Research Institute (including Large Corporations that invest in Startups/spin-offs)	Key interests
Biotechnology Research Institute, Universiti Malaysia Sabah, Kota Kinabalu	Focuses on natural product, drug discovery, molecular microbiology, micro propagation and tissue culture, molecular genetics, biosensor and bioprocess engineering.
Malaysia Genome Institute, Selangor	Focuses on tropical bio resources research based on projects related to genome sequencing, comparative genomics and structural biology.
Centre for Research in Biotechnology for Agriculture, University of Malaya	Multidisciplinary research focuses on sustainable agricultural bioeconomy. Collaborates with leading institutions such as University of Dundee, UK and Nara Institute of Science and Technology (NAIST), Japan.
MARDI - Malaysian Agricultural Research and Development Institute	A research institute under the Ministry of Agriculture. Focus on various R&D in agriculture, biotechnology, nanotechnology and food technology.
University Putra Malaysia	One of the oldest university in Malaysia focusing on agriculture, forestry and biotechnology since inception.

Biotech/Agriculture – Incubators, Accelerators



Incubator/Accelerator	Location	Key interests
Innovation Incubation Center	Technology Park Malaysia, Kuala Lumpur	<ul style="list-style-type: none">▪ Established by the Ministry of Finance and operates under the Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC).▪ Among the clusters with highest tenancy are ICT, Engineering and Biotech, Telecommunication and many others.
Cyberjaya Living Lab	Cyberjaya	<ul style="list-style-type: none">▪ Provides coaching and market access to participants.▪ Currently Living Lab has nurtured 70 start-ups with a total revenue of RM 217 million.▪ It partners with 1337 Ventures, WatchTower and others.
Putra Science Park	Selangor	<ul style="list-style-type: none">▪ Centre of Innovation Management / Technology Transfer Office of University Putra Malaysia.▪ It enhances technology transfer activities related to research.▪ Also responsible to ensure potential technologies to move from laboratory to the market.

Biotech/Agriculture – Incubators, Accelerators



Incubator/Accelerator	Location	Key Interests
Kertih Biopolymer Park	Terengganu	<ul style="list-style-type: none">• Investment : RM 4 Billion• Arkema, French bioindustrial firm, CJ Cheil Jedang, Korean food and bio company and Gevo, a renewable chemicals and advanced biofuels firm are based in Kertih Biopolymer Park.
BioXCell	Johor	<ul style="list-style-type: none">• Investment : RM 1.6 Billion• Biocon and Stelis Biopharma, India's biopharma and bioindustrial companies as well as US bioindustrial firm Glycos are based in BioXCell.



Biotech/Agriculture – funding sources

Funding source name / can be VC, public program	Description
Malaysian Bioeconomy Development Corporation	Biotechnology Commercialization Fund Program with fund worth of RM100 million.
The Malaysian Life Sciences Capital Fund (MLSCF)	MLSCF invests in companies that apply advanced biotechnology in the areas of agriculture, industrial chemistry and healthcare.
MTDC	Manages RM 1 billion Venture Capital Fund from Government of Malaysia for non-ICT sectors, which include life sciences/biotechnology, advanced materials, advanced manufacturing and nanotechnology.
Biotech Commercialisation Fund (BCF)	Fund for BioNexus status companies ranges from RM 500 000 to RM 3 Million.

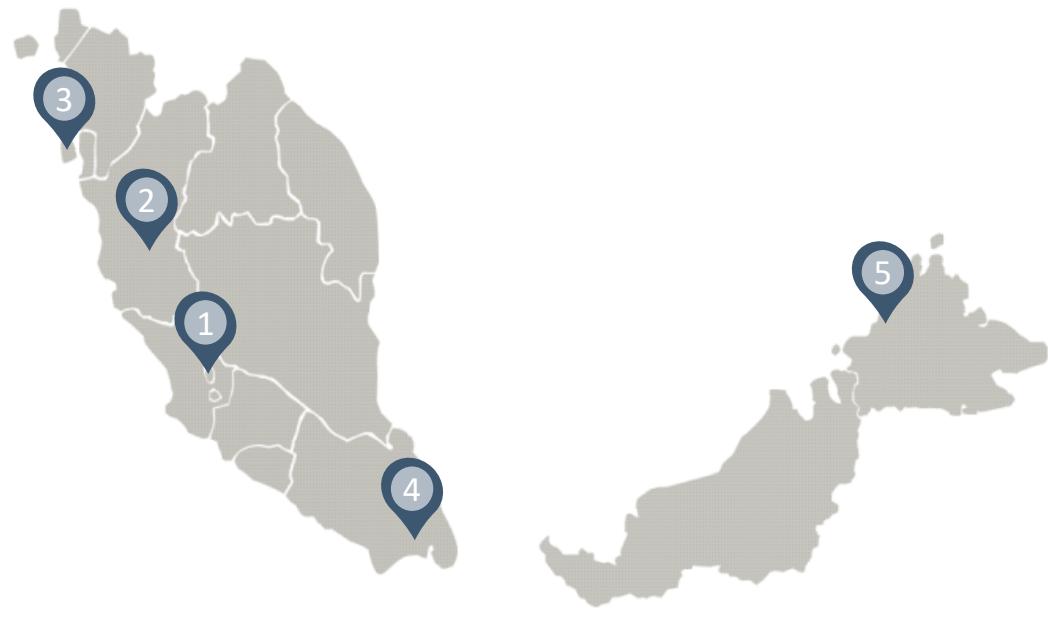
What is the typical way that start-up companies engage with the VCs, incubators, angel investors?



Biotechnology Commercialization Fund Program

1. Biotechnology Commercialization Fund is typically managed by BiotechCorp and is given to fulfil a number of objectives:
 - To assist in the commercialization of biotechnology products and services
 - To assist in expansion of existing biotechnology business
2. There are three criteria that must be fulfilled before applying for this fund:
 - Applicant must be a BioNexus Status company
 - The company is majority-owned by Malaysian, which is at least 51% of Malaysians own the equity
 - Minimum paid-up capital of RM250,000.
3. The grant offered by BiotechCorp to applicants are in the range of RM500,000 to a maximum of RM3,000,000.

Biotech/Agriculture – the most relevant ecosystems



Main startups' hubs (based on the location of startups, applied research institutes, large corporations (that invest in startups), VCs:

1. Kuala Lumpur and Selangor – Biotech, Beauty Ingredients (Biotech Resources, ACGT, Natural Wellness Biotech, Ivy Beauty Corporation)
2. Ipoh, Perak – Cosmetics; Ingredients (De Cosmetics Malaysia)
3. Pulau Pinang – Cosmetics (Zelcos Laboratory_
4. Johor Bahru – Biotech (BioXcel)
5. Kota Kinabalu (Biotechnology Research)

Potential Evolution For Biotech/Agriculture in the next 5 years



2020 to 2025 view

- There are two types of domestic manufacturers in Malaysia namely multinational companies and domestically owned entities.
- Multinational companies are from countries that have high production costs such as Hong Kong. Malaysia, together with other ASEAN countries are among the typical selected destinations for these companies due to lower production costs.
- This trend is expected to continue and further strengthen Malaysia's cosmetic industry, particularly in production expertise.
- The next five years will also witness stronger competition between multinational companies and local manufacturers that produce their own brands.
- This is due to the fact that Halal-certified cosmetics products are starting to gain traction among consumers in Malaysia. This means local manufacturers have the advantages over multinational companies since they have been producing Halal-certified products much earlier.



Environment/Sustainability/Packaging: Overview

- Malaysia is planning to develop its microalgae industry. University Putra Malaysia's Continuous Operation System for Microalgae Production Optimized for Sustainable Tropical Aquaculture-Science and Technology Research Partnership for Sustainable Development(Cosmos-Satreps) is working with Japan in research and development of commercial microalgae cultivation. The cost is RM12 million spread across five-year period starting from 2016.
- In addition, collaboration between UPM and Japan's Soka University has resulted in the design of energy-efficient and mass-culture photobioreactors that is used to produce high-value microalgae.
- The produced microalgae are from recycled nutrients of aquaculture pond sludge. It acts as environmental protection of rivers and seas from pollution.
- There are a number of microalgae species being looked into such as nannochloropsis, tetraselmis, chaetoceros, oscillatoria, phaedodactylum and isochrysis.
- There are a few interesting startups and companies in Malaysia that revolve around sustainability and biodegradable packaging. For example, Indochine Bio Plastiques produces biodegradable bio plastic resin. It uses tapioca starch as an alternative biopolymer.
- FatHopes Energy, on the other hand, turns fats, oils and grease solutions into sustainable biofuels.
- In addition, NanoMalaysia is developing alternatives to food packaging. The innovation targets to reduce the use of plastic usages particularly in the supermarkets.

Environment/Sustainability/packaging – the most relevant ecosystems



Major startups/ companies	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)
Indochine Bio Plastiques	Johor Bahru	Develop biodegradable bio plastic resin focusing on tapioca starch to be alternative biopolymer.	2005
Verdezyne x Biotech Corp.	Johor Bahru	Verdezyne is a leading biochemical producer that successfully created the first renewable nylon fiber and amongst the first to demonstrate the production of diacids with a variety of vegetable oil-derived feedstocks. In Malaysia, Verdezyne is using palm oil bi-products to produce bioplastics.	2011
Klean	Kuala Lumpur	Develops smart reverse vending machine (SRVM), together with Klean operating system and an app. It rewards those who recycle empty polyethylene terephthalate bottles and aluminum cans with points scheme.	2016
NanoMalaysia	Kuala Lumpur	Provides alternatives to food packing with aim to reduce significantly supermarket plastic waste.	2011

Environment/Sustainability/packaging– the most relevant ecosystems



Applied Research Institute (including Large Corporations that invest in Startups/spin-offs)	Key interests
Institute for Environment & Development (LESTARI), The National University of Malaysia, Bangi	The institute covers a wide range of topics such as sustainable development, conservation of natural resources, disasters, biosensors, waste management and many others.
Centre for Environmental Sustainability and Water Security, University Technology Malaysia, Johor	Involves in activities such as research, publication, consultation and services and promotion of environmental awareness. The center has provided services to various public and private agencies.
SIRIM - Standard and Industrial Research Institute of Malaysia	SIRIM is a premier industrial research and technology organisation in Malaysia, a wholly-owned company of the Malaysian Government under the Ministry of International Trade and Industry (MITI). Recent interest are in sustainability and environment technology and engineering.

Environment/Sustainability/packaging – Incubators, Accelerators



Incubator/Accelerator	Location	Fact & Figures
MaGIC	Cyberjaya	Large-scale accelerator, typically around 50-100 per batch. It was set up by the Malaysian Government.
RAVE	Petaling Jaya	One of government initiatives, RAVE provides 3-month program and offers RM 20,000 to winners in exchange for certain percentage of equity.
NEXEA	Petaling Jaya	A 6 month program focuses on early lifecycle of startups by providing mentors from entrepreneurship background.
Khazanah Neo	Kuala Lumpur	3 accelerators namely 1337 Ventures, Code Ar.my and Watch Tower collaborate to create Khazanah Neo. It is a 3 month program that provides RM 20 000 for 2%. This is only available to selected teams.



Environment/Sustainability/packaging – funding sources

Funding source name / can be VC, public program	Description
Cradle Fund	Incorporated under the Ministry of Finance, Cradle Fund focuses on early stage startups. Provides conditional grant of RM150 000 for pre-seed to transform into prototype and further provides RM 500 000 for seed to achieve commercialization stage.
500 Startups	Global venture capital firm that has backed over 150 companies in Southeast Asia. Sectors range from internet to deep technology.
Netrove Partners	Netrove is active in China, Hong Kong and Malaysia. It targets early and growth stage startups to invest.

What is the typical way that start-up companies engage with the VCs, incubators, angel investors?



Cradle Investment Program 300 (CIP300)

1. CIP300 is a pre-commercialization program that gives grant and assistance worth up to RM300,000. The fund is to help facilitate entrepreneurs in developing innovative technology so that the products and services can be commercialized.
2. CIP300 selects candidates based on pitching sessions that held on a quarterly basis, typically on March, June, September and December of the year.
3. There are a few criteria that need to be fulfilled in order to qualify for the program:
 - Primary applicant aged 18 years and above and is also a Malaysian
 - Primary applicant is a permanent resident in Malaysia
 - Minimum 51% of the company's equity is owned by Malaysian

Environment/Sustainability/packaging – the most relevant ecosystems



Main startups' hubs (based on the location of startups, applied research institutes, large corporations (that invest in startups), VCs:

1. Kuala Lumpur and Selangor
(Environment/Sustainability/Packaging)
2. Johor Bahru
(Environment/Sustainability/Packaging)

Potential Evolution For Environment/Sustainability/packaging in the next 5 years



2020 to 2025 view

- Malaysia, like the rest of the many countries worldwide, is on a mission to reduce plastic usage. The ban of single use plastics will create opportunities for alternatives
- There is also growing awareness among the consumers about the downsides of plastic packaging that are prevalently used in cosmetic industry. However, it is expected that plastic packaging will not be prohibited to used in the next 5 years.
- The importance of raw biomaterials such as algae has garnered interests among researchers in Malaysia. The benefits that the materials bring, together with ever-growing market are seen as an attractive investment.
- It is expected that in the next 5 years, research activities in the area of biomaterials will increase, where collaboration between universities and external parties would contribute largely to the growth of research activities.
- The ecosystem is likely to have more startups for alternative packaging materials.

Digital - Ecosystem Overview (1/2)



- AI In Vietnam has been applied in a number of sectors including healthcare, education, agriculture, transport and e-commerce.
- AI in Vietnam is significantly driven by government agencies and non-profit organisations. Viettel Cyberspace Center (VTCC) established in 2014 with AI being one of the research focuses. VTCC.AI focuses on providing 3 services for speech processing, including TTS (Text to Speech), Speech to Text, and Voice wake-up. These products can be applied on a variety of platforms such as reading automatic newspapers, applications in spoken books, or applications in automated customer care systems.
- VietAI, a non-profit whose mission is to train and nurture the next generation of young AI talent in Vietnam, will also serve as judges and provide technical education to our developers. McKinsey & Company, Vietnam Innovation Network (VIN) and VietAI, to launch Vietnam's national artificial intelligence (AI) movement through the Vietnam AI Grand Challenge for AI developer in major cities such as Hanoi, Ho Chi Minh City, and Danang.
- A smart healthcare system that focuses in big data and artificial intelligence (AI) has been set up by the Ministry of Health to improve the quality of health examinations and medical treatment.



- The AI startups are more focused on the e-commerce, speech recognition, fintech, and mobile payment application areas.
- Startups's ecosystem in speech recognition is expected to increase gradually going forward.
- Beauty sector in Vietnam is still dominated by foreign MNCs. They account 90% of the beauty market share in Vietnam. AI in skin care analysis is being led by large cosmetics companies such as P & G through its products such as Olay.

Typical way Startups interact with VCs and Incubators

- Startups approach the VCs, incubator, and angel investors by applying online on the VCs, and incubators websites. Online forms are available on the webpage for the startups to register their interest.
- Angel investors who are mostly investors are approached through networking events and investor related programs in which the startups can share their business ideas to the angel investors.

Digital – the most relevant ecosystems



Major Relevant startups	Location	Description - Key products/services	Facts and figures (year founded, founder, etc)	Funding Stream (Investors)
Hekate.Ai	Danang	<ul style="list-style-type: none"> Developed AI based chat bot to communicate for business operation and customer care. 	<ul style="list-style-type: none"> Founded year: 2016 Founders: Duc Nguyen 	<ul style="list-style-type: none"> Facebook Amazon Microsoft
Wee Digital	Ho Chi Minh City	<ul style="list-style-type: none"> Creates new digital banking experience with user- centric designs, biometric security technology and deep data analytics. 	<ul style="list-style-type: none"> Founded year: 2015 Founders:Christian Nguyen 	<ul style="list-style-type: none"> Vina Capital Ventures
Eyeq	Hanoi	<ul style="list-style-type: none"> Developed advanced AI, Computer Vision and Deep Learning technologies to support digital transformation processes in multiple industries, including retail, advertising, banking, security, smart city and factory. In advertising, the smart camera is used to detect the emotion of users. 	<ul style="list-style-type: none"> Founded year: 2017 Founder: Tung Le, Tuan Thi. 	<ul style="list-style-type: none"> Unilever VinMart

Digital – the most relevant ecosystems



Applied Research Institute (including Large Corporations that invest in Startups/spin-offs)	Facts and figures	Key interests
P&G Signal Accelerator to Vietnam (invests in startups and SMEs)	<ul style="list-style-type: none">A program that seeks out breakthrough innovations and business solutions to address P&G's business challenges and opportunities. Through this program, SMEs and startups can access to funding from P&G.	<ul style="list-style-type: none">AICommercial technology
VinAI Research by Vin Group	<ul style="list-style-type: none">Research institute focusing on artificial intelligence (AI).The institute will study basic AI science applications.Entrepreneur Partnership program is designed to help AI startups. As part of this program, VinAI offers startups a number of benefits including office space collocated with the lab, proximity and access to its AI experts, and connection to potential customer groups within the VinGroup ecosystem.	<ul style="list-style-type: none">Image and video processingLinguistic and voice recognitionUser interaction

Digital – Incubators, Accelerators



Incubator/Accelerators	Location	Fact & Figures	Key Technologies/Key Interest
Vietnam Innovative Startup Accelerator (VIISA)	Ho Chi Minh	<ul style="list-style-type: none"> It is an accelerator program and seed stage fund that will invest \$6 million to build global-ready startups in Vietnam. 	<ul style="list-style-type: none"> Online platforms for financial services, education, and commercial applications.
Topica Founder Institute (TFI)	Hanoi	<ul style="list-style-type: none"> Startup Accelerator program of Topica Edtech Group, the leading E-learning group in Southeast Asia. Organises mentorships and investor related programs to startups. 	<ul style="list-style-type: none"> Digital payment technology Healthcare technology Education
DNES	Danang	<ul style="list-style-type: none"> Provides intensive incubation program for startups by offering shared office space, and an easy access to key industry partners, mentors and investors. Demo Day where each team presents to a large audience of investors, corporate leaders and media. 	<ul style="list-style-type: none"> Digital Cloud services AI technology for data analysis
Vietnam Silicon Valley	Hanoi	<ul style="list-style-type: none"> Offers workshops and mentorship programs to startups. Provides working place for startups. Organises programs for investors to invest in startups. 	<ul style="list-style-type: none"> Technology related startups.

Digital – funding sources



Funding source name / can be VC, public program	Description	Key Innovation Topics	Latest Funding
G&H Ventures	<ul style="list-style-type: none">Invests in early-stage tech startups that can leverage Artificial Intelligence (AI) to solve big problems in various industries, focusing on the Asian market. In most cases, it is the first outside investor.	<ul style="list-style-type: none">AI for logistics solution<ul style="list-style-type: none">AI in educationAI in beauty and personalised.	Lily
Vina Capital Ventures	<ul style="list-style-type: none">It is a USD100 million Vietnam-focused venture capital platform focused on investing in and building world-class technology companies and incorporating them into a full digital ecosystem.	<ul style="list-style-type: none">DigitalLogistics	Wee Digital
Access Ventures	<ul style="list-style-type: none">With offices in Vietnam, Korea, and Indonesia, it invests in early stage tech companies (Seed to Series A)	<ul style="list-style-type: none">Mobile payment<ul style="list-style-type: none">AIVR	Moca



Main startups' hubs (based on the location of startups, applied research institutes, large corporations (that invest in startups), VCs:

1. Hanoi: Topica Founder Institute (TFI), Vietnam Silicon Valley, Eyeq
2. Ho Chi Minh: Vietnam Innovative Startup Accelerator (VIISA), Wee Digital
3. Da Nang: DNES, Hekate.Ai



2020 to 2025 view

- In virtual reality and augmented reality, the startups ecosystem will grow towards digital marketing applications to leverage business operations and productivity.
- Language processing AI based technologies is expected to grow particularly in speech recognition, text to speech conversion, and speech to text conversion. Moreover, health tracking apps will also proliferate in this region.
- Large foreign MNCs will still lead the innovation in beauty, healthcare, and skin care market in this region. There will be less penetration by startups in AI, VR, AR, big data, and cloud based cosmetics, beauty, and skin care analysis. However, there will be more penetration from large cosmetics corporations in Vietnam in this application area.
- The innovations of startups ecosystem in artificial intelligence will be more geared towards enabling smart nations in Vietnam such as AI in traffic monitoring.
- AI in facial and other biometric recognitions startups ecosystem is expected to grow focusing in the applications of safety and security such as in banking, airport security, and city surveillance in Vietnam.

APPENDIX – Growth Environment

Growth Environment – China



China is at the top of AI and life sciences development, and on par with the USA. China is among the global world leaders in these scientific domains. Its thriving startup landscape helps push AI innovations further. Besides, its large population of 1.3 billion people create a huge domestic market.

China's New Generation AI Development Plan launched in 2017 has also influenced key industries across its economy to use AI.

The Chinese Government has also invested in advanced manufacturing and robotics, blockchain, agricultural technology and new food production techniques. It is firing on all cylinders, providing large financial support to bolster its activities in the Deep Tech sector.



Ecosystem overview

The list of regional hubs / ecosystems



1 Beijing-Tianjin-Hebei Metropolitan Region (BTH)

Major cities: Beijing, Tianjin, Baoding, Shijiazhuang

Major innovation parks / startup clusters:

Zhongguancun, Shangdi, Wangjing, Binhai New Area



2 Yangtze River Delta Metropolitan Region (YRD)

Major cities: Shanghai, Hangzhou, Suzhou, Nanjing, Ningbo, Hefei, Wuxi

Major innovation parks / startup clusters: Zhangjiang Hi-tech Park, Future Sci-Tech City, Suzhou Industrial Park



3 Pearl River Delta Metropolitan Region (PRD)

Major cities: Guangzhou, Shenzhen, Foshan, Dongguan, Zhuhai, Zhongshan

Major innovation parks / startup clusters: Nanshan District, Songshan Lake, Tianhe Science Park



HIGHLIGHTS

- The central government of China has prioritized three city clusters to become world-class clusters, namely, Beijing-Tianjin-Hebei Metropolitan Region (BTH), Yangtze River Delta Metropolitan Region (YRD) and Pearl River Delta Metropolitan Region (PRD). They are the centers of economic activities in China, and they are also the major startup ecosystems in China.
- Startup ecosystems can increase China's productivity and innovation by grouping more innovative firms and supportive organizations and elements. Beijing-Tianjin-Hebei Metropolitan Region (BTH), Yangtze River Delta Metropolitan Region (YRD) and Pearl River Delta Metropolitan Region (PRD) provide basis for entrepreneurial activities, while the production and operation activities of startups react on entrepreneurial environment.
- The well-connected infrastructure and transport facilities are vital to these startup ecosystems in China, because the effective supply of talents, capital and new techniques rely on the well-connected infrastructure and transport facilities in these systems.

Source: Frost & Sullivan



Ecosystem overview

Innovation ecosystem stakeholders

The startup ecosystems in most western countries are primarily driven by technological advancement and market demand, but China's ecosystem is predominantly driven and facilitated by the government. The government in China can effectively create a superior business environment for startups in policies, regulations, taxation, and other political, economic or financial aspects to help startups achieve rapid and healthy development. Additionally, most universities and research organizations are funded by the government.



Source: Frost & Sullivan

Ecosystem overview



Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been based on date available and estimated

Applications	Deep Tech Startups		Applied Research Institutes	Interest Level
Biotech	Total number	70+	<ul style="list-style-type: none"> Institute of Medical Biotechnology, Chinese Academy of Medical Sciences (Beijing) Institute of Microbiology of the Chinese Academy of Sciences (Beijing) 	High
	Total funding (2019)	\$1,819 M ↑		
	Top hubs	BTH (24), YRD (16), PRD (12)		
	Highlights	<ul style="list-style-type: none"> Gene technologies Cell therapy Cancer therapy 		
Environment / Sustainability / Waste Management	Total number	10+	<ul style="list-style-type: none"> Chinese Research Academy of Environmental Sciences (Beijing) School of Environment of Tsinghua University (Beijing) 	Medium
	Total funding (2019)	\$141 M →		
	Top hubs	BTH (4), YRD (2), PRD (1)		
	Highlights			
Digital (AI, VR, big data, Cloud, etc.)	Total number	300+	<ul style="list-style-type: none"> Beijing Academy of Artificial Intelligence (Beijing) Institute of Computing Technology of the Chinese Academy of Sciences (Beijing) 	High
	Total funding (2019)	\$3,313 M ↑		
	Top hubs	BTH (63), YRD (78), PRD (94)		
	Highlights	<ul style="list-style-type: none"> Facial recognition Computer vision Human-computer interaction 		

Source: Wind, VC websites, startup websites, Frost & Sullivan

Ecosystem overview



Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been based on date available and estimated

Applications	Deep Tech Startups		Applied Research Institutes	Interest Level
Robotics	Total number	35+	<ul style="list-style-type: none"> Institute of Automation, Chinese Academy of Sciences (Beijing) Nanjing Robot Research Institute (Nanjing) 	High
	Total funding (2019)	\$1,252 M ↑		
	Top hubs	BTH (11), YRD (6), PRD (17)		
	Highlights	<ul style="list-style-type: none"> Service robotics Education robotics Industrial robotics 		
Consumer IoT	Total number	15+	<ul style="list-style-type: none"> IoT Tech Center, Tsinghua University (Beijing) Research and Development Center of Internet of Things, Chinese Academy of Sciences (Wuxi) 	Medium
	Total funding (2019)	\$868 M →		
	Top hubs	BTH (7), YRD (3), PRD (3)		
	Highlights	<ul style="list-style-type: none"> Smart home Smart wearables Security devices 		
Cosmetics / Beauty	Total number	N/A	<p>Most applied research institutes of cosmetics / beauty industries in China are the affiliates of big companies such as L'Oréal, Estee Lauder, Unilever, Jahwa, etc. For the government, they only have several test centers for cosmetics / beauty products.</p>	Low
	Total funding (2019)	N/A		
	Top hubs	N/A		
	Highlights	N/A		

Source: Wind, VC websites, startup websites, Frost & Sullivan

Ecosystem overview



Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been based on date available and estimated

Applications	Deep Tech Startups		Applied Research Institutes	Interest Level
Health & Wellness	Total number	40+	<ul style="list-style-type: none"> Shanghai Institute of Nutrition and Health of Chinese Academy of Sciences (Shanghai) Guangzhou Institutes of Biomedicine and Health of Chinese Academy of Sciences (Beijing) 	Medium
	Total funding (2019)	\$1,106 M →		
	Top hubs	BTH (22), YRD (16), PRD (11)		
	Highlights	<ul style="list-style-type: none"> Mobile healthcare devices Personal health management Big data in healthcare 		
Pharma	Total number	40+	<ul style="list-style-type: none"> Institute of Materia Medica of Chinese Academy of Medical Sciences (Beijing) Institute of Medicinal Biotechnology of Chinese Academy of Medical Sciences (Beijing) 	High
	Total funding (2019)	\$2,575 M ↑		
	Top hubs	BTH (24), YRD (7), PRD (9)		
	Highlights	<ul style="list-style-type: none"> Anti-tumor drugs Immunotherapy drugs Biologic medicine 		
MedTech / Medical device	Total number	150+	<ul style="list-style-type: none"> Institute of Medical engineering of Medical Sciences (Tianjin) The Advanced Theranostics and 3-D Imaging Laboratory, Tsinghua University (Beijing) 	High
	Total funding (2019)	\$2,089 M ↑		
	Top hubs	BTH (76), YRD (34), PRD (25)		
	Highlights	<ul style="list-style-type: none"> Medical imaging Smart diagnosis system Precise surgery equipment 		

Source: Wind, VC websites, startup websites, Frost & Sullivan

Ecosystem overview

Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been based on date available and estimated



Applications	Deep Tech Startups		Applied Research Institutes	Interest Level
Chemicals / Materials / Textile / 3D printing	Total number	15+	<ul style="list-style-type: none"> Institute of Chemistry of Chinese Academy of Sciences (Beijing) Shanghai Research Institute of Materials (Shanghai) 	Medium
	Total funding (2019)	\$1,048 M →		
	Top hubs	BTH (4), YRD (5), PRD (3)		
	Highlights	<ul style="list-style-type: none"> Nanometer materials Aerospace composite Haptics materials 		
Agriculture	Total number	10+	<ul style="list-style-type: none"> Biotechnology Research Institute of Chinese Academy of Agricultural Sciences (Beijing) Center for Agricultural Resources Research, Institute of Genetics and Developmental Biology of Chinese Academy of Sciences (Shijiazhuang) 	Low
	Total funding (2019)	\$1,201 M ↓		
	Top hubs	BTH (3), YRD (3), PRD (2)		
	Highlights	<ul style="list-style-type: none"> Agricultural drones Agricultural data platforms 		
Food	Total number	N/A	<ul style="list-style-type: none"> Institute of Food and Nutrition Development, Ministry of Agriculture (Beijing) Institute of Food Science and Technology, Academy of Agricultural Sciences (Beijing) 	Low
	Total funding (2019)	N/A		
	Top hubs	N/A		
	Highlights	N/A		

Source: Wind, VC websites, startup websites, Frost & Sullivan

Ecosystem overview

Start-up Ecosystem in the Application Areas



	Startups	Applied Research Institutes
Biotech	<p>With a strong university system churning out well-trained talents in biotech, strong research organizations in basic research, substantial financial backing from both the private and public sectors, the biotech industry in China is expected to experience steady growth in the future. Typical startups with deep tech in biotech in China:</p> <ol style="list-style-type: none">1. JW Therapeutics (Shanghai): It is an innovative biotechnology company focused on the latest cancer CAR-T therapy technologies.2. Stemirna Therapeutic (Shanghai): It is the first and the only platform-based mRNA research and develops enterprise in China. Its aim is to build a comprehensive mRNA therapeutic industrial chain includes an mRNA drug platform, a GMP production center, a tumor neoantigen library and an mRNA drug clinical cooperation platform.3. EdiGene Biotechnology (Beijing): It has platforms to develop gene-editing therapies for a range of diseases, and to conduct high throughput genome screening to enable dissection of functional big data in biological contexts.	<p>China has many advanced research institutes in biotech, such as:</p> <ol style="list-style-type: none">1. Institute of Medical Biotechnology, Chinese Academy of Medical Sciences (Beijing): As the source of the first doses of penicillin in China, the institute laid a solid foundation for the discovery and development of antibiotics. With scientific advances in theories and technologies, the research fields of the institute were extended to the areas of cancer, the cardio-vascular system, immunoregulation, among others.2. Institute of Microbiology of the Chinese Academy of Sciences (Beijing): It is the largest microbiological research institution in China. The Institute attaches great importance to cooperation with international scientific community and biotech companies in industry.

Source: VC websites, startup websites, university websites, research institute websites, Frost & Sullivan

Ecosystem overview

Start-up Ecosystem in the Application Areas



	Startups	Applied Research Institutes
Environment / Sustainability / Waste Management	<p>China is the largest and fastest growing emerging market for environmental technologies. In January 2018, China's first Environmental Protection Tax Law came into force with the aim of strengthening the enforcement of environmental regulations. Typical startups with deep tech in environment / sustainability / waste management in China:</p> <ol style="list-style-type: none">1. Ensenmax (Shanghai): It is an innovative high-tech company providing intelligent industrial gas monitoring and Internet of things solutions. Relying on its leading nano-sensing technology and pattern recognition algorithm, Ensenmax combines gas monitoring with intelligent IoT, provides innovative intelligent environmental protection and safety monitoring solutions for enterprises, and guarantees the green production and intrinsically safe operation of enterprises.2. Gaiya (Suzhou): It is a professional environmental services provider for environmental remediation, soil improvement and environmental engineering technology. It has successfully developed an environmental protection robot called GY-SR60, the first integrated equipment for soil and groundwater sampling and remediation in China.	<p>China has many advanced research Institutes in environment / sustainability / waste management, such as:</p> <ol style="list-style-type: none">1. Chinese Research Academy of Environmental Sciences (Beijing): The Chinese Research Academy of Environmental Sciences was established in 1978, in affiliation with the Ministry of Ecology and Environment of China. Its research is focusing on atmosphere, water, soil and solid waste, ecology, cleaner production, vehicle emission control, environmental engineering, environmental safety, etc.2. School of Environment of Tsinghua University (Beijing): It conducts research in a wide arrange of fields, including water supply, wastewater treatment, air pollution control, solid wastes management, environmental chemistry, microbiology, hydrology, ecology, energy and resources, environmental simulation, and environmental management and policy.

Source: VC websites, startup websites, university websites, research institute websites, Frost & Sullivan

Ecosystem overview

Start-up Ecosystem in the Application Areas



	Startups	Applied Research Institutes
Digital (AI, VR, Big data, Cloud, etc.)	<p>China has one of the most active digital-investment and start-up ecosystems in the world. China's Internet giant companies are building a rich digital ecosystem to enhance their competitiveness. Typical startups with deep tech in digital (AI, VR, big data, Cloud, etc.) in China:</p> <ol style="list-style-type: none">1. CloudWalk Technology (Shanghai): It is an artificial intelligence facial recognition firm whose technology is widely applied in the financial, public security, and aviation sectors.2. SenseTime (Beijing): It is a global company focused on developing innovative AI technologies, and it is the world's most-funded AI pure-play with the highest valuation.3. HiScene Information Technology (Shanghai): It is a provider of AR products and services, owns independently researched and developed Artificial Intelligence (AI) core technologies like computer vision, deep learning, and intelligent interaction, integrated software.4. Meetvr Technology (Shanghai): It is a company focusing on virtual reality, augmented reality, stereo vision, wearable devices and other visual interaction technologies.	<p>China has many advanced research institutes in digital (AI, VR, big data, Cloud, etc.) field, such as:</p> <ol style="list-style-type: none">1. Beijing Academy of Artificial Intelligence (Beijing): Beijing Academy of Artificial Intelligence is under the guidance and support of the Ministry of Science and Technology and the Beijing Municipal Government. It targets to promote revolutionary and disruptive breakthroughs in artificial intelligence theory, methods, tools, systems, etc., leading the frontiers of artificial intelligence and technological innovation in China.2. Institute of Computing Technology of the Chinese Academy of Sciences(Beijing): It is the first academic establishment to specialize in comprehensive research on computer science and technology in China. It has successfully built China's first general-purpose digital computer and now has turned itself into an R&D base for high-performance computer technology.

Source: VC websites, startup websites, university websites, research institute websites, Frost & Sullivan

Ecosystem overview

Start-up Ecosystem in the Application Areas



	Startups	Applied Research Institutes
Robotics	<p>China is the largest and fastest-growing robotics market in the world. So far, Chinese innovation activity in robotics is growing rapidly and there are no signs of a slowdown in innovation. Typical startups with deep tech in robotics in China:</p> <ol style="list-style-type: none">1. Horizon Robotics (Beijing): It is a pioneer in the area of AI Robotics for smart mobility and IoT applications. It has developed the Brain Processor Unit (BPU), an innovative AI computing architecture that is tailored to address the unique performance and power challenges in AI applications.2. Turing Robotics Technologies (Shanghai): It is mainly engaged in robot research and commercial application of robot operating systems. It provides leading AI robot operating systems with a leading advantage in the fields of semantic understanding, machine vision, deep learning, etc.3. Geek+ Technology (Beijing): It is a global technology company leading the intelligent logistics. It applied advanced robotics and AI technologies to realize flexible, reliable and highly-efficient solutions for warehouses and supply chain management.	<p>China has many advanced research institutes in robotics, such as:</p> <ol style="list-style-type: none">1. Institute of Automation, Chinese Academy of Sciences (Beijing): It is one of the earliest national automation institutes in China. It focuses on three main areas of intelligent technology: intelligent processing of massive information, intelligent control of complex systems and integrated intelligent systems, which are the bases for robotics technologies.2. Nanjing Robot Research Institute (Nanjing): Its main research areas include industrial robots, service robots, medical robots, special robots and intelligent manufacturing related intelligent sensing, autonomous control and other core components.

Source: VC websites, startup websites, university websites, research institute websites, Frost & Sullivan

Ecosystem overview

Start-up Ecosystem in the Application Areas



	Startups	Applied Research Institutes
Consumer IoT	<p>China is betting big on IoT with huge investments in related cutting edge technologies. Typical startups with deep tech in consumer IoT in China:</p> <ol style="list-style-type: none">1. LumiUnited Technology (Shenzhen): It is a developer of smart home appliances and IoT solutions, including smart home automation system that consists of smart hardware, mobile application and data analysis platform.2. Terminus Technologies (Beijing): It is a high-tech company incubated by China Everbright. It is committed to provide one-stop solutions that cover multiple scenarios in buildings, communities, household, transportation, etc.	<p>China has many advanced research institutes in consumer IoT, such as:</p> <ol style="list-style-type: none">1. IoT Tech Center, Tsinghua University (Beijing): It focuses on the key technologies in the field of IoT, the center has a number of cutting-edge research areas such as wireless sensor networks, IPv6-based IoT architecture, IoT data centers, and ubiquitous computing infrastructure software and hardware.2. Research and Development Center of Internet of Things, Chinese Academy of Sciences (Wuxi): It is the largest IoT professional R&D institution in China.
Cosmetics / Beauty	<p>The cosmetics / beauty industries in China are dominated by large companies with decades of operation years. Most investment in the cosmetics / beauty is focusing on marketing and production such as e-commerce, rather than on research and development of deep tech. There are very limited startups from cosmetics / beauty industries are willing to invest in deep tech in China.</p>	<p>Most applied research institutes of cosmetics / beauty industries in China are the affiliates of big companies such as L'Oréal, Estee Lauder, Unilever, Jahwa, etc. The government only takes the responsibility of quality control in the test centers before the cosmetics / beauty products are launched.</p>

Source: VC websites, startup websites, university websites, research institute websites, Frost & Sullivan

Ecosystem overview

Start-up Ecosystem in the Application Areas



	Startups	Applied Research Institutes
Health & Wellness	<p>The health and wellness industry has been witnessed a strong pace of value growth in China during the past five years, strongly driven by the healthy living trend amongst consumers in the country. Typical startups with deep tech in health & wellness in China:</p> <ol style="list-style-type: none">1. Health Hope (Beijing): It developed an AI system called smart brain, which has rich knowledge and experience to support the daily personal health decisions of users.2. Wanliyun Medical Information Technology (Beijing): It constructs a medical image big data cloud platform, provide remote medical imaging services and image cloud technology services. It has built a third-party offline medical imaging center to provide technological development and consulting services.	<p>China has many advanced research institutes in health & wellness, such as:</p> <ol style="list-style-type: none">1. Shanghai Institute of Nutrition and Health of Chinese Academy of Sciences (Shanghai): It focuses on healthy aging, major chronic diseases, nutrition and food safety, and biomedical big data, with an emphasis on application and biotechnology development.2. Guangzhou Institutes of Biomedicine and Health of Chinese Academy of Sciences (Beijing): It is exploring disease mechanism with the cutting-edge technologies and developing innovative protocols for disease control and prevention. It also provides excellent R&D platform in biomedicine and functions as an incubator for bioengineering and pharmaceutical industries to support national strategic science and technology programs.

Source: VC websites, startup websites, university websites, research institute websites, Frost & Sullivan

Ecosystem overview

Start-up Ecosystem in the Application Areas



	Startups	Applied Research Institutes
Pharmaceuticals	<p>China is the world's second-largest market for pharmaceuticals and the fastest emerging market for the sector. The government intends to turn China to be an important innovator of pharmaceutical products in the world. Typical startups with deep tech in pharmaceuticals in China:</p> <ol style="list-style-type: none">1. Haihe Pharmaceutical (Shanghai): It focuses on discovery, development and commercialization of innovative anti-tumor drugs. It has built a precision medical platform guided by biomarkers, and established a fully integrated pre-clinical evaluation technical platform and clinical study system for innovative drugs, with advanced technology and operation in consistence with international standards and norms.2. Genova Biotech (Beijing): It is a high-tech multinational bio-pharmaceutical company focusing on the research and development and industrialization of original biotech drugs. Based on its original genetic engineering technology platform, it has developed a new protein drug based on immunotherapy.	<p>China has many advanced research institutes in pharmaceuticals, such as:</p> <ol style="list-style-type: none">1. Institute of Materia Medica of Chinese Academy of Medical Sciences (Beijing): Its mandate is to discover and research innovative drugs for treating or preventing human diseases. Its scientists use the latest biomedical theories, cutting-edge technologies, and state-of-the-art equipment to develop drugs from botanical compounds, synthetic chemicals, and bio-products.2. Institute of Medicinal Biotechnology of Chinese Academy of Medical Sciences (Beijing): It is one of the primary institutions for drug research in China, and over 250 drug screening assays are used at the institute. More than 20 creative anti-microbial, anti-cancer agents and biotechnical drugs are under research and development.

Source: VC websites, startup websites, university websites, research institute websites, Frost & Sullivan

Ecosystem overview

Start-up Ecosystem in the Application Areas



	Startups	Applied Research Institutes
Medtech	<p>China is on the rise in medtech just as it is in other industries. China is also increasingly recognized as a major source of product technology innovation as well as for its innovative business models and unique innovation ecosystem. Typical startups with deep tech in medtech in China:</p> <ol style="list-style-type: none">1. Wision A.I. (Shanghai): It is a developer of Build Computer Aided Diagnosis (CAD) algorithms and systems in clinical imaging. Its products can improve diagnostic accuracy and effectiveness. It is devoted to realize clinical value of AI in various clinical settings, such as gastroenterology, ophthalmology, neurology, etc.2. Genecast (Beijing): It is high-tech medical company for tumor diagnosis. With the second-generation sequencing technology and bioinformatics, it is engaged in non-invasive and precise diagnosis and diagnosis of tumors.3. Medbanks Network Technology (Beijing): It is an oncology data platform in the field of cancer. It develops intelligent diagnosis and treatment systems, as well as comprehensive solutions to improve the tumor diagnosis and treatment and the efficiency of doctors' clinical work.	<p>China has many advanced research institutes in medtech, such as:</p> <ol style="list-style-type: none">1. Institute of Medical engineering of Medical Sciences (Tianjin): It is the leader in the research areas of medical natural degradable materials, synthetic degradable materials and composite materials. The developed biomaterials have been used in drug sustained-release systems, induced tissue regeneration membranes, tissue engineering scaffolds, gene delivery nanocarriers, etc.2. The Advanced Theranostics and 3-D Imaging Laboratory, Tsinghua University (Beijing): It is involved in the development of image-guided surgery, three-dimensional medical images, medical robotics and fusion of these techniques for minimally invasive precision diagnosis and therapy. It has developed an autostereoscopic medical image named Integral Videography and first implemented it in an image overlay system for surgical navigation.

Source: VC websites, startup websites, university websites, research institute websites, Frost & Sullivan

Ecosystem overview

Start-up Ecosystem in the Application Areas



	Startups	Applied Research Institutes
Chemicals / Materials / Textile / 3D printing	<p>China are increasingly trying to step out of low-profit commodity segments and climb up the technology ladder to more sophisticated products in chemicals and materials. Typical startups with deep tech in chemicals / materials / textile / 3D printing in China:</p> <ol style="list-style-type: none">1. China Cone (Shenzhen): It is a leading carbon nanofiber developer. Its carbon nanofiber is widely applied in many burgeoning industries such as medical apparatus and instruments, aeronautics and astronautics, 5G telecommunication wires, etc.2. BMF Precision Technology (Shenzhen): It is a global leading solution provider for micro/nano-scale 3D printing technology and disruptive precision manufacturing. Its 3D printing systems are capable of achieving ultra-high printing resolution (2µm~ 50µm) and printing tolerance.3. Polywill (Shanghai): It focuses on the development and application of waterborne auxiliaries and special emulsion technologies. As new materials, the products of it are mainly applied in containers, furniture, green buildings, etc.	<p>China has many advanced research institutes in chemicals / materials / textile / 3D printing, such as:</p> <ol style="list-style-type: none">1. Institute of Chemistry of Chinese Academy of Sciences (Beijing): It is a multi-disciplinary research institute dedicated to the basic research in broad fields of chemical sciences. It focuses on the following fields: the frontiers of molecular and nano sciences, organic and polymeric materials, chemical biology, as well as energy and green chemistry.2. Shanghai Research Institute of Materials (Shanghai): It is the technical supporter for materials technology and materials testing of China Machinery Industry Federation in the field of machinery industry in China. Its main research areas include special metal welding materials, special stainless steels, high-strength non-magnetic steels and surface modification technology and process.

Source: VC websites, startup websites, university websites, research institute websites, Frost & Sullivan

Ecosystem overview

Start-up Ecosystem in the Application Areas



	Startups	Applied Research Institutes
Agriculture	<p>Agriculture is one of the basic industries in China, and China is willing to invest in agricultural technology upgrading. Typical startups with deep tech in agriculture in China:</p> <ol style="list-style-type: none">1. Gago (Beijing): It is a big data application company serving agriculture, environment and other industries through satellite and meteorological big data collection, processing, analysis and visualization system.2. Kebai Sciences (Beijing): It is a company for agricultural Internet of things (IoT) develop and application. It committed to develop and produce agricultural IoT system and agricultural data process system. Its agricultural IoT system can monitor the key factors that may affect the production of farm.	<p>China has many advanced research institutes in agriculture, such as:</p> <ol style="list-style-type: none">1. Biotechnology Research Institute of Chinese Academy of Agricultural Sciences (Beijing): It provides supports for the research of a large-scale gene transformation, molecular breeding, new crop variety development, and bio-safety evaluation of genetically modified organisms, etc.2. Center for Agricultural Resources Research, Institute of Genetics and Developmental Biology of Chinese Academy of Sciences (Shijiazhuang): Its main research areas are plant physiology and ecology of drought tolerance, farmland water transfer and development of water saving technologies, agricultural water resource management and safety, etc.
Food	<p>Most investment in the food industry is focusing on marketing such as e-commerce, rather than on research and development of deep tech. There are very limited startups from food industries are willing to invest money on deep tech in China.</p>	<p>Most applied research institutes of food industry in China are research organizations supported by government such as Institute of Food and Nutrition Development, Ministry of Agriculture (Beijing), Institute of Food Science and Technology, Academy of Agricultural Sciences (Beijing), etc.</p>

Source: VC websites, startup websites, university websites, research institute websites, Frost & Sullivan



2

ENTREPRENEURIAL ASPIRATIONS OF YOUNGSTERS

The entrepreneurial aspirations are pervasive among youngsters in China.

1

SUPPORTIVE GOVERNMENT

China's ecosystem is predominantly driven and facilitated by the government.

3

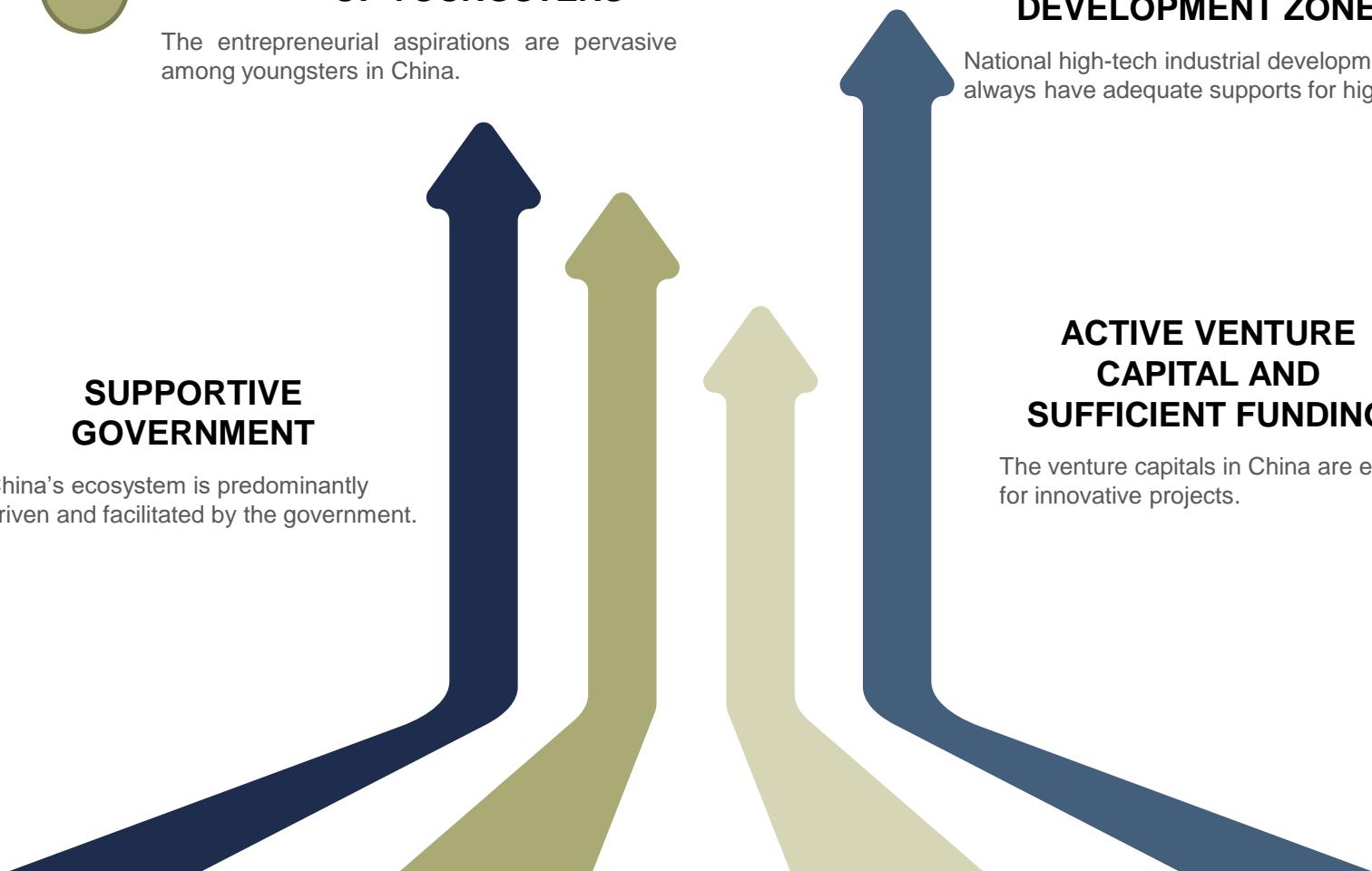
NATIONAL HIGH-TECH INDUSTRIAL DEVELOPMENT ZONES

National high-tech industrial development zones always have adequate supports for high-tech.

4

ACTIVE VENTURE CAPITAL AND SUFFICIENT FUNDING

The venture capitals in China are eager for innovative projects.





Key growth drivers, incl. government initiatives

1

The Chinese government pays much attention to promoting innovation as a major driver of the economy. The Chinese government has injected a noticeable amount of capital into the venture capital market to boost the development of startups. Education reform enacted by the government, such as the expansion of tertiary education over the past two decades, has helped to boost China's pool of human capital. The government has launched a number of programs aimed at cultivating scientific talents. The government intends to comprehensively upgrade all the industries and to make it more efficient and integrated so that it can occupy the highest parts of global production chains.

2

In China, numerous young people who were born in the 1980s and 1990s with entrepreneurial aspirations. Unlike their predecessors, these youngsters are not afraid of failure. For them, "trial and error" is an inevitable part in the way to success. The outcome, whether positive or not, adds to their experience and opens up, even more, opportunities in the future. They are the entrepreneurs with a shared dream of success, a pursuit of objectives brimming with creativity and a relentless drive to realize their goals. The youngsters excel in business model innovation, thus they will bring more innovative ideas to boost the development of the ecosystem.

3

National high-tech industrial development zones were very early examples of the government developing dedicated areas to support technology innovation. The government encourages the establishment of high-tech business incubators where startups can get the funding, mentoring, office spaces and other resources they may need to bring their business up to speed. The national high-tech industrial development zones in China are close to the key elements for startups such as universities, big companies, funding organizations, research organizations, etc., thus the startups in the zones can access to talents, capitals, innovative technologies easily.

4

Due to the innovative environment in China, many investors are willing to be involved in funding projects of innovative startups. Even global investors are pouring increasing amounts of capital into China's startup ecosystem, with 29.4% of global VC directed into Chinese startups in 2018. Thousands of domestic venture capital companies are competing in this market and seeking for growth opportunities. Altogether, these factors create a vibrant and promising Chinese venture capital environment for startups. Additionally, the venture capitals in China are resourceful: they are able to provide all-around supports to the startups they invested including human resource, marketing, strategy, etc.

Source: Frost & Sullivan



Promotion policies of each ecosystem in China

Ecosystem	Name	Effective Time	Enacted by	Content
BTH	Opinions on Accelerating Scientific and Technological Innovation to Cultivate Artificial Intelligence Industry	December, 2017	Beijing Municipal People's Government	It further enhances Beijing's artificial intelligence technology innovation capabilities, promote the deep application of artificial intelligence, foster related industry and promote the construction of high-tech economic structure.
	Interim Measures for Venture Capital Guidance Fund Management of Strategic Emerging Industries in Beijing	May, 2012	Beijing Development and Reform Commission	It raises the fundraising threshold of venture capital companies, and strengthens the business operational management of venture capital companies by publishing requirement in corporate governance, corporate finance situation, and compliance.
	Opinions on Accelerating Science and Technology Innovation to Develop Medical and Healthcare Industry in Beijing	April, 2018	Beijing Municipal People's Government	It stimulates the innovation vitality of the medical and healthcare industry, promote the development of intelligent, service, ecological and high-end medical and healthcare industries and continuously meet the growing healthcare needs of the people.
	Policies and Regulations of Tianjin Municipality on Promoting Employment through Entrepreneurship	October, 2013	Tianjin Municipal People's Government	The policy encourages all types of people to start businesses by providing offices and giving tax reduction and exemption to startups. Loan interest of startups will be given a discount of 50% of the benchmark lending rate.
	Measures to Further Strengthen Financial Support for Small and Micro Enterprises	November, 2012	Beijing Municipal People's Government	It supports qualified venture capital firms, equity investment companies, investment funds and their shareholders or limited partners to issue corporate bonds to expand the capital scale of these investment companies/funds, specifically for investing in startups.

Source: government websites, Frost & Sullivan



Promotion policies of each ecosystem in China

Ecosystem	Name	Effective Time	Enacted by	Content
YRD	Implementation Measures for Accelerating the High-quality Development of Artificial Intelligence	September, 2018	Shanghai Science and Technology Committee	It encourages agglomerating talents in the field of artificial intelligence, breaking through barriers in key core technologies, promoting the practical application of artificial intelligence, and accelerating the construction of national artificial intelligence industrial ecosystem.
	Opinions on Implementation of Shanghai Big Data Development	October, 2016	Shanghai Municipal People's Government	By 2020, it will basically form a big data development pattern in Shanghai with strong sense of data concept and data collection and convergence, high degree of openness of sharing, and extensive applications.
	Implementation Opinions of Promoting Innovation and Development of Biomedical Industry in Hangzhou	June, 2018	Hangzhou Municipal People's Government	It encourages actively introducing global biomedical innovation resources, and realizing the leap-forward development of the city's biomedical industry through government guidance, resource integration, key breakthroughs, and comprehensive promotion.
	Measures on Accelerating the High Quality Development of Suzhou Biomedicine Industry	April, 2019	Suzhou Municipal People's Government	Suzhou will focus on supporting medicine, medical devices and biotechnology startups in the next few years. Breakthroughs of R&D in pharmaceuticals, medical apparatus and instruments will be rewarded by the government. New R&D projects in medicine, medical devices and biotechnology will be funded at 15% of the project investment by the government.
	Opinions on Accelerating the Development of Future Industries	January, 2018	Hangzhou Municipal People's Government	It supports the development of core future technology industries, including cloud computing, big data, Internet of Things, artificial intelligence, 3D printing, quantum science, genetic editing, aerospace, new materials, new energy, etc., and strive to achieve major breakthroughs in science and technology.

Source: government websites, Frost & Sullivan



Promotion policies of each ecosystem in China

Ecosystem	Name	Effective Time	Enacted by	Content
PRD	Measures to Promote the Development of Venture Capital Industry in Shenzhen	January, 2019	Shenzhen Municipal People's Government	It creates a full-cycle venture capital ecosystem and policy environment. It also promotes the transformation of scientific and technological innovation achievements and facilitates the venture capital in promoting industrial transformation and upgrading.
	Shenzhen Robotics, Wearable Devices and Smart Equipment Industry Development Policy	July, 2019	Shenzhen Municipal People's Government	It encourages the development plan of robots, wearable devices and smart equipment industry. It also strengthens independent innovation capability, cultivating and developing enterprise entities, building industrial support system, and accelerating industrial talent recruiting.
	Measures to Further Accelerate the Promotion of Scientific and Technological Innovation in Guangzhou	July, 2019	Guangzhou Municipal People's Government	It encourages deeply implementing the innovation-driven development strategy. It encourages building a strong city of scientific and technological innovation, accelerating the improvement of the independent innovation capability.
	Measures to Promote the Development of Venture Capital Industry in Shenzhen	January, 2019	Shenzhen Development and Reform Commission	It encourages creating a full-cycle venture capital ecosystem and policy environment. The government also intends to promote the transformation of scientific and technological innovation achievements, and facilitate the venture capital in promoting industrial transformation and upgrading.
	Opinions on Accelerate the High Quality Development of High-tech Industries	August, 2018	Shenzhen Municipal People's Government	It proposes to implement the seven major projects and realize the main goals of scientific and technological innovation in the further development.

Source: government websites, Frost & Sullivan

Potential Ecosystem Evolution – Overall View



	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
Biotech	Biotech companies in China have been funded by all levels of governmental funds including state, provincial and local. The two major state funding programs are The National High Technology Research and Development Program for applied research and commercialization and the National Basic Research Program for early-stage research, which have funded many projects and startups in the last few years. China is leading certain fields of biotech such as genetic engineering, cancer research, stem cell research, etc. Thus, it is expected that biotech ecosystem will grow in the next five years in China.	
Environment / Sustainability / Waste Management	New companies with innovative technological advancements continue to shape the market dynamics in China. For the environment / sustainability / waste management market in China, it is really a huge area for applied technology. All levels of governments and companies in the industries that will produce wastes in China are willing to purchase effective new technologies in environment / sustainability / waste management. Thus, it is expected that ecosystem for environment / sustainability / waste management startups will grow in the next five years in China.	
Digital (AI, VR, big data, Cloud, etc.)	China is now a leading player in digital technology and digital innovation in the world with enormous growth potential. The ecosystem of digital technology is a rich digital ecosystem consisting of giants and startups. The government of China encourages investors to invest in digital technologies such as AI, big data, cloud computing, etc. Venture capital funds established by giant companies such as Baidu, Alibaba and Tencent will also help the startups in frontier technology innovation with funding, technology, business networks, etc. The digital ecosystem in China will grow in the next five years.	
Robotics	China's working-age population, people aged from 15 to 64 started declining in 2014, thus China is anxious about its manufacturing industry for shortage of skilled labor. The government encouraged to develop robotics to replace some positions of human, and thus to realize automated processes and intelligent manufacturing in the future. With the development AI technology, the development of robotics is accelerating in an unprecedented pace in China. Thus, it is expected that the robotics ecosystem will grow in the next five years in China.	

Source: startup websites, Frost & Sullivan



Potential Ecosystem Evolution – Overall View

	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
Consumer IoT	The major component segments of consumer IoT are categorized into the network infrastructure, sensor, logic device, processor, connectivity IC, and a memory device. The government is a major driving force behind the country's adoption of the consumer IoT. Now, China is leading some of the component segments such as network infrastructure, sensor, etc. Many investors in China have invested consumer IoT startups in China, thus it is expected that the consumer IoT ecosystem will grow in the next five years in China.	
Cosmetics / Beauty	The emerging startups in cosmetics / beauty industries in China are e-commerce brands with no fundamental innovation in products. Most products of these brands are produced by outsourced OEM or ODM companies. Additionally, most of these brands are focusing on lower tier cities in China, as the market in these cities is less competitive. In the future, with more brands in cosmetics / beauty industries of giant companies entering lower tier cities, the market share of emerging startups will be threatened. Thus, the ecosystem will shrink in the next five years in China.	
Health & Wellness	Strongly driven by the healthy living trend amongst many consumers in China, amidst the increasing busy life in modern society, consumers in the PRC are increasing focus on their health. The health and wellness product per capita consumption in the United States of America is approximately as 5.76 times larger as that in China in 2018. Thus, the potential for health & wellness market in China is huge for startups in China in the future. Additionally, driven by the aging population and more investment in the industry, the ecosystem will grow in the next five years.	
Pharma	Although China is the second largest pharmaceutical market after the United States in the world, some of the most effective modern medicines are not on sale in China. With the aging population, there are enormous needs for modern medicines in cancer, Alzheimer's disease, cardiopathy, diabetes, etc. in China. The government has funded many projects and research organizations in the past five years and funding organizations has invested many startups and unicorns in China. Thus, it is expected that the pharmaceutical ecosystem will grow in the next five years in China.	

Source: startup websites, Frost & Sullivan



Potential Ecosystem Evolution – Overall View

	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
MedTech / Medical device	In the past few years, investors and government serve as remarkable roles that offer medtech startups valuable resources and a vast network of industry leaders and experts in China. With the supportive investors and government, many startups in China grow rapidly in the past few years. The investors and government in China are expected to support the medtech startups in the future, thus the ecosystem will grow in the next five years.	
Chemicals / Materials / Textile / 3D printing	Chemicals / materials / textile / 3D printing industries have been key fields in China's national R&D system for years. The government has invested billions of funds in basic research and development of these fields. Additionally, many funding organizations such as PEs and VCs have invested billions of RMB in application innovations of these industries in each year. Thus, it is expected that the ecosystem will grow in the next five years in China.	
Agriculture	Agriculture is one of the basic industries in China. Most resources for agriculture of the government in China focus on modernization of farms, improving living standards of farmers, stabilizing the prices of agricultural products such as rice and other cereals. Thus, the investment in innovative technologies in agriculture will be stable for the next five years as well as the ecosystems of agriculture in China.	
Food	Most investment in the food industry is focusing on marketing such as e-commerce, rather than on research and development of deep tech. Moreover, most startups in the food industry in China cannot bear the risks of investing in deep tech. With more startups leaving food industry, the ecosystem is expected to shrink in the next five years in China.	

Source: startup websites, Frost & Sullivan

Opportunities For L'Oreal



Opportunities for L'Oreal in China	
Biotech	Traditional skin care technology is mainly focusing on the epidermis layer of skin while modern biological studies have found that proteins, special enzymes and regulatory cytokines play an important role in the growth and metabolism of cells during skin aging. The next generation of skin care technology will focus on the dermis layer of skin and improve the skin via cell engineering or protein engineering. For example, a startup called Health-Biotech (Beijing) has developed the world's first skin medication prepared from placental mesenchymal stem cells mixed with biomaterials. The stem cell technology can be used in the development of anti-aging products for L'Oreal.
Environment / Sustainability / Waste Management	There are many startups in China focusing on energy conservation and emission reduction related technology. Some of them have developed products for factories that can reduce the emission of carbon dioxide, VOCs and other concomitant noxious gases during the production process. Some of them have developed products for commercial buildings or residential buildings that can help save energy during daily use. For example, Zike Environment (Guangzhou) has a self-developed intelligent management platform for comprehensive treatment of air pollution with Internet of things (IoT) technology to realize remote control, operation and maintenance of intelligent environmental protection equipment. The intelligent management platform for comprehensive treatment of air pollution can be integrated in the production line of L'Oreal to optimize production and save energy.
Digital (AI, VR, big data, Cloud, etc.)	China is now a leading player in digital technology and digital innovation such as AI, big data, cloud computing, etc., in the world with enormous growth potential. There are many startups in China in the innovation of digital technology for skin care such as SkinRun (Shanghai): it is a company that provides smart skin test instrument with contains optical modules which can collect information of the testers' skin. The data collected by smart skin test instrument for skins can be used for R&D, production, marketing of beauty brands owners such L'Oreal via data analysis tools.
Robotics	Average salaries in China have increased rapidly over the last 10 years while the national labor force has been shrinking. With industrial robots, Chinese companies hope to keep innovating while cutting costs. The leading startups in robotics industry in China, such as Horizon (Beijing) and Turing (Shanghai) are developing robots with AI technology to realize more sophisticated functions. Considering the huge scale of production of L'Oreal, being involved in robotics projects in China can help L'Oreal to cut costs of production and boost the production efficiency significantly.

Source: startup websites, Frost & Sullivan



Opportunities For L'Oreal

Opportunities for L'Oreal in China

Opportunities for L'Oreal in China	
Consumer IoT	Now, China is leading some of the component segments of consumer IoT such as network infrastructure, sensor, etc. Leading consumer IoT startups such as BroadLink (Hangzhou) and Vane (Hangzhou) are developing third party IoT platform to connect more kinds of consumer IoT equipment in one system to realize household applications and beauty salon applications. It is an opportunity for L'Oreal to be involved in the consumer IoT applications in China via investing in consumer IoT startups especially in household applications and beauty salon applications that may coordinate with the beauty products of L'Oreal.
Cosmetics / Beauty	Most startups in cosmetics / beauty industries in China are e-commerce brands with very limited deep tech and limited budget for research and development. It is better for L'Oreal to be involved in other areas in China that have potential for cross-border cooperation with cosmetics / beauty business such as biotech.
Health & Wellness	The continuous technological developments have been influencing and transforming the health & wellness industry in China. The industry participants are investing hugely in the digitalization of health record, enabling healthcare professionals and individuals to collect and analyze huge amount of healthcare data, view past records and diagnose via portable devices and AI equipment, increasing efficiency and productivity. For example, a startup called Health Hope (Beijing) has developed an AI system called smart brain, which has rich knowledge and experience to support the daily personal health decisions of users. Beauty products are highly correlated with personal health, the similar technologies can also be applied in personal beauty. It is an opportunity for L'Oreal to invest in or acquire the innovative startups that involve the health & wellness of in China.
Pharma	Now, China is catching up in research and development of new modern medicines. There are many startups in China are developing tumor-targeted drugs based on genetic engineering technology such as De Novo Biopharma (Hangzhou), Yuanli Life Science (Shenzhen), etc. If L'Oreal can be involved in certain leading pharmaceutical projects in the fields like anti-tumor drugs, immunotherapy drugs, anti-aging drugs, etc., it will enjoy more growth in China. The genetic engineering technology applied by these pharmaceutical companies can also be applied in next generation beauty products development.

Source: startup websites, Frost & Sullivan

Opportunities For L'Oreal



Opportunities for L'Oreal in China	
MedTech / Medical device	The medtech sector in China has experienced rapid development in the past few years and it is expected to develop in the next few years. Some Chinese medtech companies in medical imaging, smart diagnosis system, precise surgery equipment, biomaterials, etc., have mature products launched in the market. For example, Bosisis Healing (Beijing) has developed regenerative extracellular matrix source materials for medical biomaterials, which can be applied in skin related business such as beauty products or cosmetic medicine. For L'Oreal, it will be reciprocal if they invest in medtech startups that have deep tech correlated with its key business.
Chemicals / Materials / Textile / 3D printing	In China, there are many remarkable applications of chemicals / materials / textile / 3D printing that can benefit the beauty related business of L'Oreal. For example, Revotek (Chengdu) has successfully implanted a 3D printed organ into living hosts during a series of animal trials using its proprietary and patented technologies. For L'Oreal, the 3D bio-printing technology could be used in the cosmetic medicine and beauty products development.
Agriculture	In China, most resources for agriculture are used for agricultural mechanization and improving living standards of farmers. Despite there are some innovative startups in agriculture industry in China are developing deep techs such as Gago which collects surface and meteorological data and consolidate the data of soil, land, crops and agricultural materials, the opportunities for L'Oreal is limited. The innovative technologies in agriculture industry in China are hard to be integrated with the business of L'Oreal in China.
Food	Most investment in the food industry is focusing on marketing and distribution such as e-commerce, rather than on research and development of deep tech. Thus, there are hardly opportunities for L'Oreal to build connections with startups in the food sector in China. However, the giant companies in China with research and development capacity are open to L'Oreal if both sides are willing to build mutual beneficial cooperation.

Source: startup websites, Frost & Sullivan

Growth Environment – Korea



South Korea is building on a strong foundation of traditional innovation system and intellectual properties. Korea has a chance to be a leader in the new deep tech space covering AI, Biotech and other emerging areas. Korea can leverage tangible IPs in the deep tech space and improve its ability vastly to create deep tech businesses

Ecosystem overview



The list of regional hubs / ecosystems



Seoul: Mapo, Hongreung, Magok, Gaepo, Gangnam Teheran Valley (AI, Biotech, Medical Tech (H&W), Med device Manf, Materials-nanotech, 3D printing)



Deaduk Valley, Daejeon (Robotics, consumer IoT, Biotech)



Pangyo, Gyeonggi (IoT, VR-AR, AI, Food, Agritech)



Gwanju – AI Industrial Complex and Energy valley

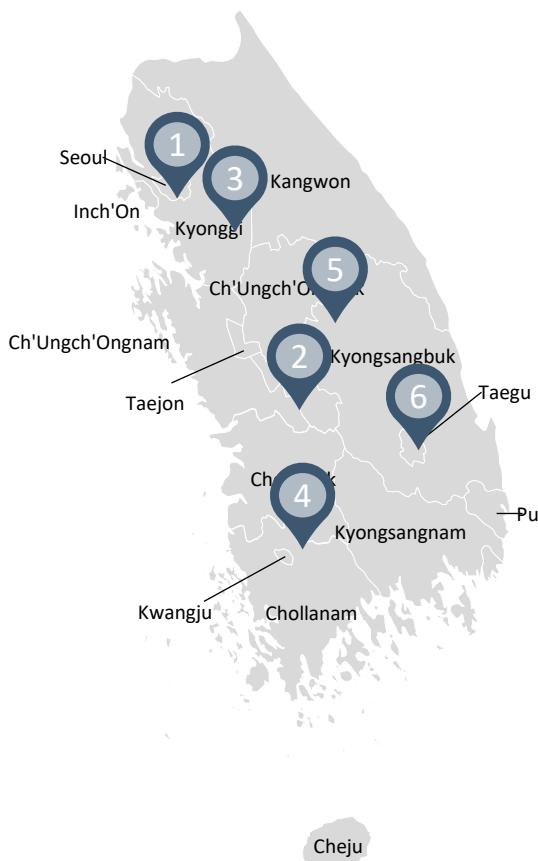


Wonju-Si, Gangwon-do - Medical Industry Technovalley, Biotech, Pharma



Daegu-Gyeongbuk - Medical Innovation Foundation, Pharma

South Korea



HIGHLIGHTS

- Korea has a deep tech ecosystem in growth phase
- Digital (AI, Blockchain VR/MR, Big Data), Biotech, Medtech, Robotics, Agritech and Consumer IOT are the deep tech areas that startups gravitate towards.
- Seoul is emerging as the most popular place for startups (including deep tech startups).
- Daejeon is emerging a prominent startup destination. Bluepoint Partners, a deep tech incubator has a lot of portfolio companies in Deaduk, Daejeon
- Kstartup offers business acceleration services for Korean innovators and entrepreneurs
- Korea's first industrial complex dedicated for artificial intelligence (AI)-related businesses will be in Gwangju
- Wonju-si and Daegu have medical clusters for Med devices and Pharma R&D

Ecosystem overview

Innovation ecosystem stakeholders



South Korea has a very fast growing deep tech ecosystems. Since 2015, the South Korean government has provided \$4bn to startups. Aim is to make Seoul a global top five startup city by 2022, with many companies focusing on startups. Startup hubs such as Seoul Global Start-up Center, Seoul Start-up Hub, and Pangyo TechnoValley. Korea ranks first in patent applications/GDP and Korean firms totally hold 640,412 patents (worldwide #3)

Many research organizations such as KEITI and KEPRI that conduct applied research in their focus domains. These institutes collaborate with the industry in Korea and globally to develop solutions

Apart from LG and Samsung, many other large companies such as Naver, Hanwah and Hyundai dominate the tech scene. It is acknowledged that the big companies have lost momentum for driving innovation. Bayer AG is investing in Health Tech startups in Korea. Google chose Kstartup as their first accelerator/incubator partner in Asia for the 'Google for Entrepreneurs' program. Most R&D investment comes from Industries and most of this goes to applied research.



South Korea has 8 leading universities that carry out applied research. Includes institutions such as KAIST, Korea University, Gwangju Institute of Science and Tech and Yonsei Univ

Strong Investment community in Korea with the participation of leading local and international VCs.
Strong support by Incubators and Accelerators such as Blueprint Partners, K Startup, Magellan and Primer. There are 38 Accelerators and Incubators in Korea

Korea has around 400 deep tech startups. AI is an important technology that accounts for almost half of the startups. The startups are driving the innovation scene in Korea supported by the Government, VCs and Incubators. Deep Tech startups are in AI, VR/AR, Med Tech, Biotech, Environment, Agriculture, Food, Energy and Chemicals among other areas. Large corporations have also invested in Korean startups.

Ecosystem overview

Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been estimated



Applications	Startups (for applications in scope)		Applied research Institutes	Interest level
Biotech	Total number	80	<ul style="list-style-type: none"> Korea Research Institute of Bioscience and Biotechnology (KRIBB) Korea Institute of Science and Technology Wonju Medical Industry Techno Valley Daegu-Gyeongbuk Medical Innovation National OncoVenture 	High
	Total investment	USD 700 million ↑		
	Top hubs	Seoul, Wonju-Si, Daegu		
	Highlights	Korea is focusing on Biotech sector and has developed “Medical” Clusters that cover Biotech, Pharma, Medical Devices and Wellness Devices. Relatively high number of deeptech startups in Biotechnology		
Pharma	Total number	2	<ul style="list-style-type: none"> Research Institute of Pharmaceutical Sciences, SNU, Seoul 	Low
	Total Investment	USD 15 million ↑		
	Top hubs	Seoul, Wonju-Si, Daegu		
	Highlights	The pharma industry is huge in Korea and dominated by Chaebols. However, the deep tech startups in this area is low. Some are privately held		
Medical/ Cosmetic Device Manufacturing	Total number	6	<ul style="list-style-type: none"> Korea Institute of Science and Technology (KIST), Seoul Wonju Medical Industry Techno Valley Daegu-Gyeongbuk Medical Innovation 	Medium
	Total investment	USD 50 million ↑		
	Top hubs	Seoul, Wonju-Si, Daegu		
	Highlights	Korean companies manufacture medium tech devices. Deregulation planned to enhance growth		

Ecosystem overview

Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been estimated



Applications	Startups (for applications in scope)		Applied Research Institutes	Interest level
Health & Wellness	Total number	11	Korea Institute of Science and Technology Wonju Medical Industry Techno Valley and Daegu-Gyeongbuk Medical Innovation	High
	Total Investment	USD 75 million ↑		
	Top hubs	Seoul, Seoul, Wonju-Si, Daegu		
	Highlights	Wellness devices such as fitness trackers, genetic testing, mobile devices for diagnostics.		
Environment / Sustainability / Waste Management	Total number	6	Korea Environmental Industry & Technology Institute (KEITI), Seoul	Med
	Total investment	USD 15 million →		
	Top hubs	Seoul		
	Highlights	Not that high interest area in Korea for deeptech.		
Digital (AI, AR, VR, big data, Cloud)	Total number	44	Korea Advanced Institute of Science and Technology (KAIST), Daejeon	High
	Total investment	USD 200 million ↑		
	Top hubs	Seoul, Pangyo, Gwanju		
	Highlights	AI Industrial Complex coming up in Gwanju to develop AI convergence technologies. High interest area among Korean VCs and Incubators		

Source: Crunchbase, Seoulz.com, ,K-Startup, e27, Venture Radar, Local Governments, VC websites

Ecosystem overview

Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been estimated



Applications	Startups		Applied Research Institutes	Interest level
Robotics	Total number	4	Korea Institute of Robotics & Technology Convergence (KIRO)	Med
	Total Investment	USD 50 million ↑		
	Top hubs	Seoul, Daejeon	KAIST – Mechanical Engg Dept DGIST, Department of Robotics	
	Highlights	Korea plans to expand the nation's robotics technology into a 15 trillion-won (\$13.3 billion) industry, with the aim of becoming the fourth-largest player in the world by 2023.		
Sensors and instrumentation (Consumer IoT)	Total number	6	ETRI (Electronics and Telecommunications Research Institute)	Med
	Total Investment	USD 40 million ↑		
	Top hubs	Seoul, Daejeon, Pangyu	The Korea Electrotechnology Research Institute (KERI)	High
	Highlights	Emerging area with innovative startups		
Chemicals / Materials / Textile / 3D printing	Total number	10	The Korea Electrotechnology Research Institute (KERI)	High
	Investment (2019)	USD 60 million ↑		
	Top hubs	Seoul, Daejeon		
	Highlights	Most incubators have atleast one 3D printing company in their premises. Nanomaterials startups identified.	Ulsan National Institute of Science and Technology (UNIST)	

Ecosystem overview

Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been estimated



Applications	Startups (for applications in scope)		Applied Research Institutes	Interest level
Cosmetics / Beauty	Total number	5	<ul style="list-style-type: none"> Korea Cosmetic Industry Institute Kolmar Korea: with TIPS AmorePacific R&D Center It's skin 	Med
	Total Investment	USD 7 million ↑		
	Top hubs	Seoul		
	Highlights	While many cosmetics companies are in Korea and the ecosystem is huge, 5 companies in the deep tech area identified by Frost & Sullivan		
Agriculture	Total number	4	National Institute of Agricultural Sciences	Med
	Total Investment	USD 10 million →		
	Top hubs	Daejeon, Seoul		
	Highlights	Smart agriculture is an important area for Korea. Frost & Sullivan has identified 4 startups in this space		
Food	Total number	4	Korea Food Research Institute (KFRI)	Med
	Total investment	USD 6 million →		
	Top hubs	Seoul		
	Highlights	Most food startups into food preparation & delivery. One deep tech startup to make meat replacements from plants		

Ecosystem overview

Start-up Ecosystem in the Application Areas



1. Biotechnology (Biotech) Startups	Applied Research Institutes
<p>Korea has a very strong Biotech sector. A good concentration of these startups are in Seoul</p> <p>The Korean government's plan to invest more than \$1.7 bn in biotechnology and biopharmaceutical sectors over the next five years will attract foreign investment.</p> <p>The government is supporting its strategy to become a global biotech hub by using its excellent infrastructure, along with top-level clinical study capacity and other IT platforms.</p> <p>Korean major biopharmaceutical companies such as Celltrion and Samsung Bioepis have already established their stronghold in the race for the development and commercialization of biosimilars.</p> <p>Korean biotech startups are now targeting to enter the US markets</p> <p>Among interesting startups in the Biotech space are:</p> <ul style="list-style-type: none">• RevoSketch, Daejeon: Molecular Diagnostics focused on developing digital PCR platform• MK biotech, Daejeon: Cloning Technology for the Development of New Pharmaceuticals• Bisichem, Seongnam: Development of Molecule Targets for Immune-oncology Therapy or Targeted Cancer Therapy	<ul style="list-style-type: none">• Korea Research Institute of Bioscience and Biotechnology (KRIBB), Daejeon, is dedicated to biotechnology research across a broad span of expertise from basic studies for the fundamental understanding of life phenomena to applied studies and business development.• National OncoVenture , Goyang-si, Gyeonggi-do, is a Korean government funded oncology drug development program

Ecosystem overview

Start-up Ecosystem in the Application Areas



2. Robotics Startups

Korea plans to expand the nation's robotics technology into a 15 trillion-won (\$13.3 billion) industry, with the aim of becoming the fourth-largest player in the world by 2023. Through the plan, the government will help boost the robotics industry in both manufacturing and service sectors.

Some interesting startups

- ANGEL ROBOTICS is a company that develops wearable robots to aid disabled individuals with paraplegia and senior or pediatric patients with difficulties in walking. ANGEL ROBOTICS was established as a spin-off company by a group of engineers from the Robot Systems Control (RSC) Laboratory (Laboratory Site Link : robotics.kaist.ac.kr), a part of Department of Mechanical Engineering, KAIST (formerly the research group used to belong to Sogang University). The director of RSC Lab, Prof. Kyoungchul Kong, is the founder and CEO of ANGEL ROBOTICS.
- SG Robotics: developed self-powered exoskeleton devices, The start-up's robots, which are designed for people with disabilities or paralyzed individuals, give any person extra strength when walking, and also have the ability to carry heavy loads

Applied research Institutes

Korea Institute of Robotics & Technology Convergence (KIRO) is a leading R&D institute specializing in robotics and technology convergence under the Korean Ministry of Trade, Industry and Energy

KAIST – Mechanical Engg Dept

DGIST (Daegu Gyeongbuk Institute of Science and Technology), Department of Robotics

Ecosystem overview

Start-up Ecosystem in the Application Areas



3. Digital (AI, VR, big data, Cloud) Startups

More Investment from VCs or AI and AI related applications startups

According to the Korea VR-AR Industry Association, the overall Korean VR market has grown to \$1.3 billion in 2017 and is expected to reach a staggering \$5.2 billion by 2020. The Korean government is committed to VR-AR industry, allocating A\$270 million in 2018 in order to support the development of the sector

The national AI research center in Gwanju will be Korea's top convergence technology research facility aimed at supporting national research projects for core technologies such as AI as well as research and work by private enterprises. It will also help researchers test, verify and standardize the AI systems they have developed.

Some interesting startups identified by Frost & Sullivan:

- Looxid Labs is a tech start-up to seamlessly integrate an emotion recognition system with VR using an eye and brain interface.
- Roborus - facial recognition + machine learning: using AI and machine learning technology to facial recognition to enhance customer experiences at retail stores, restaurants, coffee shops, and hotels.
- NeuroControls develops Cognitive Sensors and Systems using the latest A.I. technologies in electronics and cloud computing.
- Rink is a wireless hand motion controller that let you reach out and grab objects in virtual reality.

Applied research Institutes

Korea Advanced Institute of Science and Technology (KAIST), Daejeon, aims to develop brain-like computing and brain computing technology based on human brain cognitive information processing mechanism and apply these technologies to build intelligent, emotional and autonomous artifacts such as social human robots, self-driving vehicles, medical/healthcare systems, intelligent service agents, and a large scale smart infrastructure including smart farm, smart manufacturing, smart city and smart planet eventually that would provide humans convenience, well-being, safety and freedom

Ecosystem overview

Start-up Ecosystem in the Application Areas



4. Environment/Sustainability/Waste Management Startups	Applied Research Institutes
<p>Korean government introduced Extended Producer Responsibility to promote the reduction, reuse and recycling of waste by encouraging manufacturers to take into account the increasing concern about the environment. The Korean government bans single-use plastic bags at retail shops and colored plastic bottles for beverages to improve waste recycling</p> <ul style="list-style-type: none">• Foresys, Seoul: provides innovative R&D and engineering services for ocean structuring and contributes to sustainability through its renewable energy projects. developing various floating barriers for debris, oil & chemical, jellyfish, etc - basically taking care of the marine environment. offers services for renewable energy projects involving wind, wave, and current energy through design, evaluation and investigations• Ecube Labs is a Korean IT company that develops smart waste management solutions and remote monitoring tools.• Seohyun Life: fine dust measuring instrument• XRE's patented drinking cans tab design reduces beverage wastage	<ul style="list-style-type: none">• KEITI's core task is to support small and mid-sized enterprises which possess outstanding technologies but lack the resources to commercialize them. KEITI provides these companies with the support they need during the start-up and growth stages to help them more effectively advance into the global market.

Ecosystem overview

Start-up Ecosystem in the Application Areas



5. Consumer IoT (Sensors & Instrumentation) Startups

- Koreans are getting accustomed to gadgets. Korea's high-speed internet service allows for various services over the internet. South Korea telecommunications companies such as SK and KT have made faster internet a priority in South Korea. The country was also among the first to implement 5G. The demand for connected device technology increases year after year. Korea has a number of emerging and innovative IoT startups.
- Some interesting startups in the Consumer IOT space:
 - Olive Healthcare Inc. (Bello): Korean IoT startup Olive Healthcare Inc. is the maker of a portable scanner called Bello. Bello uses infrared spectroscopy to measure belly fat. Olive Healthcare Inc. has already gotten over \$4 million in funding from Korea Investment Partners and Partners Investment.
 - Korean IoT Startup Bagel Labs is the creator of PIE a smart tape measure. PIE is used to measure a person's body size and then transfer that data to its smartphone app.
 - Korean IoT startup THE WAVE TALK has created a biosensor technology that can detect bacteria and small particles in food, water, and the environment in real-time.

Applied Research Institutes

- IoT innovation center G•ROUND21: innovation center which brings startups, research institutes for IoT. It will support core ICT technology development like ICBM (IoT, Cloud, Big-Data, Mobile), etc.
- ETRI's (Electronics and Telecommunications Research Institute) Smart ICT Convergence Research Department: carry out development of ICT technology and next-generation IoT technology

Ecosystem overview

Start-up Ecosystem in the Application Areas



6. Agritech (Agriculture) Startups

Korean Government has committed investment to develop smart farming. The Smart Farm Innovation Valley, an ICT-based agriculture cluster, is a state-run project promoting the growth of agriculture and related sectors through nurturing talent and technological innovation. Korean government to invest 50.5 billion won in agritech venture fund to boost agriculture industry

Some interesting startups in the Agritech Space

- Greenoid Daejeon Multifunctional Robot for Agriculture
- Sherpaspace Daejeon Virtual Light for Agriculture
- SMARF Daejeon Algorithm-based Agricultural Devices/ Services
- N.THING Seoul Gangnam Development of a Container-type Smart Farm Cube that Combines Agriculture and IoT
- MannaCEA - Manna Controlled Environment Agriculture - is a smart agriculture company that develops controlled environment agriculture systems and automated food production solutions

Applied research Institutes

- National Institute of Agricultural Sciences provides the foundation for development of Agricultural technology and technology transfer
- Various institutes across the country undertake research in agritech
- Ministry of Agriculture and Food supports research and development for new product development and the development of technical difficulties in production sites for food start-ups

Ecosystem overview

Start-up Ecosystem in the Application Areas



7. Cosmetics/Beauty Startups	Applied research Institutes
<ul style="list-style-type: none">Cosmetic industry development plan 2018 (Ministry of Health and Welfare, MOHW)<ul style="list-style-type: none">About 55.6 billion won budget by 2020; Development promising technology for applied skin science; Support for cosmetic industry development; Plans to build Innovative beauty tech hub to bring beauty technology companies together <p>The hottest industry for the last few years has been the Korean beauty and skincare industry. Korean beauty startups are looking to bring a lot of innovation into their products</p> <ul style="list-style-type: none">Reziena: develops personal homecare beauty IoT devices that use intense focused ultrasound (IFU) technology. Developing a smart sheet mask with LED and iontophoresis technology, focusing to develop their Big Data platform based on the user's personal data so they can have a personalized beauty service at homeVirtualive(Hairfit): the creator of the AR fair and fashion app Hairfit, which is an AR-enabled virtual hairstylist that can take selfies and apply different types of hairstyles to itMelixir makes Vegan cosmeticsTroxederm is the trademark of ZEVAHEALS which makes the best green cosmetics for people who want healthy and beautiful skin. It combines Troxerutin with natural ingredients to make safe skincare productsGenoFocus is a platform technology company developing enzyme solutions for specialty food, eco-friendly processes, biopharmaceuticals, cosmeceuticals and agriculture	<p>Korea Cosmetic Industry Institute: To strengthen the global competitiveness; to support R&D in cosmetic field</p> <ul style="list-style-type: none">Kolmar Korea: with TIPS (Accelerator Investment-Driven Tech Incubator Program for Startup) to find 4th industrial revolution based cosmetic startups.AmorePacific R&D Center: Korea's first cosmetic research center established in 1954. Research bio, skin cells, natural material, medical, etc. trying to develop next generation technologies.AP TechUP+ program: Amore Pacific provides startup support program to find companies which will lead beauty market.It's skin: Startup accelerating support business with Hanwha DreamPlus.

Ecosystem overview

Start-up Ecosystem in the Application Areas



8. Medical Tech (Health & Wellness) Startups

There is a growing trend for HealthTech startups in South Korea. The big corporation are also very dominant in this area.

Bayer AG, recognizing the deep tech potential in Korea's Health & Wellness sector is investing in it.

- Lunit (formerly known as Cldi) has developed a chest radiography nodule software. The software uses deep learning technology and algorithms for medical image analysis and nodule detection in real-time.
- Sky Labs is a developer of a ring-type device called Cardio Tracker (CART) used to make an accurate diagnosis and provide customized management of atrial fibrillation.
- Life Semantics: focus on developing software platforms and systems for the medical industry. Their main platform called Life Record integrating health record data from hospital for their disease prognosis prediction algorithm.
- BBB manufactures Android-based mobile diagnostic devices. Its offerings are MarkB (for cancer, cardiovascular diseases, and Alzheimer); Neurogear (a head-worn device for brain therapy); True Plasma (blood glucose test strips); elemark (blood testing solution for chronic diseases); Gmate (connected glucose meter) and porta-qGB (lateral flow immunoassay reader).
- Genoplan, Seoul Seocho: Genetic testing system that provides the most accurate DNA analysis for Asian population

Applied research Institutes

Korea Institute of Science and Technology has two research divisions:

Biomedical Research Institute and Brain Science Institute

Ecosystem overview

Start-up Ecosystem in the Application Areas



9. Pharma Startups

The Pharma innovation in Korea is dominated by the large pharma companies.

As the 3rd largest pharma region in Asia, Korea's booming pharma industry is dominated by family-run conglomerates (Chaebol). Even tech giants Samsung and LG have transitioned seamlessly into the life-sciences sector.

The startups are focusing on Biotechnology (Biopharma).

Two startups identified in the Pharma space:

- Abion: Advancing companion diagnostic-based medicine as innovators across global markets.
- Cellatoz Therapeutics at solving the unmet medical demand of intractable diseases.

Applied Research Institutes

Research Institute of Pharmaceutical Sciences, SNU, Seoul

Ecosystem overview

Start-up Ecosystem in the Application Areas



10. Med / Cosmetic Device Manufacturing Startups	Applied research Institutes
<p>The South Korean medical device market is estimated to reach \$5.8 billion in 2019. The country depends on high-end medical devices from the U.S., Germany, and Japan to supply about 60 percent of total market demand. South Korean companies make comparatively lower-end (mid-technology) medical devices.</p> <p>The medical device market in Korea has grown at an annual average rate of 7.6% in the past five years, at least three times the rate of the global medical device market (2.2%). However, 82.4% of medical device manufacturers in Korea are companies with fewer than 20 employees, and 80.8% have annual sales below KRW 1 billion. As small firms tend to lack the competencies to develop high-value products and have limited R&D investment, Korea's market share and global competitiveness are low.</p> <p>The close cooperation between established global players in this field and Korean technology leaders may open new doors and markets. Today there are several initiatives in place to liaise global players with local manufacturers. Two Med device R&D and Manufacturing clusters are in Wonju-Si, Gangwan Do and Daegu. Some interesting Startups:</p> <ul style="list-style-type: none">• Recens Medical, Ulsan: Startup developed the First Prototype Devices of Precision Cryotherapy and also developing rapid-cooling anesthesia devices.• Beflex, Daejeon: Development of the World's First Biomechanics Solution• Healcerion, Seoul Guro: Portable Ultrasound Device and Mobile-based Ultrasound System	<p>Korea Institute of Science and Technology has two research divisions: Biomedical Research Institute and Brain Science Institute</p> <p>Wonju Medical Industry Techno Valley Incorporated Foundation and Daegu-Gyeongbuk Medical Innovation Foundation</p> <p>Five major hospitals with special programs for advanced technology: Seoul National University Hospital, Samsung Medical Center, Asan Medical Center, Yonsei Medical Center and Catholic St. Mary's Hospital.</p>

Ecosystem overview

Start-up Ecosystem in the Application Areas



11. Chemicals / Materials / Textile / 3D printing	Applied research Institutes
<p>The Ministry of Science, ICT and Future Planning in South Korea planned to spend 41.2 billion won (Approx. \$37 million USD) of 2017's annual budget to encourage the development of 3D printing across the nation</p> <p>There is an abundance of Korean startups in 3D printing, with most incubators hosting atleast one. Korean government strongly believes in the future of 3D printing technology and believes the range of applications need to be adopted by start-ups</p> <p>Nanomaterials is another area with startups</p> <p>Rokit: They aim to develop 3D printing of human skin for burn victims and those with dermatological ailments.</p> <p>T&R Biofab is a biotechnology company which creates a better future with 3D printing technology that raises the value of the world</p> <p>InssTek is a metal 3D printing company in the Additive Manufacturing market.</p> <p>BioSynectics -located in Seoul, Korea- is a company specializing in the production of nanoparticles technology</p>	<p>The Korea Electrotechnology Research Institute (KERI) has developed a new technology to 3D print highly conductive multiwall carbon nanotubes, or MWNT, using liquid ink.</p> <p>Ulsan National Institute of Science and Technology (UNIST) is taking an innovative approach to 3D bioprinting.</p>

Ecosystem overview

Start-up Ecosystem in the Application Areas



12. Food Technology Startups	Applied research Institutes
<p>While most Food startups in Korea are focusing on food preparation, nutrition, packaging and delivery, there are few innovative companies in food tech and also probiotics.</p> <p>Probiotics is the most active field of commercialization of microbiome research following intestinal microorganisms.</p> <p>The PlantEat Inc., Seoul: Korean Food tech Startup PlantEat researches and develops alternative food products. They are the fastest-growing R&D focused food technology startup in Korea. They focus on producing data-based plant materials. They are partnering with EzFarm to develop technology for growing plant foods and natural ingredients that can replace meat.</p> <p>PureSpace manufactures photocatalytic oxidation (PCO) devices. The aim is to pursue extension of shelf-life, improved food quality and food safety by ethylene and mold removal, and also sterilization</p> <p>BIFIDO is trying to be the world best in probiotics based food technology</p>	<p>Korea Food Research Institute (KFRI), Gyeonggi-do: government funded entity established in 1988 so as to contribute to the development of food, agriculture, forestry and fisheries industries and to the improvement in the quality life of the people by means of developing, diffusing and intensifying fundamental technologies in the field of food science</p> <p>Other Agencies: Korea Food Tech Association: Food tech start-up and professional association</p> <p>Food Tech nurturing investment fund Ministry of Agriculture and Food supports research and development for new product development and the development of technical difficulties in production sites for food start-ups</p>

Ecosystem overview

Start-up Ecosystem in the Application Areas



Major VCs, Incubators and Accelerators for Deep Tech Startups in South Korea (1/3)

There are many VCs, Angel Investors, Accelerators & Incubators in South Korea. Some of the important ones are:

VCs

Korea Investment Partners- Korea Investment Partners (KIP), a member of Korea Investment Holdings:

Postech Holdings: Investment in deep tech based startups in IT, biosciences, etc

SoftBank Ventures Asia: SoftBank Ventures Asia partners with Korea Venture Investment to help Korean AI startups

Other Investors: Coolidge Corner Investment, Atinum Investment, DSC Investment, Kakao Ventures, LB Investment, Mirae Asset Venture Investment

Incubators and Accelerators

KOISRA Seed Partners

KOISRA Seed Partners is a startup accelerator that accepts startups working in the IoT, E-Commerce, Internet, Robotics, Cyber Security etc. The firm offers up to ₩30M funding to startups. The accelerator runs its programs primarily in Korea.

Location: Gangnam (South Korea)

Kstartup

Kstartup is a startup accelerator that offers business acceleration services mainly in South Korea. The firm accepts startups working on a wide range of technologies and sectors.

Location: Seoul (South Korea)

Ecosystem overview

Start-up Ecosystem in the Application Areas



Major VCs, Incubators and Accelerators for Deep Tech Startups in South Korea (2/3)

Bluepoint Partners

Bluepoint Partners Program is a startup accelerator. The accelerator runs its programs in Daejeon-city. Accepts startups working on a wide range of technologies and sectors.

Location: Daejeon (South Korea)

Magellan Technology Investment

Magellan Technology Investment is a VC fund and startup incubator based in Seoul, Korea. It offers incubation and mentoring services to startups. It invests in startups across sectors such as healthcare, mobile, energy, manufacturing etc.

Location: Gangnam (South Korea)

TIPS (Tech Incubator Program for Startups): Operated by Ministry of SMEs and Startups, supporting private-led technology start-up

Ecosystem overview

Start-up Ecosystem overview and definition with the different applications



Major VCs, Incubators and Accelerators for Deep Tech Startups in South Korea (3/3)

Seoul Startup Hub

Korea's largest public incubator, Seoul Startup Hub, offers a wide range of services from manufacturing business products in small quantities to solving business challenges. Seoul Startup Hub recruits about 130 startups at various business stages, from pre-launch to mature. Startups selected to join the hub are provided with a customised incubating program, office space, subsidies and customised support, including free consulting, business model analysis, pivoting and market strategies.

SparkLabs

Sparklabs is a global accelerator providing investment solutions and mentoring for seed to early-stage startups wishing to expand globally. They provide a 3-month accelerator program twice a year.

Korean Conglomerate Accelerators

Samsung Next, SK Planet, Naver D2 Startup Factory, etc



Key growth drivers

ROBUST GROWTH ENVIRONMENT FOR STARTUPS

1

- Korea has a robust environment for startups in the form of VCs, Incubators and Accelerators.

GOVERNMENT RESEARCH INSTITUTES

2

- Korea has established leading research institutes for each of the key industry sectors. KAIST, KEITI, KRIBB, etc foster research and development in the country

3

GOVERNMENT INITIATIVES FOR ESTABLISHING INDUSTRIAL CLUSTERS - AI, BIOTECH, ETC

- The government is investing in infrastructure for developing industrial clusters.
- The AI Complex, the medical clusters, etc are examples of such clusters.

4

INNOVATION DRIVEN CULTURE AND STRONG IP PROTECTION

- Korea has a culture of innovation and most Korean startups focus on advanced technology.
- Korea has enacted strong IP Laws and a sound legal system
- The country has a stable political climate

5

FAVORABLE GOVERNMENT POLICIES

- Startup Direct Fund and Tax Incentives for Startups
- Deregulation in medical devices/health & wellness space to foster growth

Government Initiatives



1

Start up Fund for Startups

The Korean government is trying to encourage startups by infusing \$12 billion to fund startups by 2022.

2

Tax Incentives for Startups

Special tax deductions for SMEs. A special deduction on corporate taxes is available for SMEs when they are engaged in a qualified business

4

Government Initiatives for Establishing Industrial Clusters

The Korean government and The Korea Industrial Complex Corp (KICOX) will further the program, making Korean industrial complex clusters globally competitive.

5

Korean Patent Laws and IP Protection

Korea is party to Paris Convention, Patent Cooperation Treaty WTO, Madrid Protocol, Budapest Treaty, Berne Convention among others. The Korea patent law was changed in 2017 to shorten the period of deferring the substantive examination of a patent application from five years to 3 years

3

Deregulation of Medical devices to enhance growth

Medical devices regulation is to be eased. This will pave the way for further growth of this industry

Potential Ecosystem Evolution – Overall View

How will the ecosystem evolve in the next five years (2020 to 2025) and what business opportunities will they create?



	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
1. Biotech	Great push from Government for developing Biotech. VCs and other investors have shown high interest. Application area (in scope) with most number of deep tech startups. Expected to grow further in the next 5 years Growth stage ecosystem	
2. Environment	Lot of Government initiatives to improve environment. Large corporations and research institutes are driving innovation in this area. Not a very strong area for deep tech startups. Not forecast to have a high growth of startups in the next 5 years	
3. Digital	Fast growing area with sizeable number of deep tech startups. The wide reach of these applications AI, VR, AR, Big Data offer a good appeal for innovators and investors. Government push also strong. Growth stage ecosystem. Expected to grow further in the next 5 years	
4. Consumer IOT	This application area has seen a few deep tech startups. Most of these are linked to H&W. Fitness trackers, heartbeat trackers etc. The high speed of internet and the infrastructure enabling the growth of the consumer IOT devices. Early growth stage. Expected to see some new entrants but less compared to the top application growth areas.	

Potential Ecosystem Evolution – Overall View

How will the ecosystem evolve in the next five years (2020 to 2025) and what business opportunities will they create?



	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
5. Robotics	Strong area of interest for the big corporations, government institutes and startups. Well defined ecosystem shaping up. Growth stage ecosystem. Expected to see new entrants. Forecast to grow in the next 5 years	
6. Chemicals, Materials, 3D printing	3D printing emerges as the most popular area for deep tech. Innovations such as Tissue 3D printing show tremendous potential. Deep tech startups driving innovation. There is work on advanced materials in the institutes and big corporations. Early growth stage. Expected to see new entrants, especially for 3D printing, in the next 5 years	
7. Cosmetics	Not many deep tech companies in cosmetics. However, the cosmetics industry is huge in Korea. The innovation is driving by various institutes and corporations. Expected to see a few entrants in the next 5 years	
8. Pharma	Pharma is dominated by large corporations with very few deep tech startups. Institutes also drive innovation. Not expected to see growth of deep tech startups who are gravitating more towards Biotech instead of conventional pharma.	

Potential Ecosystem Evolution – Overall View

How will the ecosystem evolve in the next five years (2020 to 2025) and what business opportunities will they create?



	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
9. Health & Wellness	Innovation driven by startups, big corporations and institutes. Deep tech startups are entering this area and expected to grow in the next 5 years. Deep tech startups from Korea are expanding to other countries.	
10. Medical Devices	Korea is a big market for medical devices. However, the devices are mid tech and not high tech. The government is planning to ease regulations in this area to drive growth. This area will see influx of deep tech companies. However, it would be lesser compared to Biotech and Health & Wellness areas. Growth ecosystem	
11. Agriculture	A high priority area for the Korean government and government institutes. This is also an area big corporations drive innovation. Not many deep tech startups in this area. Not many deep tech startups expected in this area in the next 5 years	
12. Food	Food technology is another priority area for the government, government institutes and big corporations. Probiotics is also gaining importance.	

Potential Opportunities for L'Oreal (3/3)



Potential Opportunities for L'Oreal	
1. Biotech	A huge area of opportunity for working with Biotech Startups in Korea. There are some very interesting innovations from startups covering molecular diagnostics, cloning technology and cancer therapy.
2. Environment	An important focus area for Korea, F&S has been able to identify a few deep tech innovations from startups. Smart waste management solutions and remote monitoring tools.; fine dust measuring instrument and drinking cans tab design reduces beverage wastage
3. Digital	A fast growing area for startups with very innovative solutions: Emotion recognition systems with VR using an eye and brain interface Facial recognition combined with machine learning to enhance user experience Cognitive Sensors and Systems using the latest A.I. technologies in electronics and cloud computing. Wireless hand motion controller that enable user reach out and grab objects in virtual reality.
4. Consumer IOT	A few innovative deep tech startups were identified by Frost & Sullivan. Most of these cater to the wellness category. Infrared spectroscopy to measure belly fat. Smart tape measure A biosensor technology that can detect bacteria and small particles in food, water, and the environment in real-time.
5. Robotics	A fast growing area with startups working on robotic assistants for disabled and robotic exoskeletons.

Potential Opportunities for L'Oreal (2/3)



Potential Opportunities for L'Oreal	
6. Chemicals, Materials, 3D printing	The 3D printing segment is very popular with startups in Korea. Some of them are into deep tech such as 3D printing of human skin and metal 3D printing solutions. A startup specializing in the production of nanoparticles technology is also identified
7. Cosmetics	Vegan cosmetics; green cosmetics are some of deep tech innovations in cosmetics startup space in Korea
8. Pharma	While a very important industrial sector, only 2 startups were identified by Frost & Sullivan. One for companion diagnostics and the other for therapeutics
9. Health & Wellness	A growing area of opportunities. A chest radiography nodule software that uses AI for image analysis; a Cardio Tracker device, portable testers for cancer, genetic testing and DNA analysis are some of the innovations that offer opportunities
10. Medical Devices	Another important area for opportunities with startups. Precision cryotherapy, anesthesia devices, biomechanics solution and portable ultrasound systems offer potential opportunities.
11. Agriculture	Smart farming is the main theme of innovations. Startups that make multifunctional Robot for Agriculture; virtual light for agriculture, algorithm based agricultural devices and combining IOT with agriculture
12. Food	A start up that can extend the shelf life of foods and another that develops alternative food products. Probiotics is another growing area for startups with one successful startup identified

Growth Environment – Japan



Japan startup landscape is fast evolving

Compared to the United States and given the fact that it is one of the top national economies globally, Japan's startup ecosystem is still nascent. Complex and strict administrative procedures, presence of large corporations and lack of co-ordination between the government agencies had hindered the growth of startups in Japan.

However, these circumstances are changing, as big firms are not seen as stable as they used to be and more Japanese employees are leaving corporate jobs to set up their own companies. Moreover, the Japanese government took noticeable actions to help develop efficient startup ecosystems under the frame work of Abenomics.

Ecosystem overview



Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been estimated

Applications	Startups		Applied research Institutes	Interest level
Biotechnology (Biotech)	Total number	28	RIKEN. AIST Biotechnology Research Institute for Drug Discovery. The University of Tokyo, The Biotechnology Research Center. Nippon Institute for Biological Science.	High
	Total investment	USD 500 million ↑		
	Top hubs	Kanto, Kansai, Hokkaido		
	Highlights	The aging population in Japan draws strong investments and efforts toward biotech, pharmaceutical, medtech, and healthcare.		
Pharma	Total number	3	Research Institute of National Center for Global Health and Medicine(NCGM). RIKEN-Center for Integrative Medical Sciences.	High
	Total Investment	USD 89 million ↑		
	Top hubs	Kanto, Kansai, Hokkaido		
	Highlights	Clusters focus on biotech pharma, medtech and healthcare as a whole.		
Medical Tech (Health & Wellness)	Total number	12	National Center for Geriatrics and Gerontology (NCGG). The BioBank Japan Project.	High
	Total investment	USD 78 million ↑		
	Top hubs	Tokyo, Osaka, Fukuoka, Hokkaido		
	Highlights	Its position as a global tech and biomedical powerhouse makes Japan an ideal incubator of cutting-edge devices and applications.		

Ecosystem overview



Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been estimated

Applications	Startups		Applied Research Institutes	Interest level
Medical devices	Total number	4	MTJapan: the Medical Technology Association of Japan. Japan Biodesign.	High
	Investment	USD 452 million		
	Top hubs	Kanto, Kansai, Fukuoka, Aichi		
	Highlights	Robotics is taking a more and more important share in the development of medical devices in Japan.		
Environment / Sustainability / Waste Management	Total number	4	National Institute for Environmental Studies (NIES). AIST-Department of Energy and Environment.	Low
	Total investment	USD 10 million		
	Top hubs	Kanto, Osaka city, Kitakyushu		
	Highlights	Smart cities are the engine of innovation for environment. Osaka and Kitakyushu are leading but still have few startups.		
Digital (AI, VR, big data, Cloud)	Total number	43	RIKEN – AIP Center for Advanced Intelligence Project. AIST – AIRC Artificial Intelligence Research Center. The University of Tokyo - Matsuo Laboratory	High
	Total investment	USD 925 million		
	Top hubs	Kanto, Kansai, Fukuoka, Aichi		
	Highlights	AI by itself has a very high level of interest, followed by Cloud (all categories combined) and VR+AR		

Ecosystem overview



Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been estimated

Applications	Startups		Applied Research Institutes	Interest level
Robotics	Total number	16	AIST – RIRC Robotic Innovation Research Center. RIKEN – AIP Center for Advanced Intelligence Project. Chitose Institute of Science and Technology-Oda Laboratory.	High
	Total Investment	USD 810 million		
	Top hubs	Kanto, Kansai, Hokkaido		
	Highlights	Japan has been number one worldwide for robotics innovation and production for decades. The rise of IoT and AI provides it even more dynamism.		
Consumer IoT (Sensors and Instrum.)	Total number	9	NICT - National Institute of Information and Communications Technology. The University of Tokyo – Koshizuka Laboratory.	High
	Total Investment	USD 180 million		
	Top hubs	Kanto, Kansai, Hokkaido, Fukuoka		
	Highlights	A sector tightly linked to robotics in Japan. Although it started slowly, it is gaining great importance.		
Chemicals / Materials / Textile / 3D printing	Total number	8	AIST - Department of Materials and Chemistry. RIKEN - Materials Fabrication Laboratory. Moa Museum of Art- NMRL New Material Research Laboratory.	Medium
	Total Investment	USD 300 million		
	Top hubs	Kanto (Tokyo), Hokkaido, Fukuoka		
	Highlights	This sector attracts interest mainly in 3D printing.		

Ecosystem overview



Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been estimated

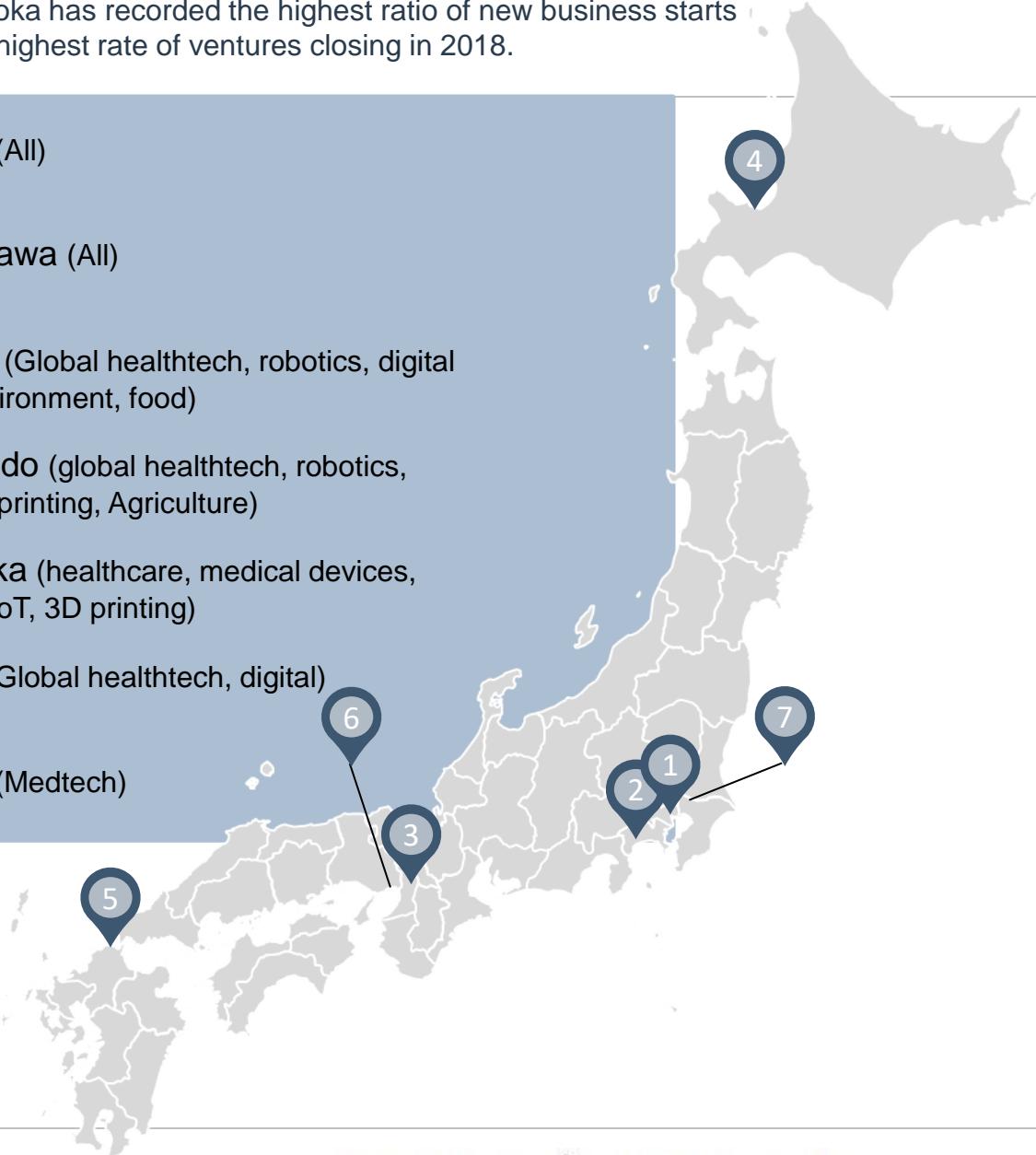
Applications	Startups		Applied Research Institutes	Interest level
Cosmetics and Beauty	Total number	4	Japan Cosmetic Center, Shiseido Global Innovation Center, or S/PARK. Tokyo University of Agriculture-Laboratory of Cosmetic Chemistry.	Low
	Investment	USD 14 million		
	Top hubs	Tokyo		
	Highlights	Although meant to be a hub for cosmetics, no startup seem to have a headquarter in Karatsu, Kyushu, home of the Japan Cosmetic Center.		
Agtech (Agriculture)	Total number	9	JIRCA - Japan International Research Center for Agricultural Sciences.	Low
	Investment	USD 3 million		
	Top hubs	Kanto (Tokyo), Hokkaido and Gifu		
	Highlights	With the shortage of human resources, efforts are directed toward automatization and yield optimization.		
Food	Total number	2	NIBIOHN - National Institutes of Biomedical Innovation, Health and Nutrition. AIST-Biological Clock Research Group	Low
	Total investment	USD 33 million		
	Top hubs	Tokyo and Osaka		
	Highlights	Few deep tech startups but noticeable in application: growing meat directly from meat cells.		

Ecosystem overview

The city of Fukuoka has recorded the highest ratio of new business starts and the second-highest rate of ventures closing in 2018.



- 1 Tokyo (All)
- 2 Kanagawa (All)
- 3 Osaka (Global healthtech, robotics, digital IoT, environment, food)
- 4 Hokkaido (global healthtech, robotics, IoT, 3D printing, Agriculture)
- 5 Fukuoka (healthcare, medical devices, digital, IoT, 3D printing)
- 6 Kobe (Global healthtech, digital)
- 6 Chiba (Medtech)



HIGHLIGHTS

- Tokyo is the largest focal point, gathering over 77% of the investment and leading by far in the number of startups, all application combined.
- Startup ecosystems are encouraged in selected regions and not within the whole country.
- Osaka, Kobe, and Fukuoka are definitely cities that offer a conducive environment for startups, but based on the level of activity nationwide, other major cities in Japan also carry the potential to develop their own startup ecosystems.
- JETRO has developed a mapping tool (with space for improvement) that provides information about the industrial clusters in various regions of Japan, and various sectors (some out of scope here).

<https://www.jetro.go.jp/en/invest/region/icinfo.html>

Ecosystem overview

As of 2018, Japan has produced 4 unicorns and the government is aiming to raise this number to 20 by 2023.

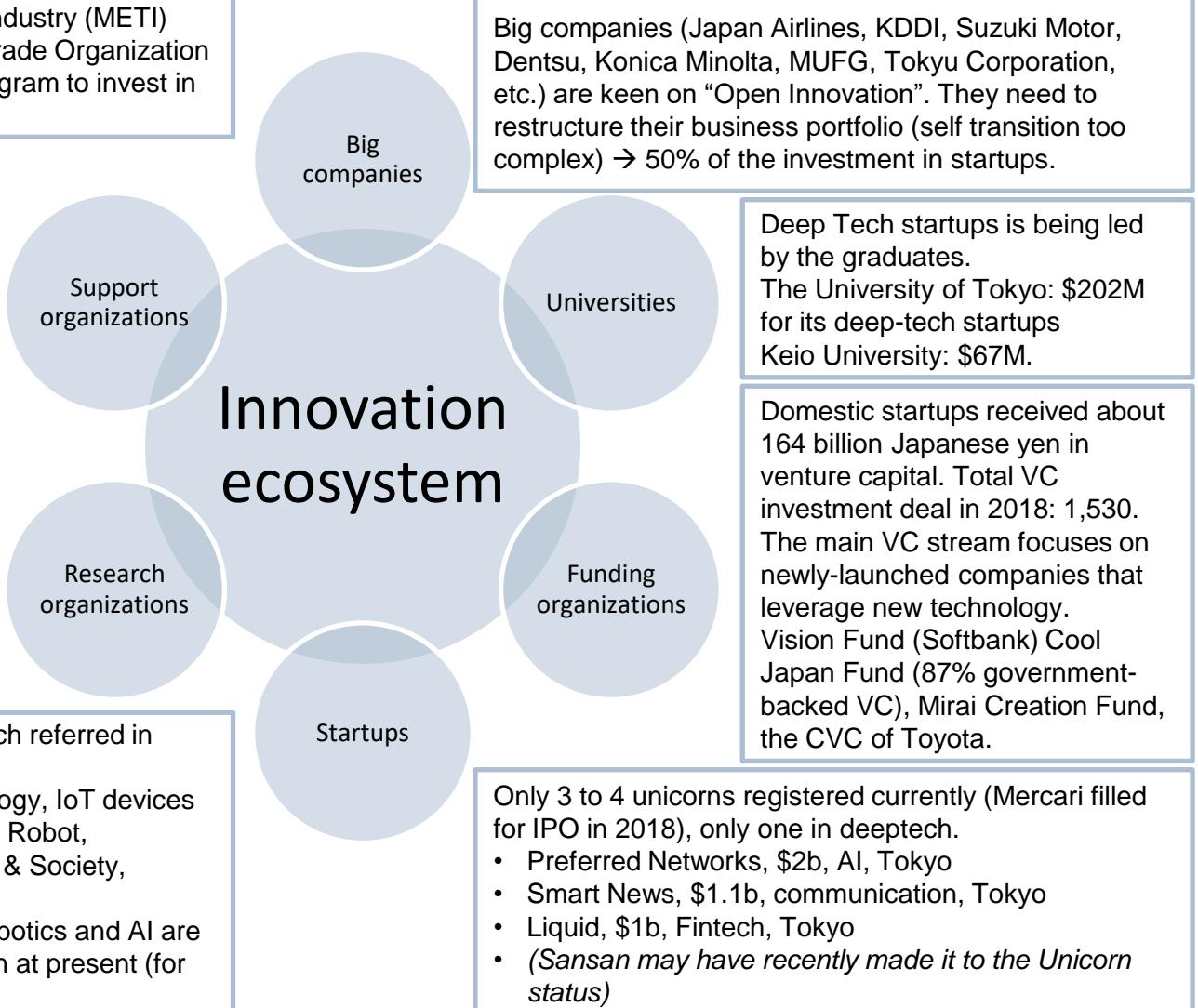


The Ministry of Economy, Trade and Industry (METI) together with the Japanese External Trade Organization (JETRO) established the J-Startup program to invest in Japanese deepTech startups.

Other organization: Hello Tomorrow Japan (fostering DeepTech initiatives globally)
Open Innovation platform: LIP Yokohama (Healthcare)+ I.TOP Yokohama (IoT)
Kashiwanoha Chiba (MedTech)
King Skyfront Kanagawa (Life Science), etc.

NEDO: New Energy and Industrial Technology Development Organization
National Cancer Center: fundamental research

About 363 startups developing deeptech referred in Japan (DW).
Categories are: AI & AI control technology, IoT devices and ICT, Services & Platform, Mobility, Robot, HealthcareTech, Environment, Energy & Society, Aerospace, Manufacturing & Material.
HealthcareTech/MedTech/Biotech, Robotics and AI are the three most thriving sectors in Japan at present (for applications in scope)



Ecosystem overview – Biotechnology (Biotech)

Start-up Ecosystem in the Application Areas



Biotechnology (Biotech) Startups	Applied Research Institutes
<p>Today, in pharmaceuticals and medical devices, in health care services and regenerative medicines, non-Japanese firms are learning from Japan's markets before the aging trend arrives elsewhere in the world. Japan already features the world's second largest markets in pharmaceuticals and medical devices, behind only the United States. While Japanese companies and universities are seeking foreign partners, the government is actively promoting foreign investment and other business from non-Japanese companies. In pharmaceuticals, Japan has eased some regulation, sped approval times, and passed laws that promote the development of orphan drugs, drugs that are developed to address rare diseases but remain commercially undeveloped because of limited potential for profitability. The field of regenerative medicine is attracting special interest worldwide to Japan.</p> <p>Typical startups with deep tech in biotech in Japan:</p> <ol style="list-style-type: none">1. iHeart (Kyoto): It is developing regenerative medicinal products for severe heart failure, using iPSC technologies.2. REGiMMUNE Corporation (Tokyo): a biotechnology company producing immune-regulatory therapeutics for life-threatening diseases and debilitating disorders.3. AccuRna, Inc.'s: aims at promoting therapeutic innovation in the form of nucleic acid medicine utilizing robust DDS platform, providing effective treatment for refractory diseases for which there is currently no cure.	<ol style="list-style-type: none">1. RIKEN (Tokyo): Japan's largest comprehensive research institution renowned for high-quality research in a diverse range of scientific. Researchers are active in the area of stem cells, both as a research tool for elucidating disease mechanisms and as an ingredient for regenerative medicine.2. AIST (Advanced Industrial Science and Technology), Biotechnology Research Institute for Drug Discovery (Tokyo-Tsukuba): It promotes development of new technologies for drug discovery and regenerative medicine and the commercialization of the achievements in collaboration with industry.3. The University of Tokyo, The Biotechnology Research Center (Tokyo): a leading research center which focuses on innovative research about microbial/ plant biotechnology.4. NIBS - Nippon Institute for Biological Science (Tokyo), a private-sector research organization which has been conducting research activities in preventive medicines of livestock.

Biotech/Pharma – Some Relevant Researches



Applied Research Institute, Corporation, University	Research/technology (year)	Description
University of Tokyo  東京大学 THE UNIVERSITY OF TOKYO	iPS cell technology (2013)	The system established provides “rejuvenated and regenerated” antigen-specific T cells by taking advantage of reprogramming technology. The related research suggests that manipulating T cells using iPSC techniques could be useful for future development of more effective immune therapies. Potential application of rejuvenated antigen-specific T cells to immunotherapy and immune regeneration
University of Tokyo  東京大学 THE UNIVERSITY OF TOKYO	highly active immobilized catalysts (heterogeneous catalysts) (2015)	The research group has succeeded in synthesizing (R)- and (S)-rolipram, the active component of a medicine, in high yield with high selectivity by an innovative catalyzed flow fine synthesis instead of the traditional batch method used in the production of 99% of medicines. This new technology can be applied to not only other γ -aminobutyric acids and medicines but also various chemicals such as flavors, agricultural chemicals, and functional materials.
Kyoto University  京都大学 KYOTO UNIVERSITY	virtual precursor-eye (2018)	The team developed a computational simulation that calculates the formation of three-dimensional tissue structures. Using this knowledge and past experimental data, they constructed a virtual precursor-eye and were able to predict the physics driving the sphere-forming cells.
Kyoto University  京都大学 KYOTO UNIVERSITY	'wake-up' signal for deep-sleeping neural stem cells (2019)	The researchers studying brain chemistry in mice have revealed the ebb and flow of gene expression that may wake neural stem cells from their slumber. These findings, which may also apply to stem cells elsewhere in the body, were recently published in the journal <i>Genes & Development</i> .

Ecosystem overview – Pharmaceutical

Start-up Ecosystem in the Application Areas



Pharmaceutical Startups	Applied Research Institutes
<p>The market needs being introduced by Japan's ageing population and the depth of research being done at the universities gives Japan the raw materials to be a biotech, pharmaceutical, healthcare and medtech start-up powerhouse. Japanese pharmaceutical companies are willing to make investments and the government is willing to subsidize those investments. However, Japan's start-ups with a real chance for global innovation resides remains underfunded and must rely on big Pharma rather than the market place to vent their ideas.</p> <p>In the pharma world, the list of companies targeting expansion in Japan include Germany's Bayer, Portugal's Hovione, and Finland's Orion. Superstar U.S. firms like Pfizer, Merck, and Eli Lilly also are interested and partnering with various Japanese universities.</p> <p>Typical startups with deep tech in pharmaceutical in Japan:</p> <ol style="list-style-type: none">1. TMS Co., Ltd. (Tokyo): clinical-stage biotech company that unlocks fungus-derived SMTP small molecule compound group. SMTPs have novel dual mode of action, both thrombolytic and anti-inflammatory.2. Modulus Discovery (Tokyo): preclinical stage drug discovery company focused on rapid design and generation of small molecule clinical candidates for a range of high-value disease targets.	<ol style="list-style-type: none">1. NCGM - Research Institute of National Center for Global Health and Medicine (Tokyo), aims to promote research in infectious diseases, metabolism-related disease, immune disease and international health medical care operation.2. RIKEN – IMS Center for Integrative Medical Sciences (Tokyo, Tsukuba) is specialized in the pathogenesis of human diseases and aims to develop new therapeutic methodologies.

Ecosystem overview – Medical Tech (Health & Wellness)

Start-up Ecosystem overview and definition with the different applications



Medical Tech (Health & Wellness) Startups	Applied Research Institutes
<p>Japan is uniquely positioned to develop high-tech innovations in healthcare. Long known as a global tech powerhouse, it has deep capabilities in biomedical engineering and advanced manufacturing, both of which are necessary to incubate cutting-edge devices and applications. It also has strong government support for medtech R&D, with leaders who have expressed commitment for policies to encourage innovation and fast-track regulatory approvals for novel devices. Electronics giants including Canon, Konica, and Nikon spent billions on medtech acquisitions in recent years. Insurers, automotive manufacturers, and firms in many other sectors are also making moves in healthcare technology.</p> <p>Typical startups with deep tech in healthcare/medtech in Japan:</p> <ol style="list-style-type: none">1. Moff (Tokyo): a gesture-controlled wearable tech bracelet and wearable IoT platform for healthcare and gamification applications.2. Bisu (Tokyo): Bisu Body Coach, a smart urine analyzer which provides instant, actionable insights to improve your health and fitness.3. Quantum Operation (Tokyo): Wearable watch type non-invasive multiple vital data acquisition sensor- Visualize all necessary data for future medical care, nursing care, and employee safety management	<ol style="list-style-type: none">1. NCGG - National Center for Geriatrics and Gerontology (Aichi): plays a leading role in research field in longevity science.2. The BioBank Japan Project (Tokyo): a leading project of the Ministry of Education, Culture, Sports, Science and Technology(MEXT), not only collects clinical information of patients, now also pioneer the research field of personalized medicine.

Devices – Some Relevant Researches



Applied Research Institute, Corporation, University	Research/technology (year)	Description
University of Tokyo 	The new technique of complementary vibrational spectroscopy (2019)	Researchers have built a new tool to study molecules using a laser, a crystal and light detectors. This new technology will reveal nature's smallest sculptures - the structures of molecules - with increased detail and specificity. The new technique of complementary vibrational spectroscopy relies on improvements in ultrashort pulsed laser technology.
University of Tokyo 	Breathable, wearable electronics on skin for long-term health monitoring	A hypoallergenic electronic sensor can be worn on the skin continuously for a week without discomfort, and is so light and thin that users forget they even have it on, says a group of researchers at the University of Tokyo and their collaborators. The elastic electrode constructed of breathable nanoscale meshes holds promise for the development of noninvasive e-skin devices that can monitor a person's health continuously over a long period.

Ecosystem overview – Medical devices

Start-up Ecosystem in the Application Areas



Medical devices Startups	Applied Research Institutes
<p>Japan is the second largest industry for medical devices, and is well-acknowledged for its high-tech and high-quality medical device products, especially in the categories of diagnostic imaging, dental products, and medical optician technologies. In recent years, the Japanese government has also developed policies to further the industry and helped facilitate the R&D of innovative medical devices and regenerative products. The Japanese medical device market is set to reach from \$54.5 billion in 2018 to \$74.7 billion in 2025, growing at a compound annual growth rate (CAGR) of 4.6%. Top Japanese medical device companies, in terms of sales, include Terumo, NIPRO, Olympus Medical Systems, Toshiba Medical Systems, Hitachi Medico, Nihon Koden, and Fukuda Denshi.</p> <p>Typical startups with deep tech in Medical devices in Japan:</p> <ol style="list-style-type: none">1. Triple W Japan (Tokyo): develops DFree, the first wearable device for incontinence that can track the progression of bladder movements using a non-invasive ultrasonic sensor.2. Holoeyes Inc.(Tokyo): collecting the data from CT scans, forming 3D human body models, and accumulating it creates a so-called medical VR database.3. Aba Inc. (Chiba): developed a device that can detect and record the excretion status of the care recipient, aiming to solve the mental and physical burden of the caregiver / care recipient by excretion sensing and pattern analysis.	<ol style="list-style-type: none">1. MTJapan: the Medical Technology Association of Japan (members between 250 and 300 companies) acknowledge that technologies, including AI and IoT, will bring new effects and values beyond the conventional concept of medical devices.2. Japan Biodesign is a fellowship program that aims at developing medical devices based on the needs at the clinical site and helps aspiring innovators commercialize new medical technologies.

Ecosystem overview – Environment / Sustainability / Waste Management



Start-up Ecosystem in the Application Areas

Environment / Sustainability / Waste Management Startups	Applied Research Institutes
<p>Japan is committed in principle to addressing global climate change and to bringing Japanese lifestyles, economy, and policies in line with the requirements of environmental sustainability. With the signing of the Kyoto Protocol in 1997, the country became a global exemplar of efforts to control CO₂ emissions. The country is developing smart cities such as kashiwanoha in Chiba, Moroyama in Saitama or Kakogawa in Hyogo prefecture. These cities are by themselves innovation centers in the field. However, their main purpose are more often related to other research applications such as biotech or medtech and not environment itself.</p> <p>Typical startups with deep tech in environment in Japan:</p> <ol style="list-style-type: none">1. Biomass Resin Minamiuonuma (Niigata): produces "rice" plastic resin and provides it to a wide variety of fields including toy makers.2. Algae Cultivate Engineering (Saitama): supports basic culture and breeding of algae, and extraction of useful ingredients and commercialization to understand sustainable resource creation with micro-algae and to supply renewable energy, decrease carbon dioxide, increase the rate of food self-sufficiency, and supply high-quality nutrients.	<p>1. NIES National Institute for Environmental Studies (Tsukuba) is dedicated to research across a wide range of environment-related issues from the daily material cycles and waste management to the broad global environment.</p> <p>2. AIST - Department of Energy and Environment (Tokyo): it is developing technologies to utilize alternative energies, increase efficiency in energy consumption, and evaluate different environmental risks.</p>

Ecosystem overview – Digital (AI, VR, Big Data, Cloud)

Start-up Ecosystem in the Application Areas



Digital (AI, VR, Big Data, Cloud) Startups	Applied Research Institutes
<p>Artificial intelligence (AI) was one of the strongest fields of development in Japan. The Japanese government is betting on AI as the key to rewrite Japan blueprint for the future. Prime Minister Abe has called for greater use of AI and robotics including IoT as part of the government's economic growth strategy, urging businesses to invest more into researching new technologies. Japan's AI market is estimated to grow from JPY 3.7 trillion in 2015 to JPY 87 trillion by 2030.</p> <p>Typical startups with deep tech in digital applications in Japan:</p> <ol style="list-style-type: none">1. Preferred Networks (Tokyo): focused on applying real-time machine-learning technologies to new applications in the emerging field of the Internet of Things, with a focus on three business areas: transportation, manufacturing, and bio/healthcare.2. LeapMind (Tokyo): carrying out research on original chip architectures in order to implement Neural Networks on a circuit with low power.3. Emotion Intelligence Inc. (Tokyo): develops a "technology that understands emotions", perceives human emotions in order to predict behavioral changes.	<ol style="list-style-type: none">1. RIKEN – AIP Center for Advanced Intelligence Project (Tokyo, Tsukuba) conducts research on AI technology, as well as the ethical, legal and social issues incurred by the spread of it.2. AIST – AIRC Artificial Intelligence Research Center (Tokyo) is working on the implementation of AI in various industries, increasing Japan's competitiveness in the manufacturing and service sectors.3. The University of Tokyo - Matsuo Laboratory (Tokyo): It is a highly-reputed research center specialized in Deep Learning and enhanced AI technologies.

Ecosystem overview – Robotics

Start-up Ecosystem in the Application Areas



Robotics Startups	Applied Research Institutes
<p>Japan is the world leading “Robot Nation”. In the area of industrial robotics, Japan has continuously maintained its position as the world's top exporter of robots in terms of value of shipments and number of operating units. Japan leads the world in the field of robotics with highly competitive research, development and applied technologies. Robots are now working on the front lines in a diverse array of areas, including aeronautics, medicine/welfare, disaster mitigation, disaster investigation and rescue. The Japanese government has placed a priority on developing and disseminating medical equipment that utilizes robotics technology. Accordingly, the government promotes the product development, implementation and spread of innovations that will reduce the burdens of both medical professionals and patients alike, such as surgery assistant robots.</p> <p>Typical startups with deep tech in robotics in Japan:</p> <ol style="list-style-type: none">1. Groove X (Tokyo): designs and develops a totally new, next-generation household robot that no one has seen before, that truly touches people's hearts and inspires real affection.2. Meltin MMI (Tokyo): a cyborg-technology company that focuses on biosensors and robotic arms.3. Ispace technologies (Tokyo): a space resource exploration company founded in 2013 to develop micro-robots that will locate the resources necessary to extend human life into outer space.	<ol style="list-style-type: none">1. AIST – RIRC Robotic Innovation Research Center (Tokyo): Its tasks are to analyze whether robotics can be applied to specific industries, and to evaluate the consequences of its application.2. RIKEN – AIP Center for Advanced Intelligence Project (Tokyo, Tsukuba)3. Chitose Institute of Science and Technology-Oda Laboratory (Chitose): It is trying to develop the robotics technology, motion control techniques, robot vision and sensing technology.

Ecosystem overview – Consumer IoT (Sensors and instrumentation)



Start-up Ecosystem in the Application Areas

Consumer IoT (Sensors and Instrumentation) Startups	Applied Research Institutes
<p>IoT applications began in Japan at a slow grind, with minimal hype. Today, there are more than 3.17 million individual IoT (SIM card) subscriptions in Japan. It is expected to explode in sectors such as telemetering, transportation management, e-payment, surveillance, digital signage, and data backup. This brings huge business opportunities by creating new potential growth areas in an already saturated Japanese mobile market. In 2018, the internet of things (IoT) applied consumer and home electronics market was estimated to reach almost 1.8 trillion Japanese yen. Driven by the increased use of smart devices, such as smart speakers, the market was forecast to almost double in size in 2025 to approximately 3.6 trillion Japanese yen.</p> <p>Typical startups with deep tech in IoT applications in Japan:</p> <ol style="list-style-type: none">1. Edgecortix (Tokyo): bringing intelligence to edge devices with an AI driven automated software & hardware co-design space exploration platform.2. O: (Tokyo): a company attempting to visualize the human circadian clock through an original IoT device.3. Futurocket (Tokyo): Creating an IoT device called "hackfon". Which turns an analog phone to a smart remote. By just dialing or pushing buttons on the phone, the user can control IoT devices and web services quickly and easily.	<p>Applied Research Institutes</p> <ol style="list-style-type: none">1. NICT - National Institute of Information and Communications Technology (Tokyo): Advanced ICT Research Institute focuses the R&D of new approaches to multiple innovative science areas and apply them to ICT in the future. Cybersecurity Research Institute focuses on the R&D of big data/IoT-related cybersecurity issues.2. The University of Tokyo – Koshizuka Laboratory (Tokyo): It is an innovative research laboratory that aims at establishing high-quality information communication system and apply it to the society.

Ecosystem overview – Chemicals, Materials, Textile, 3D Printing

Start-up Ecosystem in the Application Areas



Chemicals, Materials, Textile, 3D Printing Startups	Applied Research Institutes
<p>The Japanese chemical industry is the country's second largest manufacturing industry behind transportation machinery. The industry is highly relying on big companies such as Mitsui Chemical, Teijin or JSR.</p> <p>Innovation in textile involves nanotechnology to create colorful fabrics without dying them.</p> <p>The material market for 3D printing is presumed to be worth ¥29.97 billion by 2020. In early 2015, the New Energy and Industrial Technology Development Organization (NEDO), a Kanagawa-based semi-public body, announced a ¥2.5 billion fund to spur the growth of highly advanced 3D printing mechanisms for human tissue regeneration.</p> <p>Typical startups with deep tech in Chemicals, materials, textile or 3D printing in Japan:</p> <ol style="list-style-type: none">1. Spiber (Yamagata): biomaterials company engaged in the research of synthetic spider silk and other protein-based materials.2. Advanced Softmaterials Inc. (Chiba): first-ever material with movable crosslinks, encouraging rapid advancement in various fields including medicine, cosmetics and health3. D-light Matter (Yamagata): a company that sells 3Dprinting equipment, material and expertise in hydromaterials and other soft materials.	<p>AIST - Department of Materials and Chemistry (Tokyo): contributes to the development of practical use of new materials.</p> <p>RIKEN - Materials Fabrication Laboratory (Tokyo, Tsukuba) is developing new material processing technologies.</p> <p>Moa Museum of Art- NMRL New Material Research Laboratory (Shizuoka): dedicated to combine the existing materials and new ones to promote innovation.</p>

Material – Some Relevant Researches



Applied Research Institute, Corporation, University	Research/technology (year)	Description
University of Tokyo 	Ordered yet flexible gel (2019)	<p>Researchers from the University of Tokyo's Institute for Solid State Physics have found a way to produce a new kind of gel which overcomes this limitation. It is still malleable and adaptable like existing gels, but it has a more ordered structure, which can open up a new range of possible uses in various fields.</p> <p>Ordered yet flexible gel networks could be used in applications like high-performance chemical filters, flexible sensors, mechanical actuators, controlled drug release and even ultra clear optical fibers</p>
Kyoto University 	artificial skin (2018)	<p>Following successful clinical trials, Naoki Morimoto and his research team at Kyoto University's School of Medicine have received Japanese government approval for the use of a new type of artificial skin, intended for treatment of chronic skin ulcers and other dermatological conditions.</p>

Ecosystem overview – Cosmetics and Beauty

Start-up Ecosystem in the Application Areas



Cosmetics and Beauty startups	Applied Research Institutes
<p>Japan has always been known across Asia for the quality of its cosmetics from companies such as Shiseido Co., Kosé CORP., and brands like P&G's luxury SK-II line, but a new surge in demand from neighboring countries is shaping cosmetics up to be an important export sector and should be key in how Japan positions itself internationally. In 2017, Japan exported 500 billion yen in cosmetics, according to government trade data, 4 times more than in 2012.</p> <p>Typical startups with deep tech in cosmetics and beauty applications in Japan:</p> <ol style="list-style-type: none">1. Novera (Tokyo): Introducing the latest news and articles on the smartphone app "viewty" and smart mirror "novera". The mirror records daily face data, analyzes the skin, provides AR simulation, etc.2. Grancell (Chiba): Industrializing the results of regenerative medicine research, with applications in stem cell cosmetics.3. Spacevision (Tokyo): Among other products, a scanner that takes 3D images of faces and bodies. The face shape and color texture are converted into data in 3D.	<ol style="list-style-type: none">1. Japan Cosmetic Center (Karatsu): a business environment suited to the cosmetics sector through partnership among industry, academia, and government.2. Shiseido Global Innovation Center, or S/PARK (Yokohama): it is Shiseido's new research center which combines research facilities and tourist attraction. The company's new R&D strategy encourages open innovation.3. Tokyo University of Agriculture-Laboratory of Cosmetic Chemistry (Tokyo): focuses on cosmetic chemistry.

Ecosystem overview – Agtech (Agriculture)

Start-up Ecosystem in the Application Areas



Agtech (Agriculture) Startups	Applied Research Institutes
<p>The number of commercial farm households and the number of individuals working within the agricultural industry are rapidly declining in present-day Japan. One determining factor in the decline of the agricultural sector is the shortage of farmland in Japan, with more and more land being used for housing. With the help of new technological advancements, ICT solutions in agriculture, such as precision farming or next-generation fish farming, promise enhancements in agricultural and rural developments. The government estimated that Japan's organic food market was worth about ¥185 billion in 2017. Yano Research Institute estimates that the market will expand to ¥196 billion in 2022.</p> <p>Typical startups with deep tech in agriculture applications in Japan:</p> <ol style="list-style-type: none">1. Farmship (Osaka): Developed a plant factory equipped with AI for optimization of production and processing (LED lightning, seeding environment, 3D conveyors, etc.).2. Agri-Light Lab (Yamaguchi): specializes in the control of light environments where local and short-term changes in plant growth conditions are possible.3. AgroDesign Studio (Tsukuba): conducts research and development of pesticides using active ingredient compounds. It is a biochemical-based pesticide development and agricultural biotechnology to contribute to sustainable agriculture.	<p>JIRCA - Japan International Research Center for Agricultural Sciences (Tsukuba): a public research institute specialized in technological advancement of agriculture, forestry, fisheries and related industries.</p>

Ecosystem overview – Food

Start-up Ecosystem in the Application Areas



Food Startups	Applied Research Institutes
<p>The food and drink sector is a stable yet massive industry in Japan. Revenue in this segment amounts to US\$15 billion in 2018, with an annual growth of around 8%. The consumer profile has changed a lot, as the Japanese have adopted Western habits when it comes to food choice and consumption. In Asia, Japan holds the second highest food consumption percentage at 23% next to China which has 38% market share. This demand is expected to continue to grow. A majority have begun to consume more milk, wheat, meat and other dairy products. As an increasing number of Japanese consumers allocate a higher budget percentage for food, various opportunities await investors and international brands to enter the market to introduce new food preferences for local consumption.</p> <p>Typical startups with deep tech in Food applications in Japan:</p> <ol style="list-style-type: none">1. Shojinmeat Project (Tokyo): an inter-disciplinary collaborative project for development of cultured meat. Even though it is real meat, it doesn't need pasture, nor does it kill animals2. EcoloBlue (Tokyo): a company manufacturing water server that produces drinking water from the air.	<ol style="list-style-type: none">1. NIBIOHN - National Institutes of Biomedical Innovation, Health and Nutrition (Osaka) conducts research on hygiene, nutrition and diet, and is known for its expertise in health research on food, nutrition and physical activity.2. AIST - Biological Clock Research Group (Tsukuba) studies advanced food functionality such as antihypertensive effect of food materials.

Ecosystem overview

Start-up Ecosystem in the Application Areas



Major VCs, Incubators and Accelerators for Deep Tech Startups in Japan (1/2)

There are 47 Accelerators & Incubators in Japan. Some of the important ones in applications in scope are:

BCG Digital Ventures

BCG Digital Ventures is the corporate venture capital and incubator arm of The Boston Consulting Group. It invests in tech companies in operating in sectors like Artificial Intelligence, Healthtech, and AdTech.

Founded: 2013

Location: Tokyo

Portfolio: AutoGravity, Takt, FarePilot, Ad Lightning, Kaishi.

Skyland Ventures

Skyland Ventures is a seed & early stage incubator and micro venture capital firm. Makes investments in territories such as Japan. Typically invests in tech companies in sectors like SaaS, VR, Media. Typically invests 500 Yen to 15M Yen in companies.

Founded: 2012

Location: Shibuya

Portfolio: Hachimenroppi, Translimit, Cluster, EventRegist, SlideStory, Translimit.

Mistletoe

Mistletoe is an incubator and VC investor that makes investments primarily in Japan & India. Generally invests in tech companies specializing in areas like AgriTech, Food Tech, Smart Cities and FinTech.

Founded: 2014

Location: Minato

Portfolio: Zoox, Garena, Zipline, Garena, Enevo, Funderbeam, InnerChef.

Ecosystem overview

Start-up Ecosystem in the Application Areas



Major VCs, Incubators and Accelerators for Deep Tech Startups in Japan (2/2)

Code Republic

Code Republic is a startup accelerator which operates an accelerator programs that runs over the course of 3 months. The company accepts tech startups working in the Internet industry space. The firm provides 3.5 million yen in funding in return for 3.5% of equity.

Founded: 2016

Location: Tokyo

Portfolio: Hecto.

OrangeFab

Orange Fab is the startup accelerator arm of Orange. It runs a 12-week accelerator program primarily in Japan, South Korea & Taiwan. The firm accepts startups engaged across multiple sectors like Machine learning, Virtual reality, Big data, Cloud services, eHealth, Fintech, IoT, Security & Video technologies, etc.

Founded: 2013

Location: Tokyo

Portfolio: WASSHA, StradVision, SecuLetter.

Deepcore

DEEPCORE is a startup incubator based in Japan. It focuses on AI startups. Offers co-working space and investments to startups. Also, it collaborates with enterprises, educational research institutes, etc. and conduct demonstration experiments.

Founded: 2017

Location: Tokyo

Portfolio: Engineer, Kea, UTU.

Key growth drivers, incl. government initiatives



2

GROWING VC INDUSTRY

Although still low (15% share), the VC investment amounts in Japan rapidly increased, supported by large corporations.

1

FIRMS MORE INTERESTED IN OPEN INNOVATION

Lots of big companies are keen on “Open Innovation” and their venture arm as Corporate Venture Capital.

3

ACTIVE EFFORTS BY UNIVERSITIES

Japan has a lot of strong and unique startups, and a number of them have been established by graduates from big universities.

4

ACTIVE EFFORTS BY THE GOVERNMENT

The Ministry of Economy, Trade and Industry (METI), together with the Japanese External Trade Organization (JETRO) established the J-Startup program to invest in Japanese deep tech startups and the startup visa to attract foreign talents.

Key growth drivers, incl. government initiatives



1

Firms more interested in open innovation:

Big companies have changed their attitudes toward startups since they have understood that they need to innovate themselves and restructure their business portfolio, otherwise they will be disrupted. In addition, they have also understood that to make this transition happen by themselves is extremely difficult. As a result, 50% of the money invested in startups in Japan in 2018 had been made by big companies. The challenge, however, is that there are not yet any significant outcomes by such Open Innovations at present.

3

Active efforts by Universities:

In general, technologies in leading universities are considered to be 10 to 20 years more advanced than technologies in large corporations. However, deep tech startups spun-out from universities tend to lack know-how and capabilities to commercialize. Therefore, they are motivated to collaborate with corporations which can support them to transform their technologies into viable products and services. Startups from University of Tokyo raised \$202M and Keio University raised \$67M in the past 10 years

2

Growing VC industry:

The VC investment amounts rapidly increased after the inception of the economic growth policy "Abenomics" in 2013. The quantitative easing policy increased the amount of capital in the market and encouraged private-sector investment, resulting in the dramatic change in VC investment from \$0.8 billion in 2013 to \$2.5 billion in 2017 with a CAGR of 35.1%. Large corporations invest in VC funds in order to search for promising startups as potential business partners, especially those in frontier domains. In the past couple of years, investment in deep tech startups has significantly increased.

4

Active efforts by the government:

J-Startup project: aims at making winning startups expand to global market by actively publicizing, supporting financially and on regulations. Preferred candidates are deep tech, platform and SDG-oriented startups.

Startup visa: Relaxed visa requirements for international entrepreneurs under the support of local governments. Consultation staff in major cities supporting Japanese market entry. Support includes Japanese market surveys and assistance in creating business plans.

Potential Ecosystem Evolution – Overall View



	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
1. Biotechnology (Biotech)	Japan's citizens already are the world's oldest, with 27% of its population over age 65. The Japanese government has focused on this challenge and the opportunity. already growing at CAGR of 3.4%, the country keep pushing by implementing widespread changes in health-related policies, regulations, and laws (valid for the 4 domains on this page). Therefore all domains related to health and presented on this page are vowed to grow positively in Japan over the next 5 years.	
2. Pharma	Japan already features the world's second largest markets in pharmaceuticals and medical devices. In pharmaceuticals, Japan has eased some regulation, speed approval times, and passed laws that promote the development of orphan drugs. The list of non-Japanese companies collaborating to enter or expand in Japanese markets includes some of the best known in life sciences.	
3. Medical Tech (Health & Wellness)	Japan unique position and strength in developing high-tech innovations associated with strong government support in health-related domain, presents deep capabilities in biomedical engineering and advanced manufacturing, both of which are necessary to incubate cutting-edge devices and applications.	
4. Medical devices	The concurrent decline in Japanese birth rates means the country also faces a shortage of caregivers, a situation that offers more opportunities for technology and innovations to replace or substitute for human workers. The government created National Strategic Special Zones, which are selected regions that offer eased regulations and tax benefits, are encouraging creation of innovative drugs and medical devices.	

Potential Ecosystem Evolution – Overall View



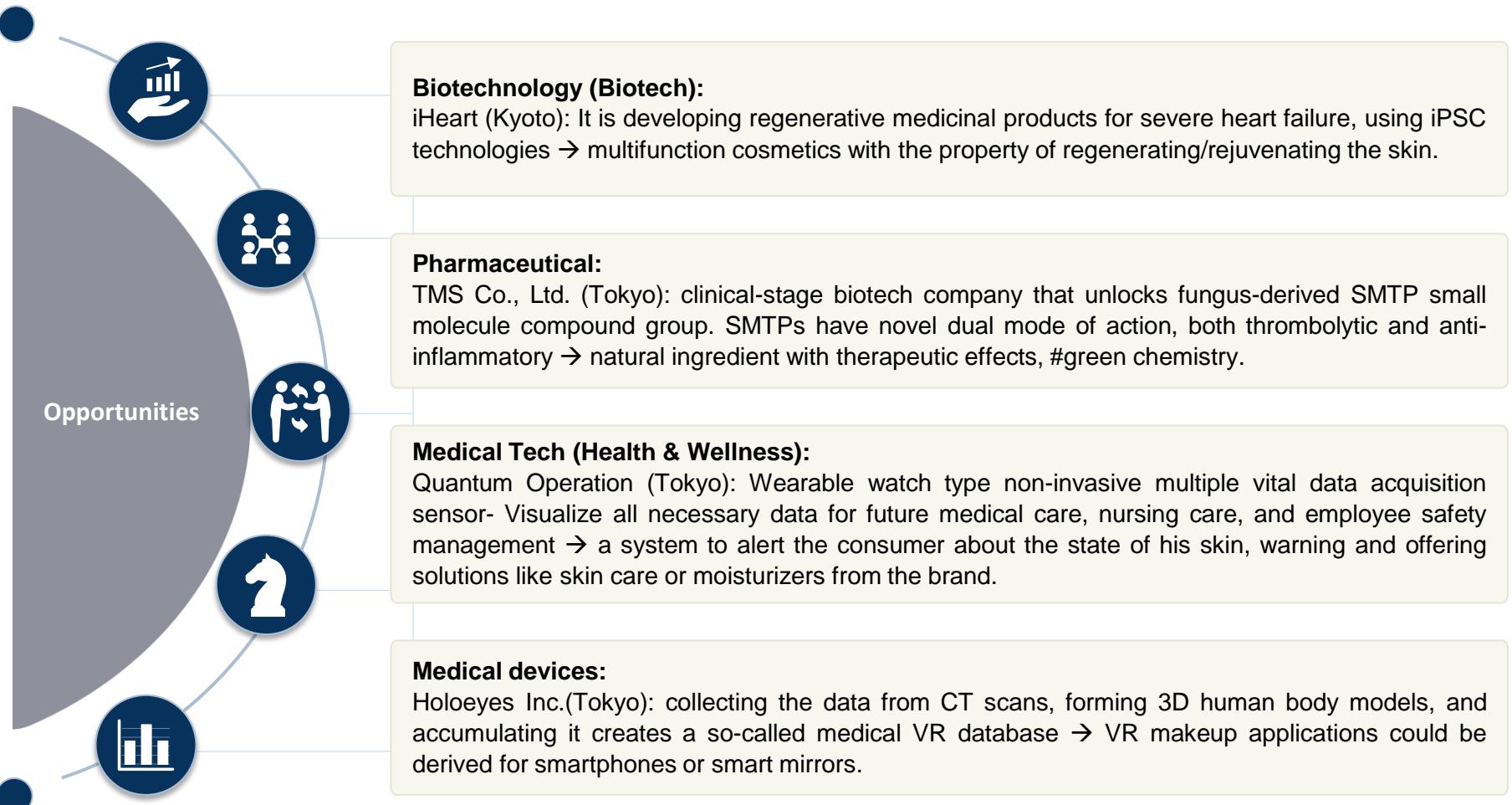
	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
4. Environment / Sustainability / Waste Management	Environment concerns have fallen behind in Japan, although the country is developing smart cities which are by themselves innovation centers in the field. However, their main purpose are more often related to other research applications and environment is not thriving as it used to be. Even though the government is trying to favor innovation in SDG-oriented startups, the evolution will remain stagnant or even be negative over the next five years.	
5. Digital (AI, VR, big data, Cloud, Blockchain)	Prime Minister Abe has called for greater use of AI and robotics including IoT as part of the government's economic growth strategy, urging businesses to invest more into researching new technologies. Japan's AI market is estimated to grow from JPY 3.7 trillion in 2015 to JPY 87 trillion by 2030.	
6. Robotics	According to JETRO, Demand for service robots in Japan is expected to grow significantly at a CAGR of 13.9% over the 20 year period leading up to 2035. Japan also has a strong global presence as a production market, ranking 4th in the world by number of service robot manufacturers. The rise of smart robots, using other technologies such as AI, Cloud, machine learning or IoT will also boost these sectors in the coming years.	
7. Consumer IoT (Sensors and Instrumentation)	In 2018, the internet of things (IoT) applied consumer and home electronics market was estimated to reach almost 1.8 trillion Japanese yen. Driven by the increased use of smart devices, such as smart speakers, the market was forecast to almost double in size in 2025 to approximately 3.6 trillion Japanese yen. Pulled by the growth of robotics, this sector will keep growing positively over the 5 next years.	

Potential Ecosystem Evolution – Overall View



	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
9. Chemicals / Materials / Textile / 3D printing	This sector is more complex to estimate as it gathers different activities. Although advanced materials and 3D printing are growing sectors, the already well established and competitive chemical sector and the aging textile sector are not attracting much attention and the overall segment considered here is expected to remain stagnant or with a slight growth over the next 5 years.	
10. Cosmetics and Beauty	A new surge in demand from neighboring countries is shaping cosmetics up to be an important export sector and should be key in how Japan positions itself internationally. In 2017, Japan exported 500 billion yen in cosmetics, according to government trade data, 4 times more than in 2012. This trend will keep being as such over the considered period.	
11. Agtech (Agriculture)	In Japan in the fields of agriculture, forestry and fisheries, there is a serious shortage of labor due to decrease in farming population and progress of ageing but going forward improvement is expected due to progress of smart agriculture. The Ministry of Agriculture, Forestry and Fisheries has announced the future image of "New agriculture for the realization of ultra-labor saving and high quality production" utilizing artificial intelligence (AI), IoT, big data, robot technology etc. promising growth in the next 5 years.	
12. Food	The food and drink sector is a stable yet massive industry in Japan. Revenue in this segment amounts to US\$15 billion in 2018, with an annual growth of around 8%. A majority have begun to consume more milk, wheat, meat and other dairy products. As an increasing number of Japanese consumers allocate a higher budget percentage for food, growth is predicted in this domain too.	

Opportunities For L'Oréal in the Identified Ecosystems



Opportunities For L'Oréal in the Identified Ecosystems



Opportunities For L'Oréal in the Identified Ecosystems



Chemicals / Materials / Textile / 3D printing:

Advanced Softmaterials Inc. (Chiba): first-ever material with movable crosslinks, encouraging rapid advancement in various fields including medicine, cosmetics and health → faster development of new cosmetics.

Cosmetics and Beauty:

- Grancell (Chiba): Industrializing the results of regenerative medicine research, with applications in stem cell cosmetics → multifunction cosmetics with the property of regenerating/rejuvenating the skin.
- Spacevision (Tokyo): Among other products, a scanner that takes 3D images of faces and bodies. The face shape and color texture are converted into data in 3D → shape and color control for customized cosmetics (color and style suggestion – AI)

Agtech (Agriculture):

Mebiol (Hiratsuku): Imec® (Film Farming) is the world's first hydrogel membrane based agro-technology to address some of the serious issues that our world communities' face today regarding food shortage, water scarcity and land contamination → This hydrogel could be considered as a new encapsulation material with preferential release properties #encapsulation, #Capture and release.

Food:

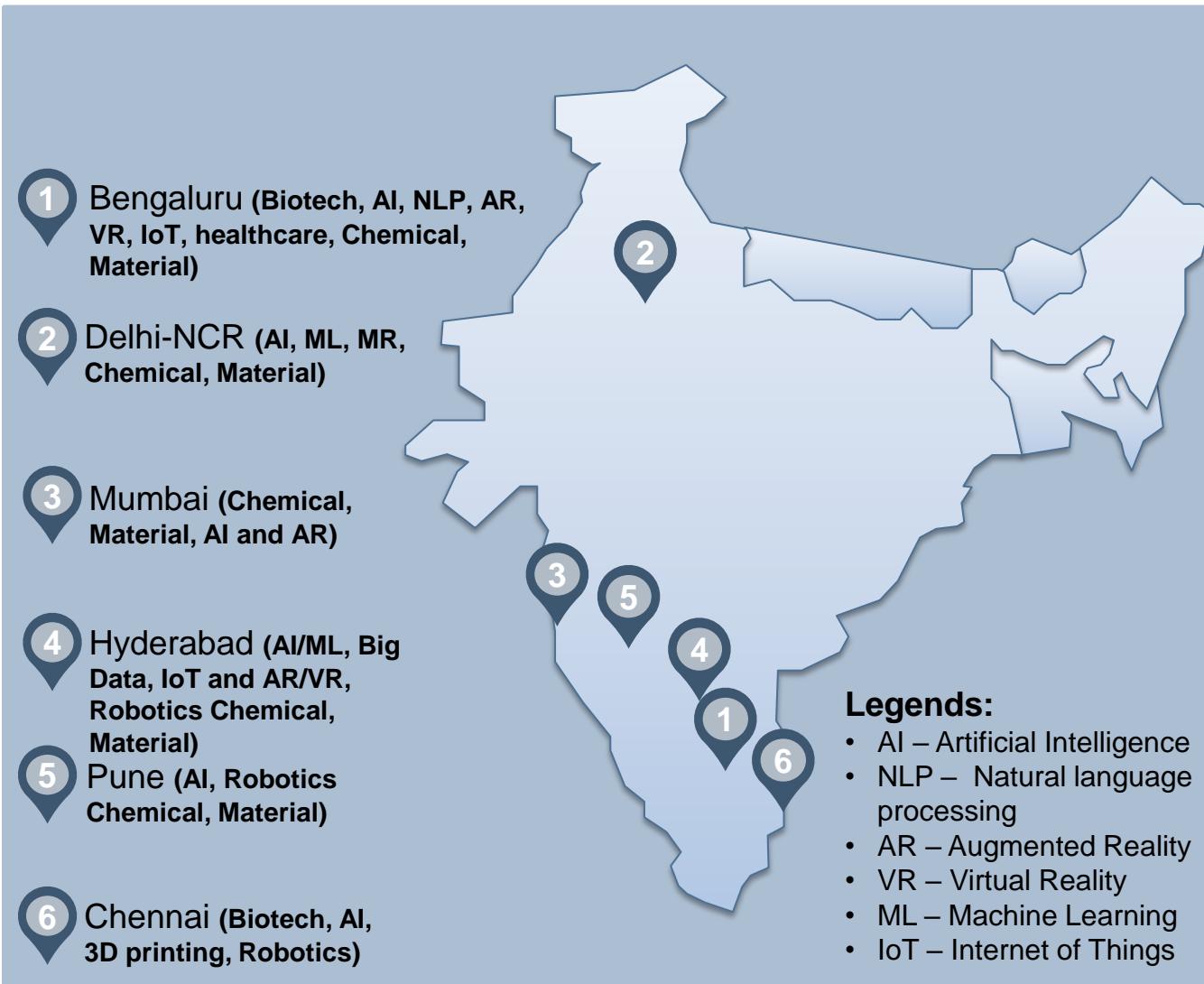
Shojinmeat Project (Tokyo): an inter-disciplinary collaborative project for development of cultured meat. Even though it is real meat, it doesn't need pasture, nor does it kill animals → Application in meat is not directly of interest but the technology for muscle cell s multiplication to "grow" the meat might be applied to skin cells, and could be used to grow various real skin types for product testing.

Growth Environment – India



The government of India is deploying Deep Tech to discover new climate resilient agricultural species. There is a vibrant startup culture emerging which is slowly focusing on deep tech sector. With a large engineering and scientific pool, the country aims to be a deep tech startup hub in certain key areas such as AI, AR/VR, Waste Management, Robotics, Chemicals, Materials and Agritech.

Ecosystem overview



HIGHLIGHTS

- India has witnessed the emergence of more than 1000 deep-tech start-ups and the adoption of advanced technology is growing rapidly at a 50% YoY growth rate.
- 55%-58% of start-ups are based in Bengaluru, Delhi-NCR and Mumbai.
- Bengaluru, Delhi NCR and Mumbai together represented about 85.28% of all fundings deals in Indian startups in H1 of 2019.
- Bengaluru, Delhi-NCR, Mumbai, Hyderabad, Pune and Chennai falls under the Established Start-up Hubs category since most of the deeptech innovations are developed due to large number of government and infrastructure supports.
- AI, AR/VR, IoT, Robotics deep technologies are widely adopted in the India regions.

Ecosystem overview

Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been estimated



Applications	Startups		Applied research Institutes	Interest level
Biotech	Total number	3	<ul style="list-style-type: none"> International Centre for Genetic Engineering and Biotechnology Centre for Cellular & Molecular Biology National Botanical Research Institute, Rajiv Gandhi Centre for Biotechnology, National Agri-Food Biotechnology Institution (NABI), National Institute of Animal Biotechnology (NIAB) Regional Centre for Biotechnology (RCB) 	HIGH
	Investment (2019 or cumulative or whatever is available)	\$7M ↑		
	Top hubs	Chennai, Bengaluru		
	Highlights	<ul style="list-style-type: none"> Drug discovery. Animal-origin free proteins and enzymes 		
Environment / Sustainability / Waste Management	Total number	7	<ul style="list-style-type: none"> CSIR-National Environmental Engineering Research Institute (Nagpur) International Institute of Waste Management (IIWM) (Bengaluru) National Solid Waste Association of India (NSWAI) (Mumbai) 	HIGH
	Investment	\$40M ↑		
	Top hubs	Haryana, Hyderabad, Bengaluru, Gujarat		
	Highlights	Plastic recycling, Pollutants to ink/paint		
Digital (AI, VR, big data, Cloud, Blockchain)	Total number	4	<ul style="list-style-type: none"> Wadhwani Institute For Artificial Intelligence (Mumbai, India) Department of Computational and Data Sciences, Indian Institute of Science (Bengaluru) Indian Management School & Research Centre (Mumbai) 	MEDIUM
	Investment	\$10M →		
	Top hubs	Bengaluru, Mumbai		
	Highlights	AR / VR are highly adopted technology for healthcare applications.		

Source: Crunchbase, Venture Radar, Local Governments (<https://www.startupindia.gov.in/>), Company websites

Ecosystem overview

Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been estimated



Applications	Startups		Applied Research Institutes	Interest level
Robotics	Total number	5	<ul style="list-style-type: none"> Indian Institute of Information Technology Allahabad. National Institute of Robotics & Artificial Intelligence (NIRA) (New Delhi) Centre for Artificial Intelligence and Robotics (Bengaluru) 	HIGH
	Investment	\$15 M ↑		
	Top hubs	Bengaluru, Delhi		
	Highlights	AI integrated robots		
Consumer IoT	Total number	4	<ul style="list-style-type: none"> IoT LAB, Indian Institute of Information Technology and Management – Thiruvananthapuram Kerala 	HIGH
	Investment	\$55.5 M ↑		
	Top hubs	Bengaluru, Hyderabad, Kerela		
	Highlights	<ul style="list-style-type: none"> IoT connected device enables remote monitoring Nanosensing 		
Cosmetics / Beauty	Total number	2	<ul style="list-style-type: none"> Institute Of Natural & Modern Cosmetech, Haryana Hygienic Research Institute Pvt Ltd., Mumbai 	LOW
	Investment	\$1M →		
	Top hubs	Hyderabad, Pune		
	Highlights	Machine Learning for beauty analysis.		

Source: Crunchbase, Venture Radar, Local Governments (<https://www.startupindia.gov.in/>), Company websites

Ecosystem overview

Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been estimated



Applications	Startups		Applied Research Institutes	Interest level
Health & Wellness	Total number	8	<ul style="list-style-type: none"> Wadhwani Institute For Artificial Intelligence (Mumbai) The Indian Council of Medical Research (ICMR), New Delhi Healthcare Technology Innovation Centre (Chennai) 	HIGH
	Investment	\$45.2M ↑		
	Top hubs	Bengaluru, Mumbai, Hyderabad		
	Highlights	<ul style="list-style-type: none"> AI and Machine Learning is transforming healthcare sector Wearable skin patch 		
Pharma	Total number	3	<ul style="list-style-type: none"> National Institute of Pharmaceutical Education And Research (NIPER) (Hyderabad) Delhi Institute of Pharmaceutical Sciences & Research (Delhi) 	MEDIUM
	Investment	\$18.5M →		
	Top hubs	Bengaluru		
	Highlights	AI technology is garnering interest in the pharma sector		
MedTech / Medical device	Total number	13	<ul style="list-style-type: none"> The Indian Council of Medical Research (ICMR), New Delhi Healthcare Technology Innovation Centre (Chennai) 	HIGH
	Investment	\$57.8M ↑		
	Top hubs	Bengaluru		
	Highlights	<ul style="list-style-type: none"> Smart Gait Analysis Cancer cell detection via imaging system Biosensor monitoring diabetes 		

Source: Crunchbase, Venture Radar, Local Governments (<https://www.startupindia.gov.in/>), Company websites

Ecosystem overview

Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been estimated



Applications	Startups		Applied Research Institutes	Interest level		
Chemicals / Materials / Textile / 3D printing	Total number	16	<ul style="list-style-type: none"> Central Salt and Marine Chemicals Research Institute, Gujarat Indian Institute of Technology (IIT) Delhi, India Bhabha Atomic Research Centre (BARC) (Mumbai) 	HIGH		
	Investment	15M ↑				
	Top hubs	Mumbai, Bengaluru, Hyderabad, Delhi				
	Highlights					
	<ul style="list-style-type: none"> Chemicals from renewable sources Graphene Nano composites from Sea Weeds Nanocomposite material synthesized from cotton Graphene-based metal Biodegradable compounds Compounded polymers. 					
Agriculture	Total number	22	Wadhwani Institute For Artificial Intelligence (Mumbai, India)	HIGH		
	Investment	80M ↑				
	Top hubs	Delhi, Mumbai, Pune, Bengaluru				
	Highlights					
	<ul style="list-style-type: none"> Holistic organic farming processes Chemical-free food through zero-budget natural farming. Smart IoT and AI based Precision Agriculture 					
Food	Total number	4	<ul style="list-style-type: none"> CSIR - Central Food Technological Research Institute (Mysuru, India) Indian Institute of Food Processing Technology (IIFPT) (Tamil Nadu, India) NIFTEM-National Institute of Food Technology Entrepreneurship and Management (Haryana, India). 	MEDIUM		
	Investment	1M ↑				
	Top hubs	Kochi (Kerala), Udaipur, Haryana				
	Highlights					
	<ul style="list-style-type: none"> Computer vision based food item recognition Kitchen cutlery using rice flour and wheat flour Meat based on plants AI based food processing 					

Source: Crunchbase, Venture Radar, Local Governments (<https://www.startupindia.gov.in/>), Company websites



Ecosystem overview

Innovation ecosystem stakeholders

Government and Support Organizations: Central and state governments in India are playing an active role in the growth of the deep-tech start-up ecosystem by stimulating entrepreneurial activity to promote job creation, develop an environment by decreasing the regulatory burden and formulating new policies, infrastructure design and training, provide funding support and fiscal incentives and assist all members of the deep-tech start-up ecosystem to collaborate and connect. For example, Deep Tech Innovation & Incubation Networked Centers Initiative by TotalStart Entrepreneurship Ecosystem Developers aims in focusing Deep Tech Innovation & Incubation Networked Centers in India focusing on ML, AI, IOT and Business Intelligence.



Universities: Major universities promote a culture of respect for entrepreneurship through the inclusion of courses in their curriculum, the establishment of technology and business incubators, the establishment of entrepreneurship cells, the provision of support to student entrepreneurs, the introduction of break year concepts and deferred placements.

Research Organizations: Several research/mentor organizations and groups such as National Association of Software and Services Companies (NASSCOM), The IndUS Entrepreneurs (TiE), ISB Centre for Innovation & Entrepreneurship (CIE) and T-Hub aims to foster a energetic deep tech ecosystem for the establishment and growth of enterprises. For instance, NASSCOM plans to mentor 30 growth-stage deep tech startups from the National Capital Region, Bengaluru, Hyderabad, and Mumbai regions. The Indian Technology Institute of Delhi (IIT-D) has decided to support startups and research scientists who are ready to enter a deep technology market that includes artificial intelligence and machine learning to improve their deep-tech research ecosystem.



Ecosystem overview

Innovation ecosystem stakeholders

Big Corporations: Many large multinational corporations have set up incubator and accelerator programs in the past 3-5 years. Companies are looking for the latest in innovation and providing technical expertise to take Start-up solutions to the next level. For instance, at T-Hub, Hyderabad, large corporations partnered with government and academics. In India, foreign and domestic companies are also running their own incubator and accelerator programs.



Funding Organizations: Deep-tech funding accounts for just 1.45% of Indian start-ups' total funding. Funding in deep-tech start-ups in India has increased at a CAGR of 22.8%. Funding in deep technologies has boosted investors and VC companies in the last year, as their cravings for niche products and platforms are growing significantly, in addition to pooling more money in higher rounds of funding. The key reasons were higher technology expertise, global ambitions, and more "patient" capital availability.

Deep Tech Startups: Deep-tech is the latest tag from the Indian technology ecosystem. In India, there are currently around 9,300 Tech start-ups, while 1,600 are deep-tech start-ups. Indian deep technology start-ups have focused more on medical diagnostics, precision agriculture, predictive analytics and fraud detection. A number of home-grown companies employ new-age technologies such as AI, ML, data analytics, cloud and the IoT for solving real-world problems. India is the third largest AI startup ecosystem with Bengaluru city leading the hub for deep tech startups, followed by Hyderabad.

Ecosystem overview

Start-up Ecosystem in the Application Areas



Bio Tech Technology Start-ups	Applied Research Institutes
<p>Biotechnology is one of India's fastest growing segments and developments are in nascent stage. The Indian biotechnology sector are categorized into five major sub-categories –</p> <p style="padding-left: 40px;">bio-pharmaceutical, bio-services, bio-farming, bio-industry and bio-informatics</p> <p>The Society for Innovation and Entrepreneurship (SINE) at IIT Bombay receives grants and benefits from the Department of Science and Technology (DST) and the Ministry of Electronics and Information Technology (MeITY) of the Government of India. Biotechnology Industry Research Assistance Council (BIRAC) also provided funding under its Bio-NEST incubation support and seed fund support schemes.</p> <p>The Indian Government has invested INR 380 Cr to develop bio-clusters and bio-incubators in India. In order to promote health, agriculture, food and nutritional technologies, The Department for Promotion of Industry and Internal Trade (DPIIT) is reserving a certain section of funds from Funds of Funds for Startups (FFS) for biotechnology ventures.</p> <p>The Indian government has provided a lot of support over the past few years by launching initiatives such as DBT, DST, CSIR, and BIRAC that inject a generous amount of money into the biotechnology start-up ecosystem.</p> <p>Deep tech Start-ups:</p> <ul style="list-style-type: none">• Bengaluru based RichCore Life Sciences develops animal-origin free proteins and enzymes.• Chennai based AURA Biotechnologies develops cell lines, recombinant proteins, antibodies, vector expressions, and a number of diagnostic kits for processing drug discovery and development.• Kolkata based Noor Enzymes Private Limited develops enzymes for industrial applications.	<p>International Centre for Genetic Engineering and Biotechnology, Centre for Cellular & Molecular Biology, National Botanical Research Institute, Rajiv Gandhi Centre for Biotechnology, National Agri-Food Biotechnology Institution (NABI), National Institute of Animal Biotechnology (NIAB) and Regional Centre for Biotechnology (RCB) that research on plant, animal, agricultural and environmental biotechnology researches.</p>

Ecosystem overview

Start-up Ecosystem in the Application Areas



Environment / Sustainability / Waste Management Technology Start-ups	Applied Research Institutes
<p>India is moving forward in all major industries with artificial intelligence, machine learning and AI, it would be important to see a lot of start-ups cropping up in waste management.</p> <p>Deeptech Startups:</p> <ul style="list-style-type: none">• Haryana based Polycycl's technology deploys the Contiflow Cracker continuous process for conversion of waste plastics to lighter distillate fuels.• Hyderabad based Banyan Nation (Banyan Sustainable Waste Management Solutions Pvt. Ltd.) is a technology-driven organization which is involved in plastic recycling and waste management in India.• Chakr Innovation based in Haryana has developed a technology for emission control that captures pollution from diesel generators and converts the captured pollutants into usable inks and paints.• Protoprint, a Pune-based company, has partnered with Pune waste collectors and transforms plastic waste in 3D printing filaments.• Sparkle innovations based in Gujarat transforms banana stem agro-waste into all-natural sanitary pads, organic fertilizer and other goods with added value.• GPS Renewables is a company based in Bangalore that operates on a thumb rule – zero waste. It transforms into biogas all the kitchen and other organic waste.• Mumbai based Indra Water (Inphlox Water Systems Pvt. Ltd.) has developed wastewater treatment methodology through novel innovations in electrocoagulation, electrochemical oxidation, two-phase solids separation, disinfection, distillation and pollutant monitoring hardware.	<p>Applied research institutes in India who are focussing on the deep tech are very limited, however, in the future it is expected to be adopted for the technology and product research and development. Some of the research institutes are as follows</p> <ul style="list-style-type: none">• CSIR-National Environmental Engineering Research Institute (Nagpur)• International Institute of Waste Management (IIWM) (Bengaluru)• National Solid Waste Association of India (NSWAI) (Mumbai)

Ecosystem overview

Start-up Ecosystem in the Application Areas



Digital (AI, VR, big data, Cloud) Technology Start-ups

AI, VR, big data, Cloud are at the cusp of an explosion in India. With the digitization in India, there has been high interest amongst the technology start-ups planning to leverage the deep tech beneficiaries in wide range of applications such as industrial and commercial applications.

Indian Government has formulated and launched various schemes such as Make in India, Start-up India for adopting digital technologies.

Deep tech Start-ups:

- Hyderabad-based company Imagine has developed its NuSpace platform by adopting Augmented Reality (AR), Virtual Reality (VR) & Mixed Reality (MR) technology enterprise.
- Wobot Intelligence (New Delhi) - Computer Vision solutions for monitoring your business operations.
- Mumbai-based Tesseract Imaging is an MIT spin-off developing holographic cameras and goggles that build products that work with your smartphone in the Mixed Reality (AR / VR) area.
- Bengaluru based Uncanny Vision is an AI-based Computer Vision company focusing on making cameras more intuitive with Real-time, Edge-based technology for a better, stable and competitive environment.

Applied research Institutes

- Wadhwani Institute For Artificial Intelligence in Mumbai creates and applies AI-based technologies and solutions to a wide range of societal fields including healthcare, agriculture, education, infrastructure and financial integration.
- Department of Computational and Data Sciences, Indian Institute of Science (Bengaluru) and Indian Management School & Research Centre (Mumbai) are researching on Big Data platforms and Cloud Computing

Ecosystem overview

Start-up Ecosystem in the Application Areas



Robotics Technology Start-ups	Applied research Institutes
<p>India is the fastest growing emerging market for robotic technologies. A new initiative called ' Tech Start-up Program ' has been launched by the All India Council for Robotics and Automation (AICRA) that acts as an incubation environment for start-ups and other early stage adopters working on Robotics and Robotics Process Automation (RPA).</p> <p>The consortium formed by some deep tech start-up founders had preliminary meetings in Bengaluru with corporations such as ABB and Honeywell.</p> <p>The robotics company, tagged as a ' soonicorn, ' is highly probable to be India's first deep-tech unicorn and has already earned overall funding of USD 180 million.</p> <p>Deep tech Start-ups:</p> <ul style="list-style-type: none">• Omnipresent Robot Technologies, based in Delhi, was instrumental in using robotics to clean and rebuild the Ganga river.• CynLr, a deep-tech robotics company based in Bengaluru, develops visual object intelligence for industrial robots.• Invento Robotics based in Bengaluru has developed Mitra robot that aids in contextual support for the customers.• TartanSense – An agricultural-robotics company• Genrobotics based in Thiruvananthapuram operates with the aim of sewage deaths caused by manual scavenging. With Bandicoot, a spider-shaped robot, it cleans manholes.	<ul style="list-style-type: none">• Indian Institute of Information Technology Allahabad has an official Robita robotics club, which has a laboratory for robotics and machine intelligence to develop and advance the technology using machine learning techniques.• Delhi based National Institute of Robotics & Artificial Intelligence (NIRA) and Centre for Artificial Intelligence and Robotics in Bengaluru focuses in the areas of Artificial Intelligence (AI), Robotics, and Control systems.

Ecosystem overview

Start-up Ecosystem in the Application Areas



Consumer IoT Technology Start-ups	Applied Research Institutes
<p>Since 2015, the Indian start-up ecosystem has seen an IoT boom. IoT start-ups in India had raised approximately \$54.5 million in funding till May 2018. In July 2015, Prime Minister Narendra Modi announced the Center of Excellence for IoT as part of the Digital India Initiative to launch the IOT ecosystem taking advantage of India's IT strengths and helping the country achieve a leadership role in the converging hardware and software sectors.</p> <p>Deep tech Start-ups:</p> <ul style="list-style-type: none">• Bengaluru based InCEve, a sonar system built on the (IoT), enables fishermen use the appropriate technology to optimize this process and collect the appropriate information for catching the fish schools.• Hyderabad-based Indriyn employs IoT to collect the data from all sources and persistently feed it to a cloud-based big data engine, where machine learning algorithms detect faults, energy leaks, and forecast the future action plans.• Mumbai based NanoSniff Technologies has developed a cantilever and a micro-heater technologies for micro- and nano-scale sensing applications.• Bengaluru based Yuktix Technologies develops indigenous remote monitoring and sensor analytic solutions.	<p>Applied research institutes in India who are focussing on the deep tech are very limited. Some institutes like IoT LAB Indian Institute of Information Technology and Management – Kerala are rigorously working on the IoT platform. However, in the future it is expected to be adopted for the technology and product research and development.</p>

Ecosystem overview

Start-up Ecosystem in the Application Areas



Pharmaceuticals Technology Start-ups	Applied Research Institutes
<p>In India, it takes time to implement deep tech to switch from fundamental science to a technology that can be applied to real use cases in pharmaceutical applications, but several companies are working on deep tech to market the technology.</p> <p>Deep tech Start-ups:</p> <ul style="list-style-type: none">• Zumutor Biologics INC, based in Bengaluru, has developed antibody libraries to develop new immunotherapy and has a global license for a breast cancer treatment.• In order to personalize diagnosis, Mitra Biotech based in Bengaluru has developed a new way to test cancer drugs on tumour cultures in the lab.• Bengaluru based OncoStem Diagnostics conducts tests to estimate cancer recurrence in patients in India at an affordable cost.	<p>Applied research institutes in India who are focussing on the deep tech are very limited, however, in the future it is expected to be adopted for the technology and product research and development. Some of the applied research institutes in pharma technology are</p> <ul style="list-style-type: none">• Delhi Institute of Pharmaceutical Sciences & Research (New Delhi)• Bombay College of Pharmacy (Mumbai)
Beauty/Cosmetics Technology Start-ups	Applied Research Institutes
<p>The growth in beauty product consumption in India has created new trends that give cosmetics companies and brands with significant opportunities.</p> <p>Deep tech Start-ups:</p> <ul style="list-style-type: none">• SkinKraft Laboratories, based in Hyderabad, is one of India's few cosmetics companies which uses machine learning to provide customers with more precise product ideas.• Pune-based NeuroTags is a unique start-up leverage of digital and AI-based technologies that eliminates the falsification of branded physical goods completely.	<ul style="list-style-type: none">• Central Drugs Standard Control Organization (CDSCO) governs the end-end solutions of drugs and cosmetics in India. Applied research institutes in India who are focussing on the deep tech are very limited such as Institute Of Natural & Modern Cosmetech, Haryana, Hygienic Research Institute Pvt Ltd., Mumbai, however, in the future it is expected to be adopted for the technology and product research and development.

Ecosystem overview

Start-up Ecosystem in the Application Areas



Health and Wellness Technology Start-ups	Applied research Institutes
<p>The health and wellness industry has been witnessed a strong pace of value growth in India during the past five years, strongly driven by the healthy living trend amongst consumers in the country. In India, the use of AI in healthcare is still in its early stages. However, with India's acute medical doctor shortage, especially in rural areas, it has been suggested that AI can soon be indispensable to health care. While experts find the use of AI for medical assistance to be a welcome development.</p> <p>Deep tech Start-ups:</p> <ul style="list-style-type: none">Docturnal, a T-Hub incubated AI start-up, is trying to tackle tuberculosis (TB) using a system that uses music timbre to quantify TB cough.Bengaluru-based mFine, uses bots to collect simple symptom information from patients and handover to qualified doctors, in rural areas.Bengaluru-based Niramai Health Analytix uses artificial intelligence thermal imaging for non-invasive breast cancer screening.Bengaluru based Myelin Foundry, a deep tech company, develops AI-based products in health and wellness field.Mumbai-based deep-tech start-up UE LifeSciences aims to provide an alternative to mammography that are low-cost and radiation-free.In order to monitor cardiac function, Monitra Healthcare based in Hyderabad has developed a patch strip device called upBeat ®.Cure. Fit, based in Bengaluru, offers holistic health & wellness solutions that combine AI-based and offline solutions to provide physical, nutritional, clinical and mental well-being in a holistic, integrated manner.Eyestem company based in Bengaluru aims to develop treatments for eye diseases that can not be cured.	<p>Wadhwani Institute For Artificial Intelligence in Mumbai creates and applies AI-based technologies and solutions to a wide range of societal fields including healthcare, agriculture, education, infrastructure and financial integration. The Indian Council of Medical Research (ICMR), New Delhi and Healthcare Technology Innovation Centre (Chennai) are researching on innovative technologies.</p>

Ecosystem overview

Start-up Ecosystem in the Application Areas



Med Tech/Med Device Technology Start-ups	Applied research Institutes
<p>India is on the rise in MedTech industry. India is also increasingly recognized as a major source of product and technology innovation and unique innovation start-up ecosystem.</p> <p>Deep tech Start-ups:</p> <ul style="list-style-type: none">• Bengaluru-based Achira Labs has developed an immunodiagnostics technology platform.• Bengaluru-based SigTuple utilizes AI and visual medical data based on smart screening tools to assist with medical diagnosis.• EzeRx, a MedTech company based in Kolkata, is developing affordable, non-invasive IoT solutions for fast chronic disease diagnoses.• Bengaluru-based Forus Health is a medical technology start-up that develops a solution to eradicate preventable blindness.• Bengaluru-based Coeo Labs is a start-up company that solves unmet clinical needs through innovative medical devices focused on emergency, trauma and critical care.• Mimyk is an Indian Institute of Science (IISc) spin-off from Bengaluru builds interactive clinical simulation technologies combining hardware and software.• A wearable electrocardiography (ECG) device called Biocalculus has been developed by Kollam-based Waterchips.• Bengaluru based I-MOV MOTIONTECH has developed Smart Gait Analysis and Functional Electrical Stimulation Systems helps faster treatment of movement disorders.• Chennai based Neomotion Assistive Solutions Private Limited has designed a customizable wheelchair and two accessories for use on the road.• Bengaluru based Sascan Meditech uses its unique imaging technology for the early detection of squamous cell carcinoma in the oral cavity and cervix.• PathShodh Healthcare Private Limited (Bengaluru) is a medical device research and development company incubated at the Indian Institute of Science (IISc) has developed a new miniaturized biosensor that controls diabetes and helps to diagnose chronic kidney disease in advance.• A device for cancer screening called Smart Scope has been developed for Pune based Periwinkle Technologies. It is made up of a pencil camera that gives the cervix a close-up view.• Wellthy Therapeutics, based in Bengaluru, has developed a prescribable digital platform for patients with type 2 diabetes.	<p>IIT Delhi is sponsoring Indian medical technologies to adopt deep technology in their research and development, however, in the future it is expected to be adopted for the technology and product research and development. The Indian Council of Medical Research (ICMR), New Delhi and Healthcare Technology Innovation Centre (Chennai) are researching on innovative technologies.</p>

Ecosystem overview

Start-up Ecosystem in the Application Areas



Materials/Chemicals/Textile/3D Printing Technology Start-ups	Applied Research Institutes
<p>India is increasingly seeking to step off minimal-cost product segments and increase the technology level in 3D printing and materials to more technologically advanced products.</p> <p>Deep tech Start-ups:</p> <ul style="list-style-type: none">Mumbai based deep tech start-up Icarus Innovations leverages AR/VR and Deep Learning for providing the commercial solutions in the areas of textile industry.Ethereal Machines (EM), a Bengaluru-based deeptech company that produces 5-axis CNC machines and 3D printers.Bengaluru-based Deep Tech 3D Bioprinting Company Next Big Innovation Labs focusses on the development of products and services for R&D and clinical applications.Bengaluru based start-up NoPo Nanotechnologies Ltd., has developed a completely new material which can be leveraged in spacecraft construction.Bengaluru based Log 9 Materials has developed graphene-based metal-air batteries that can ideally be used for powering electric vehicles.Hyderabad based Nanospan is a graphene & nano composites R&D pioneer, developing materials for EV energy storage, ballistic/blast/fire/radiation protection; nanocomposites and advanced components for smart-fabrics/wearables.New Delhi based EnNatura Technology Ventures is a clean materials company that develops specialty chemicals from renewable sources.UP based Green Organic Clothing Pvt. Ltd. Develops and provides solution oriented eco-friendly clothing & soft furnishing products in retail and institutional space.Bengaluru based Spectalite have developed innovative technologies using Biodegradable Compounds that enable us to use fast-renewable resources such as bamboo, rice husk and starch.	<ul style="list-style-type: none">Researchers at the Central Salt and Marine Chemicals Research Institute, Bhavnagar have developed Graphene Nanocomposites Derived from Abundant Sea Weeds can Take up Heavy Metals.Researchers at the Indian Institute of Technology (IIT) Delhi, India, have developed an innovative nanocomposite material synthesized from cotton, which is magnetic in nature,Bhabha Atomic Research Centre (BARC), based in India, has developed a bulletproof jacket using boron carbide ceramics.

Ecosystem overview

Start-up Ecosystem in the Application Areas



Agriculture Technology Start-ups	Applied Research Institutes
<p>The government has been exploring ways to use deeptech to grow India's agricultural sector. The government recently launched an online platform focused on blockchain to establish coffee production and sale.</p> <p>IIIT-Hyderabad and the National Institute for Agricultural Extension Management (MANAGE) have signed a MOU to initiate an Agri Tech Start-up Accelerator Program using deeptech technology and inventions to tackle agricultural issues in India.</p> <p>Center for Cellular and Molecular Platforms (C-CAMP) has signed a MoU with StartLife, a major Dutch incubator to launch the Indo Dutch Life Sciences Sister Innovation Hubto to nurture and encourage deep-rooted science and deep technology advances with societal impact in agriculture.</p> <p>Deep tech Start-ups:</p> <ul style="list-style-type: none">AgroWave, a Haryana-based start-up, aims to use analytics to reinvent agricultural supply chains.Farmagain Agro Private Limited, based in TamilNadu, has succeeded in turning over 2,500 acres of land in India into organic farms using technological methods.ATGC biotech based in Hyderabad has developed new chemistries and new routes of synthesis for the production of high-quality insect pheromones.Pune based Ecozen enables Farm-to-Fork Value Chain for Perishables.Bengaluru based Fasal has developed Climate Smart Precision Agriculture PlatformFIB-SOL Life Technologies Pvt. Ltd, a spin-off deep tech startup from IIT Madras leverages nano-biotechnology and computational biology for providing light-weight, consistent and stable biofertilizers.Pune based BioPrime AgriSolutions Pvt. Ltd. has technology platforms that interfaces between chemical and biological crop protection and nutrition, precision technology and plant biology.	<p>Wadhani Institute For Artificial Intelligence in Mumbai creates and applies AI-based technologies and solutions to a wide range of societal fields including healthcare, agriculture, education, infrastructure and financial integration.</p>

Ecosystem overview

Start-up Ecosystem in the Application Areas



Food Technology Start-ups	Applied Research Institutes
<p>The Food technology start-ups in India are growing at an incremental phase by adopting deep technologies in their food technology research. Most investment in the food industry is focusing on marketing such as e-commerce like Amazon , BigBasket , FlipKart , Zomato and Swiggy etc, rather than on research and development of deep tech.</p> <p>Deep tech Start-ups:</p> <ul style="list-style-type: none">• Kochi (Kerela) based Psyight have developed World's first dedicated computer vision platform for recognising food items that leverages deep technology.• Bakeys based in Hyderabad has created a unique cutlery consisting of spoons, forks made by mixing jowar (sorghum) with rice flour and wheat flour.• Good dot based in Udaipur is a food tech startup that offers meat based on plants. The company turns grain and plant proteins into items that look like food, taste like meat, using a special technology.• Haryana-based ImagoAI helps food processing companies boost operational efficiency and reduce the risk of product recall by automating food analysis using state-of - the-art imaging tools and patented AI technologies.	<p>Most applied research institutes of food industry in India are research organizations supported by government such as</p> <ul style="list-style-type: none">• CSIR - Central Food Technological Research Institute (Mysuru, India),• Indian Institute of Food Processing Technology (IIFPT) (Tamil Nadu, India),• NIFTEM-National Institute of Food Technology Entrepreneurship and Management (Haryana, India).• Indian Institute of Technology, Hyderabad (India)

Ecosystem overview

Start-up Ecosystem in the Application Areas



Major VCs, Incubators and Accelerators for Deep Tech Startups in India (1/2)

There are 274 Accelerators & Incubators in India. Some of the key VCs, incubators and accelerators in India are as follows:

1. GrowX Venture Management

GrowX is an early-stage investment company based in Delhi NCR, with an emphasis on deeptech and B2B. The company has been involved in 6 deals in the fields of healthcare and deep-tech this year's third quarter, with 5 deals in the whole of 2018.

Founded: 2008

Location: New Delhi (India)

Portfolio: Doxper, Pixxel, Meddo and others

2. Axilor Ventures

Axilor is a seed capital and start-up accelerator. It spends \$153k to \$460k in seed phase firms. It invests in sectors such as technology, internet, healthcare and deep tech. It also runs a 100-day business accelerator program in the go - to-market stage.

Founded: 2014

Location: Bengaluru (India)

Portfolio: SigTuple, Niramai, Pocket Aces and others

Ecosystem overview

Start-up Ecosystem in the Application Areas



Major VCs, Incubators and Accelerators for Deep Tech Startups in India (2/2)

3. T-Hub

T-Hub is a Telangana government and three educational institutes that include IIIT-H, ISB & NALSAR-backed startup accelerator and incubator. It provides partnered services for acceleration and two programs for incubation-catalyst incubation system and digital incubation software.

Founded: 2015

Location: Hyderabad (India)

Portfolio: Uncanny Vision, Paymatrix, IntelliVision and others

4. Blume Ventures

The start-up fund VC seeks to help start-ups seeking to solve different Indian problems. The company has funded over 120 start-ups across multiple sectors since its inception, 10 of which are deep-tech start-ups.

Founded: 2011

Location: Mumbai (India)

Portfolio: GreyOrange, Locus.sh, Carbon Clean Solutions, Tookitaki, Systemantics, Agaralabs, Tartan Sense, Ethereal Machine, Zenatix, Tricog

5. Pi Ventures

Pi Ventures is an Indian-based early stage venture fund. investing in artificial intelligence and the Internet of Things (IoT) start-ups are planning to invest in 18 to 20 deep-tech start-ups over the next 4 years.

Founded: 2016

Location: Bengaluru(India)

Portfolio: SigTuple, NIRMAI, ten3T and others



Key Growth Drivers

INCREASING FOCUS ON AI/ML AND SMART AUTOMATION APPLICATIONS

2

India's deep tech companies focusing on the emerging technologies that drives more convenient and efficient technological advancements.

HIGH FUNDING POURS IN DEEP TECHNOLOGIES FROM GOVERNMENT AND VC

1

Indian Deep-tech sectors have received both federal and venture capital funding, accelerating research, development activities and commercialization processes of AI, ML and IoT based systems.

ENCOURAGING GOVERNMENT POLICIES AND REGULATORY FRAMEWORKS FOR DEEP TECH ADOPTION

3

Government of India have formulated policies and regulations for the startups that shows keen interest in the deeptech and emerging technologies.

PROMISING GOVERNMENT SUPPORT AND PUSH FOR NEW TECHNOLOGY DEVELOPMENT

4

Most deep technology start-up founders in India have developed their skills and credentials before they become entrepreneurs.



Key Growth Drivers (Explanation)

1

The government has taken several initiatives by setting up schemes funded by various technology clusters and is also driving the establishment of startups focusing on emerging and disruptive technologies. With the aim of driving the "Digital India" initiative, the Indian Government has set up several schemes and has awarded high funding for the development of several key technologies in the electronics and automation sectors. Many research labs/universities, startups working in deep tech in the fields of healthcare and consumer electronics are backed by government and venture capital funding. With 360 funding deals and \$5.85 billion in total funding, Bengaluru secured the top slot in 2019.

2

Deep tech and AI start-ups would allow the business, academia and the government to concentrate their efforts and mentorship. India's public and private sectors are increasingly focusing on adopting next-generation technology, demand for advanced deep-tech and AI-related technologies will see huge domestic growth, creating opportunities for start-ups and tech players to deliver innovative products and services. With the increasing popularity of deep tech, there is intense competition in the Indian market and this is complemented with the influx of several technology start-up companies and university spin offs trying to commercialize the new deep technology.

3

Central and state governments in India are playing an active role in the growth of the start-up ecosystem by stimulating entrepreneurial activity to promote job creation, develop environment by decreasing the regulatory burden and presenting new policies/initiatives like Atal Innovation Mission, MUDRA, Start-Up India, "Make in India" and "Digital India" building capacity through infrastructure design and training, provide funding support and fiscal incentives and assist all members of the Start-up ecosystem to collaborate and connect. Indian Government is creating conducive regulatory framework for start-ups by making business initiatives and business-friendly policies easy. In October 2019, India recently made a remarkable reached 63rd position in the 2019 World Bank's doing business ranking.

4

Government support through skills, funding, tax benefits, subsidies, and training plays a key role in driving entrepreneurship and small business growth. To effectively build business linkages, the highly fragmented and distributed talent needs a wide network of supporting infrastructure and regulations. For example, The government of Telangana has made efforts to promote start-ups in real time. By setting up T-Hub, a fair play for start-ups has been guaranteed by the state government because enterprises registered under the initiative can be directly involved in government projects. The Indian government has launched a Scheme for Facilitating Startups Intellectual Property Protection (SIPP) for adoption and encouraging awareness of Intellectual Property Rights among startups.

Potential Ecosystem Evolution – Overall View



	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
1. Biotech	There is growing interest and support by the Indian government for the development deep tech based biotechnology solutions. The biotechnology sector is expected to grow further in the next 5 years with the adoption of deep technologies such as AI and IoT.	
2. Environment	The Government of India offers to introduce a slew of reorganizations and plans to invest heavily on the startups that are focussing on waste management and in the current scenario this application area is strong and growing for deep tech and innovative startups. The forecast of the deep technologies adoption in this sector is expected to be in incremental growth.	
3. Digital	In recent years AI, AR / VR, Big Data, Blockchain and Cloud technologies have gained significant market penetration. By 2020, at least two-thirds of Indian companies will be setting up an exclusive center of excellence to accelerate the adoption of efficiency-centered technologies and applications. As demonstrated by Indian flagship initiatives such as Digital India, Make in India, and Start-up India, the Government of India is also optimistic about the growth prospects of these technologies. Expected to grow further in the next 5 years.	
4. Consumer IOT	India has joined the global race to become an IoT powerhouse, however, a lot needs to be done. The Government of India is taking strides to change the way citizens live and work. This application area has seen a few deep tech startups. Currently the developments in this application are in early growth stage and expected to grow in 5 years.	

Potential Ecosystem Evolution – Overall View



	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
5. Robotics	<p>Key Government initiatives such as Make in India, Start-up are driving deep tech technologies in robotic applications. Several Indian subsidiaries of international firms are also leveraging and implementing robotics. Moreover, the Indian firms are also investing to contend with leading foreign players.</p> <p>Growth stage ecosystem. Expected to see new entrants. Forecast to grow in the next 5 years.</p>	
6. Chemicals, Materials, 3D printing	<p>Research in materials and chemicals are growing rapidly and Indian market is expected to be a game changing market in the next 5 years. 3D Printing, with its use restricted to traditional applications such as prototyping for modeling and testing, is still not widely permeated in India. Few Deep tech startups are driving innovation.</p> <p>Expected to see new entrants, especially for 3D printing, in the next 5 years</p>	
7. Cosmetics	<p>There is no deep tech companies in beauty/cosmetics area in India. However, the cosmetics industry in India has seen a great growth in the last few years due to increasing beauty fears among both men and women. This area is not expected to see growth of deep tech start-ups.</p>	
8. Pharma	<p>There are few deep tech startup pharma companies that are focusing on their research in AI. This area has received good grants from both federal and as well as the VCs for the driving the growth of deep technologies. This area is expected to see new entrants in the next 5 years.</p>	

Potential Ecosystem Evolution – Overall View



	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
9. Health & Wellness	Innovation driven by deep tech startups and research institutes; expected to grow in the next 5 years.	
10. Medical Devices	India has few medical technology startups that are leveraging and researching on the deep technology. Major universities such as IIT Delhi is backing the startup companies to adopt and implement the deep technology in their product/technology development. Increasing growth stage. Expecting new entrants in large numbers in the next 5 years.	
11. Agriculture	India is foreseeing a slow and steady growth in the agricultural sectors with the support from many government funding and initiatives to leverage deep technologies. There are few deep tech startups in this area. Expected to grow in this area in the next 5 years.	
12. Food	In India, the start-ups of food technology are rising at an incremental level by implementing deep technologies in their research into food technology. However, very few deep tech startups in this area. Though the application sector has high impact expecting few deep tech startups in the next 5 years.	



Potential Opportunities for L'oreal

Potential Opportunities for L'oreal	
1. Biotech	Biotechnology is India's fastest growing segments. Some of the startups are innovating technologies and products related to animal-origin free proteins and enzymes cell lines, recombinant proteins, antibodies, vector expressions that has high impact and opportunities.
2. Environment / Sustainability / Waste Management	India has a vital focus on the environment and waste management sectors, where Frost & Sullivan has identified a pool of innovative startups who are creating innovative technologies and products through waste materials and pollutions. For instance, some innovations are plastic recycling to fuels, pollutants to inks/paints, plastic wastes to 3D printing filaments, organic sanitary pads and biogas from kitchen wastes.
3. Digital	Frost & Sullivan identified few deep tech startups in this digital segment that provides huge opportunities, some of the innovations are related to AR/VR/MR and Computer Vision solutions for enterprise monitoring that provides intuitive with Real-time, Edge-based technology for competitive environment.
4. Consumer IOT	Frost & Sullivan have identified a few IOT startups that leverages sonar system built on the IoT, cloud-based big data engine, micro- and nano-scale sensing technology, remote monitoring and sensor analytic solutions where high potential opportunities exists in these technologies.
5. Robotics	Robotics is fastest growing emerging segment in India that involves visual object intelligence for industrial robots and contextual support for the customers.
6. Chemicals, Materials, 3D printing	Chemical and material segments are highly established in India with innovations related to graphene materials, nanocomposite materials, advanced chemicals from renewable sources, biodegradable compounds. While textile and 3D printing segments are emerging with their innovations in deep technologies such as 5-axis CNC machines, 3D bioprinting and eco-friendly clothing & soft furnishing products.



Potential Opportunities for L'oreal

Potential Opportunities for L'oreal	
7. Cosmetics	Frost & Sullivan have identified a few cosmetics startups that leverages machine learning and AI based technologies for solving customer related issues such as counterfeits. The Indian trend of Go-Green and Vegan cosmetics provides huge opportunities.
8. Pharma	Frost & Sullivan have identified 4 pharma deep tech startups that involves research in antibody libraries to develop new immunotherapy, testing cancer drugs on tumour cultures, estimate cancer recurrence in patients and AI based thermal imaging for non-invasive breast cancer screening.
9. Health & Wellness	Wearable fitness tracker will be a significant and disruptive technology and will have the power to significantly impact medical diagnosis and drug delivery and most vital for self-tracking of health, particularly useful for monitoring elderly patients and babies. AI with Machine Learning to diagnose breast cancer, skin patches have huge opportunities.
10. Medical Devices	Non-invasive IoT solutions, immunodiagnostics technology platform, wearable ECG device and smart gait analysis have high potential opportunities for L'oreal. Adopting these technologies will aid in real-time monitoring of the health.
11. Agriculture	Digital farming is an evolving area which could transform the agricultural sector. Technologies, such as sensor technologies, data management and analytical tools, robotics, drones, and artificial intelligence are being integrated to develop products that enable digital farming. Frost & Sullivan have identified few innovative companies that produces biofertilizers, biopesticides, nutraceuticals and herbal pesticides to develop holistic organic farming processes. L'oreal can leverage this kind of organic based beauty and cosmetics products that is chemical free and safe for skin.
12. Food	Frost & Sullivan have identified a few deep tech start-ups who are working on various innovative methodologies and platforms such as computer vision, artificial intelligence to produce a disruptive by-product. L'oreal can utilize these innovative techniques by converting their products to innovative kitchen cutlery items.

Growth Environment – Singapore



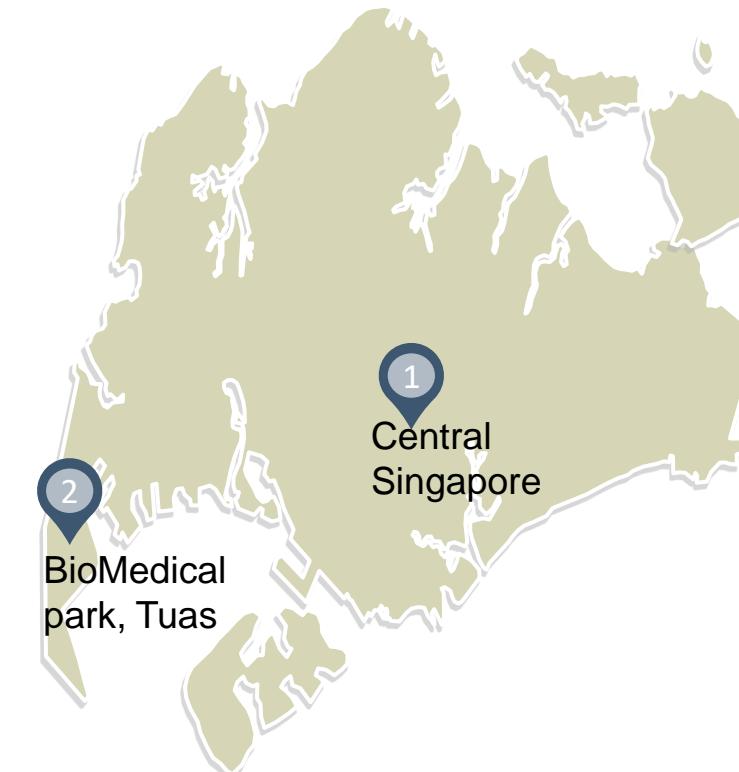
"In Southeast Asia, the Deep Tech landscape is in its nascent stage. Of the countries in the region, Singapore has the most advanced startup ecosystem but Deep Tech investments are still few and far between" SG Innovate

Ecosystem overview



- 1 Central Singapore (Biotech, Health & Wellness, Digital, Agriculture, Food)
- 2 Tuas BioMedical park; BioPolis Research Institute Complex for A*Star and other private companies; National University of Singapore

- Singapore's deep tech sector has gradually developed over the years. Compared to other Southeast Asian nations, it is ahead. The Singapore Government's support has led to the establishment of a good startup ecosystem. The deep tech ecosystem is weaker with less funds for this segment.
- The country's startup ecosystem is very well-developed, with about 5,000 startups, a strong and growing community of VCs including angels, and more than 100 incubators/accelerators. However, all this is catered to mostly general tech companies. The DeepTech sector in this ecosystem is in an embryonic stage.
- Deep tech startups have higher risks and longer gestation. The deal size are also smaller to reduce risk. This has stymied growth.



HIGHLIGHTS

- Singapore has the presence of many VCs and funding agencies. Most startups in ASEAN are funded from Singapore based VCs
- Singapore serves as a strategic market place for deep tech startups to penetrate emerging markets in Southeast Asia such as India, China, and Japan
- The deep tech startups in Singapore are focused on biotech, digital, agritech and food tech.
- The innovations are fostered largely by government organizations.
- The deep tech ecosystem in Singapore is pioneered by government agencies such as A*Star, SGInnovate, and Enterprise Singapore.



Ecosystem overview (1/2)

Innovation ecosystem stakeholders

- Singapore Government and Government linked organisations such as SGInnovate and Enterprise Singapore are supporting deep tech start-ups in Singapore.
- There are many research organizations under A*STAR, that cover research scopes such as biotechnology, robotics, medical agencies, Infocomm, food, nutrition, and consumer care.
- The Economic Development Board's (EDB's) Biomedical Sciences (BMS) group, Bio*One Capital, A*STAR's Biomedical Research Council (BMRC) work in close partnership. The goal is to develop the BMS cluster comprising pharmaceuticals, medical technology, biotechnology and healthcare services.
- In 2016 Singapore government has committed around USD\$19 billion over the period of 5 years, until 2020 in deep technology R&D development and to accelerate the commercialization of deep technologies. The key areas of deep technology application are Agri and food tech.

Singapore is the research hub for large MNCs. Large companies such as Roche and Abbott is partnering with public institutes in Singapore to innovate health tech solutions. Public-private partnerships are also observed such as A*Star partnered with P&G and Lion to explore innovations in Singapore.

National University of Singapore(NUS) and Nanyang Technology University (NTU) drive provides grants, mentorships, and business acceleration to deep-tech start-ups. NTUitive, an incubator from Nanyang Technological University that helps in fostering many deep tech start-ups.



There is a strong VC presence. VCs such as Red Dot Ventures, Jungle Ventures, and Sequoia Capital are actively investing in innovative technology based start-ups. Incubators and Accelerators such as SGInnovate, A*Star, and Singapore Enterprise, are government provisioned agencies that help to foster deep tech start-ups in this region. A*ccelerate is the commercialization arm of A*STAR.

There are many deep tech start-ups in the country that have been spawned from agencies' researches , universities' Initiatives and ambitious founders. These deep-tech start-ups have received investments from VCs and government agencies in Singapore. Some of the interesting deep tech start-ups are Invitrocue, KaHa, ACM Biolabsand, Shiok Meat. Med Device company Awak Technologies received \$11.2biillion funding.

Ecosystem overview



Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been estimated

Applications	Startups		Applied research Institutes	Interest level
Biotech	Total number	15	<ul style="list-style-type: none"> • Biopolis, an international research and development centre for biomedical sciences that provides collaboration among the private and public scientific community research institute in Singapore. It houses five research institutes of Agency for Science, Technology and Research (A*STAR) 	High
	Total investment	USD 120 million ↑		
	Highlights	The R&D in Singapore is strong and therefore became a hub for biotechnology researches. The biotechs start-ups are focused on therapeutics and diagnostics for Asian-specific diseases.		
Pharma	Total number	n/a	<ul style="list-style-type: none"> • Genome Institute of Singapore • Singapore Institute for Clinical Sciences <p>The Singapore Institute for Clinical Sciences (SICS) mission is the development of disease-oriented clinical and translational research programs in focused disease areas.</p>	Med
	Total Investment (2019)	n/a		
	Highlights	Dominated by the big pharma corporations		
Medical/ Cosmetic Device Manufacturing	Total number	2	<ul style="list-style-type: none"> • Roche establish the medical research center focusing in translational Medicine (CHF 100 million) by establishing partnerships with Singapore's scientific and medical institution. 	Low
	Total investment	USD 11.5 Billion ↑		
	Highlights	Dominated by large corporations. Awak Technologies received \$11.2billion funding in 2017.		



Ecosystem overview

Deep Tech Startups identified by Frost & Sullivan given here

Applications	Startups		Applied Research Institutes	Interest level
Health & Wellness	Total number	4	<ul style="list-style-type: none"> A*STAR's Institute of Microelectronics (IME) Singapore Institute for Neurote Technology (SINAPSE) 	High
	Investment	USD 15 million ↑		
	Highlights	<ul style="list-style-type: none"> The start-ups ecosystem is strong in health & wellness. A deep tech startups have been identified by Frost & Sullivan 		
Environment/ Sustainability/ Waste Management	Total number	4	<p>Nanyang Environment Management Institute</p> <ul style="list-style-type: none"> Developed method of waste plastic recycling to carbon nanotubes 	Low
	Total investment	USD 40 million ↓		
	Highlights	Start-ups which are largely focus on the recycling plastics and managing waste in most efficient way.		
Digital (AI, AR, VR, big data, Cloud, Blockchain)	Total number	10	<ul style="list-style-type: none"> National University of Singapore Nanyang Technology University 	High
	Total investment	USD 80 million ↑		
	Highlights	<ul style="list-style-type: none"> Government initiatives and start-ups are primarily focusing on AI and cloud data. Large companies such as Alibaba opened research labs in Singapore. Robotics Process Automation (RPA) enable utilizes AI and machine learning. 		

Ecosystem overview



Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been estimated

Applications	Startups		Applied Research Institutes	Interest level
Robotics	Total number	2	<ul style="list-style-type: none"> Nanyang Technology University (NTU) National University of Singapore (NUS) 	Low
	Investment	USD 10 M →		
	Highlights	F&S could not identify significant start-ups in robotics apart from robotics in manufacturing industry.		
Sensors and instrumentation (Consumer IoT)	Total number	2	<ul style="list-style-type: none"> National University of Singapore 	Low
	Investment	USD 15 M →		
	Highlights	<ul style="list-style-type: none"> There are few start-ups focusing on consumer IoT. 		
Chemicals / Materials / Textile / 3D printing	Total number	2	<ul style="list-style-type: none"> Nanyang Technology University printed human skin in 2018. 	Low
	Investment (2019)	USD 3 M →		
	Highlights	F&S was able to identify 2 deep tech startups in this space		

Ecosystem overview



Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been estimated

Applications	Startups		Applied Research Institutes	Interest level
Cosmetics / Beauty	Total number	3	<ul style="list-style-type: none"> Asian Cosmetics Research & Development Corporation 	Low
	Investment	USD 20 million ➔		
	Highlights	Organic cosmetics, cosmetics from Bird's nest, nano-encapsulation technologies		
Agriculture	Total number	9	<ul style="list-style-type: none"> National University of Singapore Nanyang Technology University Nanyang Environment & Water Research Institute 	High
	Investment	USD 50 million ↑		
	Highlights	Many start-ups are focusing in AI and data analytics in the research of lab based farming and in the research of increasing productivity of crops.		
Food	Total number	8	<ul style="list-style-type: none"> National University of Singapore Nanyang Technology University 	High
	Total investment	USD 35 million ↑		
	Highlights	There are many start-ups that are focusing researching for alternative meat and plant-based protein.		



Ecosystem overview

Start-up Ecosystem in the Application Areas

Bio Tech Start-ups	Applied Research Institutes
<p>Economic Development Board's biotechnology investment arm, Singapore Bio-Innovations supports funds for companies that are willing to enter into strategic alliances and joint ventures. The typical size of an investment ranges from SG\$200,000 to SG\$2 million.</p> <p>Biomedical sciences (BMS) accounts for 5% of Singapore's GDP and BMS manufacturing output is more than S\$23bn in 2017.</p> <p>Some interesting Bio Tech start-ups are:</p> <ul style="list-style-type: none">• RWDC Industries focuses on commercial production of multiple bio-based polymers and to forge the path towards a more sustainable future.• MiRXES, a spin-off from A*Star has Developed early cancer detection solutions.• Invitrocue is a spin-off from A*Star. specialises in developing ground-breaking 3D cell-based models derived from liver and tumour tissues.• ACM Biolabs, spin-off from A*Star is a synthetic biology company specializes in providing customized membrane protein products, services and expertise for drug discovery, diagnostics, and biomedical applications. The start-ups is backed up by team of international scientists.• Imagene Labs a leading global DNA-based beauty and wellness company that creates customised solutions based on individuals' unique genetic traits.• Aslan Pharmaceuticals: ASLAN Pharmaceuticals is a clinical-stage oncology and immunology focused biopharmaceutical company developing novel therapeutics for global markets.• TauRx Pharmaceuticals: Diagnostics and Treatment for neurodegenerative diseases.• S*Bio: Discovery and Development of drugs for cancer	<ul style="list-style-type: none">• Bioprocessing Technology Institute (BTI) in A*STAR.• Institute of Bioengineering and Nanotechnology (IBN) in A*Star• Genome Institute of Singapore (GIS)• Tuas BioMedical Park• Singapore Immunology Network (SIgN).• Institute for Health Innovation and Technology (iHealthtech), NUS



Ecosystem overview

Start-up Ecosystem in the Application Areas

Pharma Start-ups	Applied Research Institutes
<p>Singapore's pharmaceutical industry is regulated by the Health Sciences Authority (HSA) and the Health Products Act 2007, which includes all medical devices, pharmaceuticals, medicines and other supplements. Government policies in enabling public-private relationship enables the innovations of in pharmaceuticals in this region.</p> <p>Large companies are primarily dominates the pharmaceutical market in Singapore that are Abbott, GlaxoSmithKline, Lonza, MSD, Novartis, Pfizer and Sanofi-Aventis. These pharmaceutical companies account for more than 35-40% share of Singapore's regional market.</p> <p>Frost & Sullivan could not identify any pharma deeptech startups. Most are biotech/biopharma</p>	A*STAR Institute of Chemical and Engineering Sciences



Ecosystem overview

Start-up Ecosystem in the Application Areas

Medical/Cosmetic Device Manufacturing Start-ups	Applied Research Institutes
<p>Health Products Act (HPA) requires that all the pharmaceutical and medical device products must be registered with the HSA before they can be sold in Singapore. There are two categories of applications: new drug application (NDA) and generic drug application (GDA). This application is dominated by large corporations such Abbott, Amgen, and GSK healthcare companies. These regulatory bodies carry out stringent approvals for cost effective and efficient medical devices, and other medical products.</p> <p>In 2018, HPA altered the regulation on lower risks medical devices to enable faster market access for lower risk medical devices. HPA also establishes clearer regulatory controls for newer medical devices(e.g. telehealth devices) and higher risk medical devices and more emphasis on post-market measures.</p> <p>Singapore emerging as the manufacturing hub for the medical device market. Singapore's medical devices industry is currently aiming to hit SG \$5 billion in manufacturing output.</p> <p>Interesting startups in the Medical Devices space:</p> <p>Awak Technologies has developed an innovative sorbent technology enabling dialysis to be performed on-the-go with ultra-portable systems, thus giving freedom to patients and enhancing their quality of life.</p> <p>Osteopore specialize in the production of 3D printed bioresorbable implants that are used in conjunction with surgical procedures.</p>	<ul style="list-style-type: none">• Singapore Institute for Clinical Sciences• Clinical Imaging Research Centre (CIRC)



Ecosystem overview

Start-up Ecosystem in the Application Areas

Health & Wellness Start-ups	Applied Research Institutes
<p>Singapore houses R&D centers for 30 global medtech companies including Biosensors, Becton Dickinson, Alcon and Hill-Rom, as well as local start-ups such as HealthSTATS and Veredus Laboratories. SGInnovate acts as an incubator and accelerator for health & wellness start-ups in Singapore</p> <p>Health & Wellness is a growing area for digital platforms. Frost & Sullivan has identified a few interesting deep tech startups:</p> <ul style="list-style-type: none">• Attune Technologies: Developed Cloud platform supports the entire healthcare ecosystem, right from a single clinic to national health projects spread across multiple regions and provinces.• Scanbo: It aims to construct a digital ecosystem bringing the internet, artificial intelligence, deep learning and an individual's biological, behavioural and psychological profile together.• UCARE.AI: AI for health predictions• Holmusk: Diagnosing Mental health disorders	<ul style="list-style-type: none">• A*STAR's Institute of Microelectronics (IME)• Singapore Institute for Neurote Technology (SINAPSE)



Ecosystem overview

Start-up Ecosystem in the Application Areas

Environment/Sustainability/Waste Management Start-ups	Applied Research Institutes
<p>Singapore government made The Sustainable Singapore Blueprint in 2015 to reduce plastics waste in the nation.</p> <p>Resource Sustainability Act to mandates reduce, reuse, and recycle plastics to achieve zero waste in the nation. The Act includes a mandates that large electronics retailers with a floor area bigger than 300 meter-square have to provide in-store e-waste collection points.</p> <p>There are not many significant start-ups are focusing in this application scope:</p> <ul style="list-style-type: none">• EcoWorth Tech, a spin-off from NTU is a waste-to-worth solutions partner specialised in transforming waste materials into reusable products while delivering social and environmental benefits.• Taraph Technologies: Plastic waste treatment solution	<ul style="list-style-type: none">• National Environment Agency (NEA)<ul style="list-style-type: none">- conducts research, surveillance, and evidence-based risk assessment on infectious diseases of environmental concern.• Nanyang Environment And Water Research Institute (NEWRI)<ul style="list-style-type: none">- NEWRI ecosystem strives to take its lab-scale innovations to innovative engineered solutions for the water and environmental markets.• Singapore Centre for Environmental Life Sciences Engineering:<ul style="list-style-type: none">- Focuses on Environmental Engineering, Meta-'omics & Microbiomes, Microbial Biofilms, and Public Health & Medical Biofilms.• Rehabilitation Research Institute of Singapore (RRIS).



Ecosystem overview

Start-up Ecosystem in the Application Areas

Digital (AI, AR, VR, big data, Cloud, Blockchain) Start-ups	Applied Research Institutes
<p>AI Singapore is a national program established by Singapore Government to enable digital economy in Singapore. The government plans to invest S\$150m in AI over the next 5 years.</p> <p>The objectives of AI Singapore are to use AI to address major challenges that affect society and industry, to invest in scientific innovation, and to broaden adoption and use of AI and machine learning within industry. It focuses on three key industry sectors: finance, city management solutions, and healthcare.</p> <p>Infocomm Media Development Authority (IMDA) is one of the agencies that focus on the AI system implementations in Singapore. One of the initiatives is to mainstream VR in variety of applications. For example, new techniques using VR technology systems are being pioneered for advanced clinical training to help trainees improve their performance in real-life situations.</p> <p>Some interesting start-ups in AI technology are:</p> <ul style="list-style-type: none">• Taiger developed AI to automate Manual yet Complex Tasks, Intelligently,• Seventh Sense developed AI models optimized for low powered, embedded, edge silicon devices that are compatible with any camera system already deployed worldwide.• AntWorks developed ANTstein to autonomous data processing for both structured and unstructured data.	<ul style="list-style-type: none">• National University of Singapore• Nanyang Technology University• Infocomm Media Development Authority (IMDA)



Ecosystem overview

Start-up Ecosystem in the Application Areas

Robotics Start-ups	Applied Research Institutes
<p>Singapore government has committed 450 million to National Robotics Policy and the majority of this funding is dedicated for robotics in manufacturing or Industry 4.0.</p> <p>There are few start-ups that can be related to robotics in cosmetic packaging manufacturing and medical industry:</p> <ul style="list-style-type: none">• Eureka robotics- Developed robotic arm that can handle fragile materials such as mirror and lenses effectively with human assistance.• NDR Medical- Developed Automated Needle Targeting (ANT) technology with robotics and AI based system. The AI based algorithms also allows the system to use training data to continually improve the accuracy of how lesions are targeted. ANT technology uses Integrated robotic system with Image analysis.	<ul style="list-style-type: none">• Rehabilitation Research Institute of Singapore- The objective of the institute is to invest in technologies to solve healthcare labor shortages, with one of the main focus areas being clinical robots.



Ecosystem overview

Start-up Ecosystem in the Application Areas

Sensors & Instrumentation (Consumer IoT) Start-ups	Applied Research Institutes
<p>Infocomm Media Development Authority (IMDA), a agency from Ministry of communication in Singapore that helps in digitalising Singapore. One of the notable initiatives includes partnerships amongst local companies and MNCs to enhance the IoT ecosystem in all verticals.</p> <p>However the deep tech start-ups focusing in consumer IoT are not many. Nonetheless one notable consumer IoT device is:</p> <ul style="list-style-type: none">• Kaha- Developed a registered brand, Cove, an end to end smart IoT wearables platform focusing on verticals such as digital payment, health & wellness, safety, lifestyle, and special needs.• Meridian Innovation- Developed of low cost, mass producible thermal sensors. It raised US\$6 million.	<ul style="list-style-type: none">• Government Technology Agency (GovTech)



Ecosystem overview

Start-up Ecosystem in the Application Areas

Chemicals/3DPrinting/Textiles Start-ups	Applied Research Institutes
<p>Deep start-ups focusing in Chemical, 3D printing, and textiles within the application scope is still at the nascent stage. Government's institutes and universities research are still dominating the innovations in these industries.</p> <p>One interesting start-up in chemical technology is:</p> <p>Seppure</p> <ul style="list-style-type: none">- Developed sustainable nanofiltration solutions to separate chemical mixtures at a molecular level with minimal energy used, curbing the reliance on one of the most energy-intensive and polluting processes on the planet. <p>Bio3D Technologies</p> <ul style="list-style-type: none">- Bio3D Technologies develops scientific 3D printing platform and innovations for a variety of research and biomedical applications.	<ul style="list-style-type: none">• NTU- In a collaborative project with the Biodesign Institute at the Arizona State University in the US, the fermentation process and symbiotic bacterial and yeast cultures to form new tactile media from cellulose fibres are developed. The resulting leather-like material can be developed further into sensorial material by embedding conductive composites.• NUS- Invented smart textiles that have 1000 times battery life.• Singapore for Additive Manufacturing (AM.NUS)



Ecosystem overview

Start-up Ecosystem in the Application Areas

Cosmetics/Beauty Start-ups	Applied Research Institutes
<p>ASEAN Cosmetic Directive (ACD) from 1 January 2008. Under the Regulations, there are ingredients that are prohibited in the formulation of cosmetic products and there are ingredients that are only allowed to be used with certain restrictions.</p> <p>Market size in Singapore in 2019 is USD 1.04 billion and is growing at CAGR 1.6 from 2019 to 2023.</p> <p>A few interesting startups in Cosmetics space:</p> <p>Matralix is a company that is working on lipid based encapsulation technology. Founded in 2014, the company focuses on developing micro encapsulation systems. For example, methods of protecting and delivering active ingredients in cosmetics and pharmaceuticals. It develops manufacturing processes as well as research and development tools which can then be licensed out to larger firms for use in their labs and manufacturing.</p> <p>Purer Skin: Making cosmetics from Bird's nest</p> <p>Kew Organics: Makes water based organic products</p>	<ul style="list-style-type: none">Health Sciences Authority (HSA)



Ecosystem overview

Start-up Ecosystem in the Application Areas

Food Tech Start-ups	Applied Research Institutes
<p>FoodInnovate, an initiative launched Singapore Government to drive innovation in food in this nation. This initiative has been leading by Enterprise Singapore with other government agencies such as the Agri-Food and Veterinary Authority.</p> <p>The Food Innovation and Resource Centre (FIRC) was launched in 2007 as a joint initiative between Singapore Polytechnic and Enterprise Singapore to innovate food enterprises with technical expertise in new product and process development including packaging, shelf life evaluation and market testing.</p> <p>Singapore government has committed S\$144 million for research funding in food innovation under the Government's Research, Innovation and Enterprise 2020 plan. One of the initiatives includes research on the optimised nutritional food for Asian.</p> <p>In 2018, food manufacturing industry was worth \$4.3 billion and contributed to about 1.1 per cent of Singapore's gross domestic product. It employed more than 48,000 workers.</p> <p>There are a number of interesting start-ups that are able to disrupt food industry in Singapore:</p> <ul style="list-style-type: none">• Shiok Meat: Developed lab based sea meat such as lobster.• Vires New Protein: Developed plant based protein alternative to animal protein• Life3 BioTech is a foodtech start-up from NUS. It developed a 'meat-free' alternative that allows people to receive the same protein benefits.• Nutrition Innovation: Raised USD 5 million Series A funding in 2019. Developed low glycemic Nucane™ sugar that is rich in anti-oxidants.• Alchemy Food Tech: Developed a patent pending technology, 5ibrePlus™, to lower the Glycemic index in white rice, bread and noodles, without changing the taste, texture and colour of the food. 15g of 5ibrePlus™ will provide 25% of suggested daily requirement.	<ul style="list-style-type: none">• Singapore Centre for Nutritonal Sciences, Metabolic Diseases and Human Development (SiNMeD) spawned from the collaboration between A*STAR and NUS.



Ecosystem overview

Start-up Ecosystem in the Application Areas

Agri Tech Start-ups	Applied Research Institutes
<p>Singapore Food Agency (SFA) sets the target of producing 30% of Singapore's nutritional needs by 2030. One of the key strategies is to use technologies to grow plants with less resources.</p> <p>Enterprise Singapore's investment arm, Seeds Capital, made a collaboration with seven co-investment partners to invest more than S\$90 million (US\$65.1 million) into Singapore-based early-stage agrifood tech startups.</p> <p>There are many deep tech agriculture start-ups in Singapore and some of them are:</p> <ul style="list-style-type: none">• Sustenir Agriculture<ul style="list-style-type: none">- Grows vegetables in labs with minimal space in a Controlled Environment Agriculture.• Artisan Green<ul style="list-style-type: none">- Use of hydroponics technology in controlled, indoor environments allow us to grow 100% pesticide-free. Our quality fresh greens are locally grown and harvested right in the heart of Singapore.• VertiVegies<ul style="list-style-type: none">- Developed versatile and scalable indoor farming that are independent to erratic climate change.• Polybee<ul style="list-style-type: none">- Using drones for cross pollination to promote cost efficient and productive agriculture.• Umitron<ul style="list-style-type: none">- Uses technology to increase the productivity in agriculture.	<ul style="list-style-type: none">• Singapore Economic Development Board• Singapore Food Agency<ul style="list-style-type: none">- Helps start-ups to network with local growers.• Temasek Foundation<ul style="list-style-type: none">- Supports the development of start-ups' agri tech farming.• NUSGRIP<ul style="list-style-type: none">- Accelerates deep-tech start-ups.



Ecosystem overview

Start-up Ecosystem in the Application Areas

VCs/Accelerators/Incubators/Mentors (1/2)

SGInnovate

- Developed deep tech Nexus strategy that supports deep tech start-ups in Singapore in various way such as funding, collaborative spaces, business building, and enhancing capabilities of talents.
- Invested over SG\$40 million in over 70 portfolio companies that have gone on to raise another SG\$450m from the market.

A*Star

- Strategically partners with leading companies' innovation centers to drive innovations in various industries. It also houses many applied research institutes to foster innovations in areas such as biotechnology, pharmaceuticals, and chemicals and as the result A*Star has spawned many deep tech start-ups. In addition, it also has A*ccelerator program that helps to commercialise the start-ups in the relevant markets.

Enterprise Singapore (Singapore government agency)

- Enterprise Singapore, a government agency aimed to foster tech start-ups in Singapore to penetrate markets outside Singapore. This agency particularly focuses on the development of advance water treatment, food technology, and health products.
- It provides financial support to the start-ups in Singapore including deep technology. Moreover, it also provides tax incentives that includes double taxation deduction, angel investor tax deduction, and the global start-ups

Jungle Venture

- One of the largest VC in Southeast Asia with funding over USD 240 million. This VC is large invested on start-ups focusing on big data, AI, and software development for data analytics.



Ecosystem overview

Start-up Ecosystem in the Application Areas

VCs/Accelerators/Incubators/Mentors (2/2)

VisVires New Protein Capital (VNVPC)

- Supports deep tech start-ups that focus on the revolutionizing in food and nutritional innovations.
- It invests in early-stage companies, from Seed to Series C.

Red Dot Ventures

- Largely invest in the deep tech start-ups in Singapore and its areas of interest include ICT, IoT, big data, artificial intelligence, clean technology & alternative energy solutions, medical technology & advanced healthcare solutions.

Economic Development Board (EDB)

- Provides R&D schemes to encourage new innovations.
- Provide IP incentives to commercialize and the IP resulted from the R&D activities.

NTUitive

- NTUitive is an accelerator program which is responsible for managing the intellectual property assets of The Nanyang Technological University and to take technology from the laboratory to the marketplace. It is based in Singapore, Singapore and seeks to invest in the technology startup companies. It provides the startups with mentorship, working space and early stage funding. It has invested over 118 start-ups and has 94 portfolio.



Key Growth Drivers

1

ROBUST GROWTH ENVIRONMENT FOR STARTUPS

- Singapore has a robust environment for startups in the form of VCs, Incubators and Accelerators

2

ATTRACTIVE PLACE FOR RAISING FUNDS FROM INVESTORS

- Venture capitalists injects funds into deep tech start-ups in Singapore. VC in Singapore has been driving the growth of deep tech technology. However, some of the venture capitalist are from foreign countries with offices in Singapore such as Jungle Ventures, Sequoia Capital, and Monk's Hill Ventures
- There are more than 180,000 millionaires in Singapore who can be a huge pool of investors in fostering deep tech start-ups in this country

3

UNIVERSITIES INITIATIVES

- Up to S\$150 million (US\$108 million) will be invested in the initiative over five years. Universities initiatives on **deep tech researches** have driven the growth of deep tech technologies in Singapore
- National University Singapore provides mentorship programs for first time entrepreneur in Singapore
- NTUitive – An initiative from Nanyang Technology University to incubate start-ups which spawn from the university researches

4

FAVORABLE GOVERNMENT POLICIES & REGULATIONS

- Environment in Singapore encourage start-ups to take risks as there are many supports from governments, prominent universities, and venture capitalists.
- The procedure to get license is easy and straight forward compared to other competitive countries such as U.S.



Government Initiatives

1

Singapore government is one of the biggest investors in deep tech

- In 2016 Singapore government invested around USD\$19 billion over the period of 5 years, until 2020 in deep tech R&D development and to accelerate the commercialization of deep tech
- The key areas of deep tech application are AI, Blockchain, Agri tech and Food tech

2

Lenient regulation on medical devices

- In 2018, Hospitality Purchasing Association (HPA) altered the regulation on lower risks medical devices to enable faster market access for such devices
- This amendment drives large corporations to invest in medical devices innovation centers in Singapore

3

International Expansion Grant

- The grant helps Singapore-based companies with annual revenue of USD\$100 million for technological expansion

4

Initiative for Artificial Intelligence

- Programme launched by the Intellectual Property of Singapore accelerates the AI patent applications to less than 6 months

5

National Research Foundation of Singapore (NRF) USD\$19 billion fund

- Under the Agency for Science, Technology and Research (A*STAR), there are over 20 research institutes that have forged partnerships with prominent research centers around the world
- Of this USD\$19 billion, SGD\$4 billion and SGD\$3.2 billion are allocated for health and biomedical sciences and advanced manufacturing & engineering respectively



Potential Ecosystem Evolution – Overall View (1/3)

Deep tech ecosystem in Singapore is at nascent stage. However, the market opportunity is huge in Singapore as it provides growth opportunities to start-ups to penetrate emerging markets in Asia Pacific. Moreover, concentrations of venture capitalist focusing on technology start-ups in Singapore has further increased its probability for tech start-ups to be successful in this region.

	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
1. Biotech	Rapid investment in Biotech by government agencies and universities organisation are expected to leverage in the next 5 years. More researches from these institutes will spawn deep tech start-ups.	
2. Environment	The initiatives and growth will be more from government agencies. Not a very strong area for deep tech start-ups. Not forecast to have a high growth of start-ups in the next 5 years	
3. Digital	Using AI in cosmetics will gain huge momentum as AI enables the better understanding of customers preferences in choosing the best cosmetics products. Mixed reality and big data will be geared towards advertising and acquisition the right customers to companies. Moreover, mixed reality will be used for virtually applying cosmetics before purchasing.	
4. Consumer IoT	There will be no significant ecosystem in consumer IoT in this period. Although the market size for consumer IoT is strong here.	

Potential Ecosystem Evolution – Overall View (2/3)



	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Start-ups
5. Robotics	Using robots in precision manufacturing will increase in the cosmetic manufacturing automation. Unlike traditional robots, the robot will be equipped with artificial technology that can efficiently perform material handling such as lenses and mirrors with great precision. Although for now there are only few deep tech start-ups, this ecosystem has potential to grow in the next 5 years.	
6. Chemicals, Materials, 3D printing	This application scope is largely driven by government institutes and universities researches. There are no significant deep tech start-ups although the application areas (in-scope) have high potential.	
7. Cosmetics	Nano-encapsulation technologies is expected to gain interest. Vegan cosmetics are expected to gain momentum as there is growing customer base who prefers to use cosmetics with plant-based ingredients rather than from animal sources. There is a startup making cosmetics from Birds' nest.	
8. Pharma	Large corporations dominate the innovation in pharma industry instead of start-ups. More strategic collaboration is expected between government agencies and large corporations. This collaborations will drive the ecosystem of pharmaceutical technologies.	



Potential Ecosystem Evolution – Overall View

	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
9. Health & Wellness	Start-ups in health & wellness is expected to grow in Singapore primarily in developing gadgets in health, wellness, and fitness significant for executives.	
10. Medical Devices	Medical devices will be more focused on medical implants and contact lenses and this ecosystem is expected to increase due to high standards in engineering and design capabilities of universities and research institutes in Singapore. More collaborations between large companies and government agencies is expected to evolve in the next 5 years.	
11. Agriculture	Agri tech start-ups will expand quickly as there is huge investments around these applications during this period. Accelerators such as government and universities (NUS and NTU) as well as huge investment from VCs will drive the evolution of this ecosystem towards cost-efficient and technology driven indoor or controlled environment farming.	
12. Food	Market for animal protein developed from the lab will proliferate in Singapore within this region where start-ups develops animal protein in the labs. This initiatives will reduce Singapore dependency on imported food. Moreover, alternative plant based protein will gain momentum during the tine period.	

Potential Opportunities for L'oreal



Potential Opportunities for L'oreal	
1. Biotech	<ul style="list-style-type: none">• Genetic based customized cosmetics and beauty products.• Using 3D modeled cells for drug discovery and validation.• DNA based bio technology products for the creation of beauty and cosmetics products.• Customized membrane protein products for drug discovery.
2. Environment	Using cost effective biopolymer materials for cosmetics and other product packaging.
3. Digital	AI to automate complex tasks and autonomous data processing for structure and unstructured data are some of the opportunities with startups
4. Consumer IOT	Low cost thermal sensors in the hair brush for provide details of the heat applied on the hair.
5. Robotics	Advanced robotics for handling fragile materials such as lenses and mirror solution in the manufacturing of cosmetics and beauty products packaging
6. Chemicals, Materials, 3D printing	Employment of nanofiltration solutions to separate chemical mixtures at a molecular level in cosmetics and skin care formulations using minimal energy; 3D printing platforms for biomedical applications



Potential Opportunities for L'Oréal

Potential Opportunities for L'Oréal	
7. Cosmetics	Lipid based encapsulation technology
8. Pharma	Accelerate the researches in the development of drugs and biopharma ingredients in cosmetics, skin care, and personal care products.
9. Health & Wellness	<ul style="list-style-type: none">IoT devices for health and wellness monitoring.
10. Medical Devices	Sorbent technology dialyzer; 3D printed bone implants
11. Agriculture	Controlled environment for growing plants, hydroponics and increasing productivity are some of the opportunities
12. Food	<ul style="list-style-type: none">Plant based protein sources as an ingredients in cosmetics, skin care, and personal care products to replace animal based protein sources with the same benefits.Using low glycemic index plant based ingredients in cosmetics, skin care, and other personal products.Low glycemic sugar with active antioxidants for cosmetics and beauty products.

Growth Environment – Thailand



Ecosystem overview

Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been estimated

Applications	Startups		Applied research Institutes	Interest level
Biotech	Total number	2	<ul style="list-style-type: none"> National Center for Genetic Engineering & Biotechnology (BIOTEC), Khlong Neung Thailand Bioresource Research Centre, Khlong Neung 	High
	Total investment	USD 1 million		
	Top hubs	Bangkok		
	Highlights	High flow cell separation and early stage bacteria detection.		
Pharma	Total number	n/a	<ul style="list-style-type: none"> Thailand Bioresource Research Centre, Khlong Neung 	Low
	Total Investment	n/a		
	Top hubs	n/a		
	Highlights	n/a		
Health & Wellness	Total number	2	<ul style="list-style-type: none"> Thailand Bioresource Research Centre, Khlong Neung National Institute of Health, Ministry of Public Health, Nontaburi 	Med
	Total investment	USD 1 million ↑		
	Top hubs	Bangkok		
	Highlights	Clusters focusing on digital health fitness platform.		

Source: National Innovation Agency, e27, Local Governments, VC websites, Crunchbase

Ecosystem overview

Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been estimated

Applications	Startups		Applied Research Institutes	Interest level
Medical devices	Total number	n/a	• Medical Sciences & Research Centre, Faculty of Medical Technology, Mahidol University, Bangkok	Low
	Investment	n/a		
	Top hubs	n/a		
	Highlights	n/a		
Environment / Sustainability / Waste Management	Total number	2	• Environmental Research Institute, Chulalongkorn University, Bangkok • Thailand Environment Institute, Nonthaburi	Medium
	Total investment	USD 2 Million →		
	Top hubs	Bangkok		
	Highlights	The startups are focusing in the biodegradable plastics for packaging.		
Digital (AI, VR, big data, Cloud, Blockchain)	Total number	n/a	• VISTEC, an AI research institutes established by DEPA. • National Electronics & Computer Technology Center (NECTEC), Khlong Neung • Thailand Institute of Scientific and Technological Research, Phatumthani	Low
	Total investment	n/a		
	Top hubs	n/a		
	Highlights	n/a		

Source: National Innovation Agency, e27, Local Governments, VC websites, Crunchbase

Ecosystem overview

Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been estimated

Applications	Startups		Applied Research Institutes	Interest level
Robotics	Total number	n/a	<ul style="list-style-type: none"> Regional Center of Robotics Technology, Chulalongkorn University, Bangkok BART LAB, Center for Biomedical & Robotics Technology, Faculty of Engineering, Mahidol University, Salaya 	Low
	Total Investment	n/a		
	Top hubs	n/a		
	Highlights	n/a		
Sensors and instrumentation (IoT)	Total number	1	<ul style="list-style-type: none"> National Nanotechnology Center (NANOTEC), Khlong Neung IoT Institute, Chonburi Thailand Institute of Scientific and Technological Research, Phatumthani 	Low
	Total Investment	USD 2 Million →		
	Top hubs	Bangkok		
	Highlights	Smart devices for nutrition content measurement.		
Chemicals / Materials / Textile / 3D printing	Total number	1	<ul style="list-style-type: none"> Thai Institute of Chemical Engineering and Applied Chemistry, Chulalongkorn University, Bangkok Thailand National Metal and Materials Technology Center, Khlong Neung 	Low
	Total Investment	USD 0.5 million →		
	Top hubs	Bangkok		
	Highlights	Graphene materials from recycled animal fat		

Source: National Innovation Agency, e27, Local Governments, VC websites, Crunchbase

Ecosystem overview

Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been estimated

Applications	Startups		Applied Research Institutes	Interest level
Cosmetics / Beauty	Total number	n/a	Beauty Institute, Bangkok	Low
	Investment	n/a		
	Top hubs	n/a		
	Highlights	n/a		
Agriculture	Total number	3	<ul style="list-style-type: none"> • Royal Agricultural Research Centre, Chiangmai • Horticultural Research Institute, Department of Agriculture, Bangkok • Rubber Research Institute Department of Agriculture, Bangkok 	High
	Investment	USD 4 million 		
	Top hubs	Bangkok		
	Highlights	Smart solution for crop management.		
Food	Total number	2	<ul style="list-style-type: none"> • Institute of Food Research & Product Development (IFRPD), Kasetsart University, Bangkok • The Halal Science Center, Chulalongkorn University, Bangkok 	High
	Total investment	USD 4 million 		
	Top hubs	Bangkok		
	Highlights	Thailand focuses on innovation of foods particularly in low glycemic level of food.		

Source: National Innovation Agency, e27, Local Governments, VC websites, Crunchbase

Ecosystem overview

The list of regional hubs / ecosystems

- 1 Bangkok (Biotech, Agri-Tech, Digital, Health & Wellness, and Food Tech)
- 2 Chiang Mai (Agri-Tech, and Food Tech)
- 3 Khon Kaen (Health & Wellness, medical devices)
- 4 Pathum Thani (Biotech, Cosmetic & Beauty)



HIGHLIGHTS

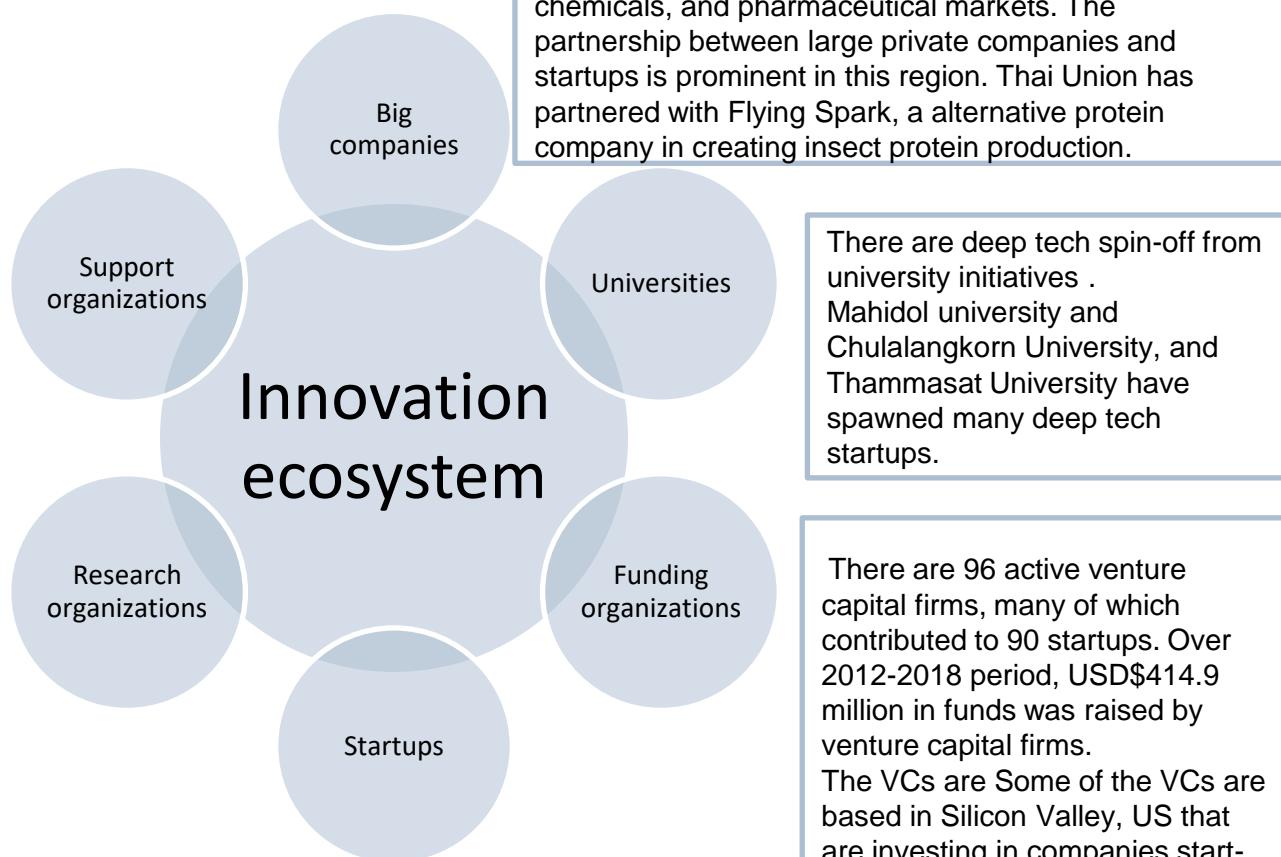
- Thailand government has been supporting deep tech startups through the National Innovation Agency with an aim to become a deep tech hub.
- Venture capitalists focus on deep techs start-ups in Thailand. The VCs are heavily invested on Agri tech, food techs, AI, and virtual reality based start-ups.
- Large companies are in the country and focus on food tech and data analytics.
- Chiang Mai houses many research institute for agriculture innovation.
- True Digital, Bangkok is the innovation hub for technology companies such as Google's Data Center
- Pathum Thani houses Thailand Science Park where many research institutes are located including BIOTEC and NANOTEC

Ecosystem overview

Thailand 4.0 has spurred the government to take action in various areas including biotechnology, agriculture, automation. National Innovation Agency (NIA), a government agency of Thailand with the mission of supporting and developing Thailand's innovation system. Some of the key targets of NIA are biotechnology, food innovation, and robotics. Moreover, DEPA Thailand is partnering with universities to leverage innovations in science and technology.

There are a number of research organisations in Thailand that are both government funded and private funded organisations. National Science and Technology Development Agency These institutes are largely focused in Bangkok and Chiang Mai.

The deep tech start-ups are supported by government agencies. The key focus of the deep tech startups are in the Agriculture, food, and AI.



Ecosystem overview

Innovation ecosystem stakeholders



Biotech Startups	Applied Research Institutes
<p>Tax incentives for biotechnology companies investing in Thailand include an 8-year corporate income tax holiday and exemption of import duties on machinery and raw materials used for manufacturing of export products.</p> <p>National Science and Technology Development Agency (NSTDA) provides government and organizational support. Through the operation of four national research centers, including BIOTEC, MTEC, NANOTEC, and NECTEC, and a technology management center (TMC), NSTDA</p> <p>Frost & Sullivan has two biotech startups:</p> <ol style="list-style-type: none">1. Zenostic: Founded by a group of students in Material Science and Engineering at the Faculty of Science, Mahidol University. Developed propriety microbial testing technology (MicroCheck Array) to detect bacteria before they become harmful. Sprint is the accelerator for this startup2. X-Zec Biotec: A spin-off from Mahidol University that developed commercializing the patented high-flow cell separation technology.	<p>1. National Science and Technology Development Agency (NSTDA)</p> <p>2. Center for Genetic Engineering & Biotechnology (BIOTEC), Khlong Neung</p> <p>3. Chulabhorn Research Institute, is a biomedical and chemistry research institute in Bangkok, Thailand.</p> <ul style="list-style-type: none">• Thailand Bioresource Research Centre, Khlong Neung

Ecosystem overview

Innovation ecosystem stakeholders



Pharmaceutical Startups	Applied Research Institutes
Largely dominated by large corporations such as Roche, Novartis, Siam Bioocience, Sanofi Aventis, and Takeda. Frost & Sullivan could not find any deep tech startups	<ul style="list-style-type: none">The Armed Forces Research Institute of Medical Sciences (AFRIMS) (Bangkok), an applied research institute in collaboration between US and Thailand. The center developed medical solutions such as drug and vaccines for diseases.
Medical device Startups	Applied Research Institutes
Medical Device Control Division (MDCO) from the Food and Drug Administration (FDA) in Thailand (also known as Thai FDA) regulates the medical device market. The approval process in Thailand for Class III general medical devices (lowest risk) is relatively fast and easy. Lower risk medical devices include surgical gloves. Large companies have partnered with government agencies Frost & Sullivan could not identify any deep tech start-ups in this application area.	<ul style="list-style-type: none">Department of BioMedical Institutes, King Mongkut's Institute of Technology Ladkrabang (Bangkok), research center for the development of medical devices.

Ecosystem overview

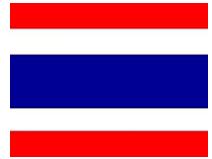
Innovation ecosystem stakeholders



Health & Wellness Startups	Applied Research Institutes
<p>A key focus area focusing on smart health. Khon Kaen city launched smart health care solution towards becoming a smart city. The smart healthcare initiatives include IoT based smart ambulance and smart ICU.</p> <p>Although there are no significant deep tech start-ups in Thailand in this space, some of the interesting start-ups related to health and wellness technology are as follow:</p> <p>YesMom: Provides personalised health care insights through machine learning.</p> <p>DoctorMe: Digital health care application that provides personalised health care solutions.</p> <p>Mind My Health: Mobile app for mental health monitoring and provides motivating quotes.</p>	<ul style="list-style-type: none">• Thailand Bioresource Research Centre, Khlong Neung• National Institute of Health, Ministry of Public Health, Nontabuti

Ecosystem overview

Innovation ecosystem stakeholders



Environment / Sustainability / Waste Management Startups	Applied Research Institutes
<p>Government initiatives is strong here and few start-ups. Thailand government enrolled new policies to minimise waste. Krabi is chosen to launch TAT waste management program by Thai Government together with Unilever Thailand.</p> <p>One interesting startup in this application area: Universal Biopack: Uses bamboo for food packaging to replace plastics. Fang Tai: Developed rice straw paper that are non-toxic and biodegradable.</p>	<ul style="list-style-type: none">Environmental Research Institute, Chulalongkorn University, BangkokChulabhorn Research Institute (Bangkok) to provide scientific evidence supporting the idea that gestation is a period of high sensitivity to environmental chemicals, and that exposures during early development may lead to an increased risk of disease later in life.Expert Centre of Innovative Clean Energy and Environment (InnoEn)InnoEn conducts R&D on clean energy technology and innovation from biomass (including water, residue from agricultural and industrial sectors and waste from communities),Thailand Environment Institute, Nonthaburi
<p>Cosmetics and Beauty startups</p> <p>Thailand's beauty and personal care products market was valued at approximately \$6.2 billion in 2018 and is expected to reach \$8.0 billion in 2022. This market is largely dominated by large corporations such as Sephora, Beautrium, Stardust, Beauty Market and Lashes.</p> <p>Frost & Sullivan could not identify any deep tech cosmetics and beauty start-ups in Thailand.</p>	<p>Applied Research Institutes</p> <ul style="list-style-type: none">Beauty Institute, BangkokNational Nanotechnology Center (NANOTEC)BIOTEC, developed herbal medicine

Ecosystem overview

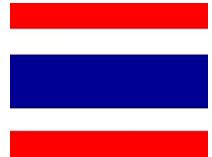
Innovation ecosystem stakeholders



Digital (AI, VR, AR, Big Data, Cloud, Blockchain, etc.) Startups	Applied Research Institutes
<p>“U.REKA” is the first university-industry collaboration program to foster Thailand’s innovation ecosystem and nurture strong deep tech startups since ideation to commercialization.</p> <p>Ministry of science and Technology via National Institute of Science, Technology (NIST), and Innovation (NISTI) is working with 12 universities in advanced research and innovation.</p> <p>The Ministry of Health has changed the regulation for lower risks medical devices such as the surgical glove that encouraged many companies to penetrate this market.</p> <p>Artificial Intelligence and virtual reality are one of the prominent of Thailand government focus of Thailand field the start-ups are focusing.</p> <p>Frost & Sullivan could not identify any deep tech cosmetics and beauty start-ups in Thailand.</p>	<ul style="list-style-type: none">National Electronics & Computer Technology Center (NECTEC), Khlong NeungThailand Institute of Scientific and Technological Research, Phatumthani
Sensors and Instrumentation (Consumer IoT) Startups	Applied Research Institutes
<p>There are few start-ups in Thailand focusing in this application scope.</p> <p>Today, there are more than 3.17 million individual IoT (SIM card) Frost & Sullivan identified one start up in Thailand:</p> <ol style="list-style-type: none">1. Rinn – Developed smart cup that can give nutritional value of the ingredients.	<ul style="list-style-type: none">National Nanotechnology Center (NANOTEC), Khlong NeungIoT Institute, ChonburiThailand Institute of Scientific and Technological Research, Phatumthani

Ecosystem overview

Innovation ecosystem stakeholders



Robotics Startups	Applied Research Institutes
<p>Thailand government is investing in robotics mainly for industrial applications such as in advanced manufacturing operations to leverage automation and robotics systems in increasing production efficiency. These area is largely dominated by large manufacturing companies.</p> <p>The government is aiming for an investment of 12 billion Baht (US\$362 million) in the first year (2019), expanding to 200 billion (US\$6 billion) Baht over the next five years. The development plan also aims to reduce the import of robotics and automation systems by 132 billion baht (US\$3.97 billion) on an annual basis toward enabling Thailand. Frost & Sullivan did not identify any deep tech start-ups in robotic in application scope).</p> <p>CT Asia Robotics – Developed a talking robot created to serve rapidly aging populations in Thailand and Japan. (this application area is not in the scope)</p>	<ul style="list-style-type: none">• Regional Center of Robotics Technology, Chulalongkorn University, Bangkok• BART LAB, Center for Biomedical & Robotics Technology, Faculty of Engineering, Mahidol University, Salaya
Chemicals, Materials, Textile, 3D Printing Startups	Applied Research Institutes
<p>National Hazardous Substances Committee voted to ban the herbicides paraquat and glyphosate and the insecticide chlorpyrifos that will automatically barred their use under existing law effective 1 December.</p>	Mahidol University

Ecosystem overview

Innovation ecosystem stakeholders



Agriculture Startups	Applied Research Institutes
<p>Agriculture is one of the major source of incomes for Thailand. In 2018, the value of agricultural products export was 1,388,541 million baht (about US\$ 44,792 million) which is about 17% of the total exports. About 30% of the population are classified as agricultural population.</p> <p>Startups with deep tech in agriculture applications in Japan:</p> <ul style="list-style-type: none">• EverGrow: Produces specialty fertilizers for fertigation and foliar nutrition.• BioMatLink: Developed smart platform in farming for increasing crop's yield• Ricult: Raised USD\$1.85 million recently. It provides digital platform based on machine learning and satellite images for small farmers to improve their crop yield by 50% on average.	<ul style="list-style-type: none">• Royal Agricultural Research Centre, Chiangmai• Horticultural Research Institute, Department of Agriculture, Bangkok• Rubber Research Institute Department of Agriculture, Bangkok

Ecosystem overview

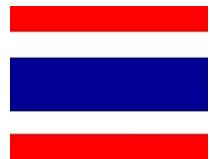
Innovation ecosystem stakeholders



Food Startups	Applied Research Institutes
<p>Food innovation in Thailand is spurred by National Innovation Agency and leading food company such as Thai Union.</p> <p>Thailand Agri Culture Development policy National Innovation Agency stresses the importance of food innovation in Thailand.</p> <p>Sprint accelerates the deep tech start-ups focusing in food in Thailand.</p> <p>Some interesting startups:</p> <p>JuiceInnov8: A Chulalongkorn University spin-off. Raised USD 0.5 million in pre-series A funding from 500 Start-ups. Developed low glycemic content sugar for low calorie sugars.</p> <p>Algaeba (Sprint): Speed up shrimp postlarvae selling process</p> <p>Electronic Nose: A spin-off from Mahidol University that provides smelling services for environment, food & beverage, and healthcare. For example, it developed electronic nose for evaluation of fragrance and human body odor in cosmetic industry</p>	<ul style="list-style-type: none">• Institute of Food Research & Product Development (IFRPD), Kasetsart University, Bangkok• The Halal Science Center, Chulalongkorn University, Bangkok• Food and Feed Innovation Center: Focuses on research and development of food, with a special emphasis on using biotechnology to improve food quality to increase the value of commercial products as well as to make process improvements. The center aims to be a solution provider to the food industry.

Ecosystem overview

Innovation ecosystem stakeholders



VCs/Accelerators/Incubators/Mentors

- Axion Ventures, Digital Ventures, 33 Capital, Kejora Ventures, Aura Group, Taurus Ventures, Stonelotus Capital, Viralety, Ardent Capital, Siri Ventures are the prominent VCs in Thailand

500 Fund (Based in US but is investing in promising start-ups in Southeast Asia, particularly Thailand)

- Has invested in deep tech startups focusing in sustainability, food tech, and health care start-ups.
- 500 invested in startups worldwide particularly in Southeast Asia such as Thailand and Vietnam.

Thailand Tech Startup Association

Supports tech start-ups in Thailand by conducting research and development for the Thai startup ecosystem, represent the country on behalf of the community, come up with startup-friendly initiatives and policies, and work with corporates and the government to grow the startup scene.

True Incube

True Incube an incubation program that selects high potential startups business to help scale and form synergies within the TRUE and CP Conglomerate. Key focus areas include AI, agri tech, food tech, medical, and fin tech.

Key Growth Drivers



1

RISE OF GLOBAL VENTURE CAPITALS

- Thailand is attracting global VCs with more than 75% of existing VCs are foreign entities
- Notable global VCs are 500 Startups, Golden Gate, Ventures and CyberAgent Ventures

2

RISE OF INNOVATION LABS

- Rise of innovation labs to spearhead incubation testing
- Some prominent incubators include Innohub, Vision and Digital Ventures

3

PARTNERSHIP BETWEEN THAI UNIVERSITIES AND SILICON VALLEY ACCELERATORS

- Universities in Thailand have started developing technology-intensive programs in partnership with leading tech companies in Silicon Valley

4

DIGITAL PARK THAILAND

- The park with a total area of approximately 160,000 square metres will be completed in 2021
- IoT Institute will be an anchor tenant
- IoT and AI will be the key technologies for development at the digital valley

5

FAVORABLE GOVERNMENT POLICIES & REGULATIONS

- Forward-looking actions by regulators legitimize new technology
- First country in the world with 3 regulatory sandboxes covering different aspects of the financial services
- Allow market participants to do pair trading for cryptocurrency
- Tax exemptions to VCs and corporate funds for their investments in selected businesses

Government Initiatives

1

Thailand 4.0 and Digital Thailand Policy launched in 2016

- To transform Thailand into a “value-based” economy
- Restructuring and developing government agencies and ministries to further support start-up industry eg. Ministry of Digital Economy and Society (MDES), Digital Economy Promotion Agency (DEPA), Electronic Transactions Development Agency (ETDA) etc.

2

Digital Economy Legislation

- Creating new laws of relevance to the digital economy and updating existing ones to protect the country from possible digital risks and threats eg. Electronic Transaction Bill (amendment), Computer-Related Crime Bill (amendment), Cybersecurity Bill, Personal Data Protection Bill, Digital Economy Promotion Bill

3

Digital Infrastructure

- Development of smart infrastructure sharing models
- Implementing a robust regulatory framework eg. first country in the world with 3 regulatory sandboxes covering different aspects of the financial services
- Building a state-of-the-art, world-class data centre and facility for cloud-based services
- Ensuring reliable and sufficient capacity for international connectivity (liberalisation of connectivity)

4

Increased Government Spending on R&D

- Thailand aims to increase investment in R&D from 1% of GDP by end of 2018 (160 billion baht) to 1.5% by 2021

Potential Ecosystem Evolution – Overall View



	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
1. Biotech	Biotech is one of the key focus of the Thailand government. Based on the increasing investment and the proliferation of start-ups, biotech is expected to grow rapidly in the next 5 years focusing in the applications of biomedical.	
2. Pharma	Pharma is largely dominated by large MNCs in Thailand. However, there is high potential for the start-ups to lead the innovations in this period.	
3. Health & Wellness	Health & wellness in Thailand is largely driven by the AI technology. There are many start-ups that focuses on the development of AI platform to develop the personalised health and wellness solution.	
4. Medical devices	Highly dominated by large corporations. The innovations is led by high corporations in Thailand due to high investments. The emergence of innovations from start-ups will be not many in this period. There are around 320 local manufacturers, mostly Small and Medium Enterprises (SMEs) producing lower risk medical products such as diagnostic kits, syringes, surgical gloves and catheters. Over 80% of domestic production is for export.	

Potential Ecosystem Evolution – Overall View



	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
4. Environment / Sustainability / Waste Management	Innovations from start-ups focuses on the packaging using replacing plastics. This trend is expected to evolve for the next five years.	
5. Digital (AI, VR, big data, Cloud, Blockchain)	More start-ups is moving towards AI, cloud systems, VR, and big data. The typical industries that these start-ups are focusing on are blockchain, fintech, and cloud services. Many VCs and government funded agencies are actively investing in these applications areas. There is a huge potential for the start-ups to focus on the virtual reality and AI related to the cosmetics.	
6. Robotics	Robotics start-ups ecosystem in the application scope is expected to have not much growth in the application scope of the ecosystem as the evolution of robotics is geared towards advanced manufacturing automation.	
7. Sensors and instrumentation (IoT)	As Thailand primarily investing in start-ups focusing in blockchain, fintech, and AI there is potential in the innovation of sensors and instrumentation in IoT devices.	

Potential Ecosystem Evolution – Overall View



	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
9. Chemicals / Materials / Textile / 3D printing	The evolution of startup ecosystem has potential. NANATEC which is located in Thailand Science Park is focusing in the innovation related to nanotechnology such as nanomaterial.	
10. Cosmetics and Beauty	Department of Thai Traditional and Alternative Medicine supports BIOTEC in an effort to turn raw herbal ingredients into high quality potent supplement at a pilot scale. There will be some potential to have innovation this herbal medicines.	
11. Agriculture	In Thailand, the initiatives from Ministry of Agriculture. The ecosystem is driven towards increasing the productivity of crops through innovative fertilizers and IoT platform for monitoring the crops.	
12. Food	The innovation s in food technology is expected to have increasing trend. Thai Union and National Innovation Agency are acting as incubator and accelerator for food tech industry.	

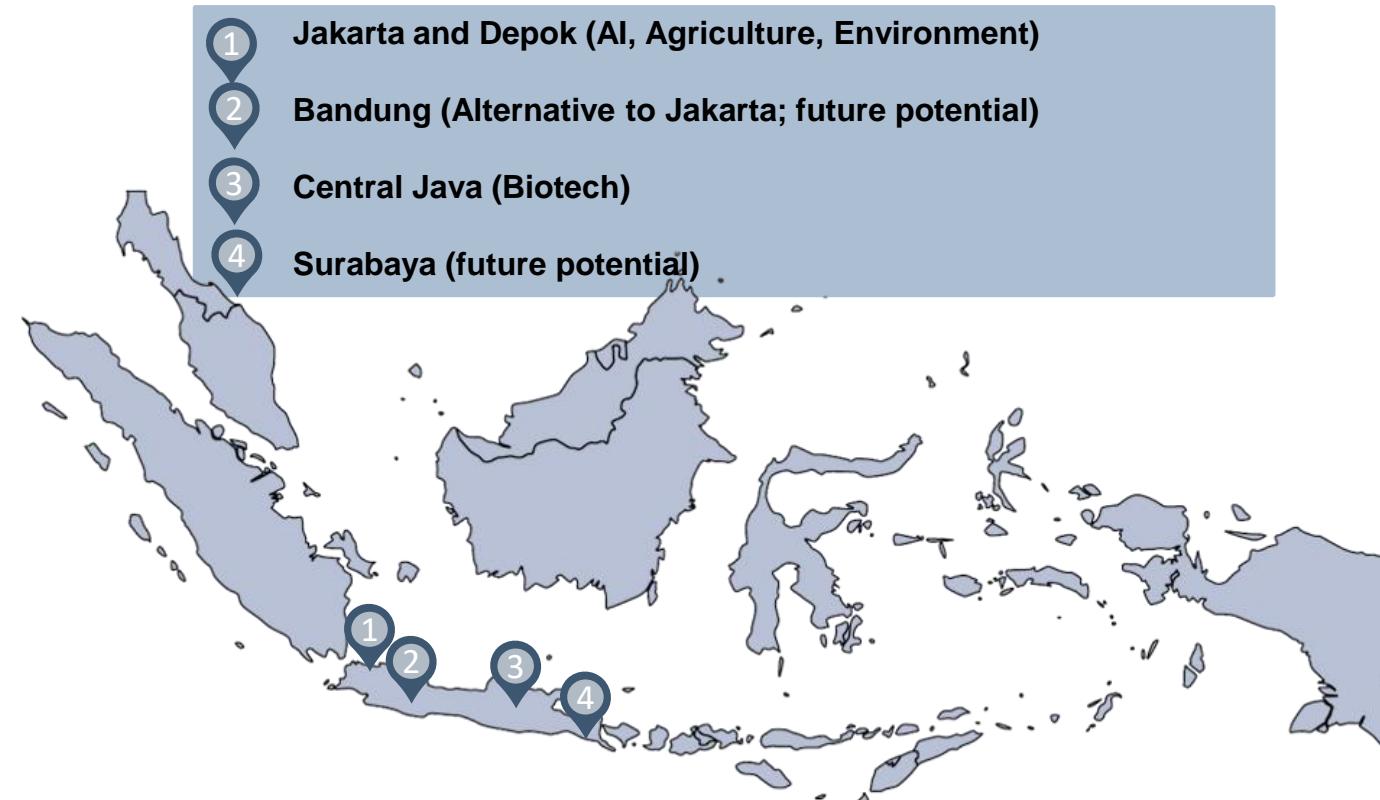
Potential Opportunities for L'Oréal

Potential Opportunities for L'Oréal	
1. Biotech	Fluid the separating biocells for chemical formulations and cosmetics Early stage bacteria testing
2. Environment	Packaging using rice flour and bamboo based packaging Environmental friendly packaging for cosmetics.
3. Agriculture	Innovation for monitoring soil condition for improving productivity and fertigation technologies
4. Food	Low glycemic content sugar ingredients for cosmetics and skin care products, probably that controls acne. Electronic nose consist of low cost chemical sensor array with a wireless communication for applications in healthcare. The electronic nose consists can be used to test fragrances effectively using chemical sensors.
5. Health & Wellness	Health monitoring devices for enhancing beauty and wellness.

Growth Environment – Indonesia



Ecosystem overview



Indonesia's startups ecosystem is expected to have record growth rate due to favorable support from government as well as private investment. The government emphasizes heavily in improving infrastructure, particularly in connectivity across country. The Ministry of Communications and Information projects that the digital economy in Indonesia to reach US\$ 130 billion by 2020, which is equivalent to 20% of Indonesia's total gross domestic product. With population of 269 million, Indonesia remains one of the countries with huge potential and an untapped market.

HIGHLIGHTS

- Indonesia's startup ecosystem gravitates more towards e-commerce and fintech, with four unicorns from these sectors.
- Indonesia is one of the biggest hubs of investment from VCs in Asia. Funding covers a wide range of industries from FinTech, E-Commerce, Logistics, to new industries such as AgriTech
- Deep Tech startups ecosystem is relatively young in the country. This is due to limited talent and also funding available for deep tech startups

Ecosystem overview

Innovation ecosystem stakeholders

Bekraf (Badan Ekonomi Kreatif : Creative Economy Agency) supports Indonesia's is an incubator for startups.

Ministry of Cooperatives and SMEs is a new ministry that takes care of tech startups

BKPM (Badan Koordinasi Penanaman Modal : Indonesia Investment Coordinating Board) is a department that provides support specifically for foreigner investors. It connects investors to the government and facilities communication between them

Indonesia is home to a few reputed applied research institutes such as Eijkman Institute for Molecular Biology and Indonesian Agricultural & Environment Research Institute. Collaboration with other nation's research institutes promote exchange of ideas

Indonesia has produced 4 unicorns from e-commerce and e-hailing service sectors. While there is interest in deeptech, the ecosystem is still nascent. There are some interesting startups in Indonesia



The big companies are from agriculture, food processing, textiles, chemicals and electronic products. While they do invest in R&D, they are not particularly known for driving innovation. Most of the innovation is driven by foreign corporations or in collaboration with foreign agencies

University of Indonesia; Faculty of Engineering at the Gadjah Mada University and Bandung Institute of Technology are some of the Universities carrying out Applied Research in Indonesia

Indonesia has strong support system across various stages ranging from pre seed, seed and up to later series. Fintech and E-commerce sectors are the main areas of interest. Of late, there is a lot of interest in Agritech. There are numerous incubators and accelerators in the country

Ecosystem overview

Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate).

Investment has been estimated.

Applications	Startups (for applications in scope)		Applied research Institutes	Interest level
Biotech	Total number	1	<ul style="list-style-type: none"> SMART Biotechnology Center, Bogor Research Center for Biotechnology LIPI, Bogor 	Low
	Total investment	USD 10 million →		
	Top hubs	Jakarta, Central Java		
	Highlights	Algae derived products		
Environment	Total number	1	<ul style="list-style-type: none"> Indonesian Agricultural & Environment Research Institute (IAERI), Central Java SMERU Research Institute, Jakarta 	Med
	Total Investment	USD 0.05 million →		
	Top hubs	Jakarta		
	Highlights	Will be an important area for Indonesian startups. Nascent as of now		
Digital (AI, AR/VR, Cloud)	Total number	2	<ul style="list-style-type: none"> Digital Capability Center (DCC), Ministry of Industry Indonesia, Jakarta AI Center of Excellence 	Med
	Total Investment	USD 3.5 million ↑		
	Top hubs	Jakarta, Depok		
	Highlights	2 startups are identified by Frost & Sullivan in this area		
Consumer IOT	Total number	n/a	- None-	Low
	Total Investment	n/a		
	Top hubs	n/a		
	Highlights	F&S could not identify any deeptech startups in scope of this study		

Ecosystem overview

Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate).

Investment has been estimated.

Applications	Startups (for applications in scope)		Applied research Institutes	Interest level
Robotics	Total number	n/a	<ul style="list-style-type: none"> EEPIS Robotics Research Centre, Surabaya Research Center for ICT and Robotics, Surabaya AI Center of Excellence 	Low
	Total Investment	n/a		
	Top hubs	n/a		
	Highlights	F&S could not identify any deep tech startup		
Chemicals, Materials, 3D Printing	Total number	n/a	<ul style="list-style-type: none"> Research Center on Chemistry, Indonesian Institute of Sciences, Jakarta 	Low
	Total Investment	n/a		
	Top hubs	n/a		
	Highlights	Frost & Sullivan was not able to identify any deep tech startup		
Cosmetics/ Beauty	Total number	1	<ul style="list-style-type: none"> Research Institute for Food, Drugs and Cosmetics Indonesia, Jakarta 	Low
	Total Investment	USD 0.1 million →		
	Top hubs	Jakarta		
	Highlights	Frost & Sullivan identified 1 startup in this sector		
Pharma	Total number	n/a	<ul style="list-style-type: none"> Eijkman Institute for Molecular Biology, Jakarta 	Low
	Total Investment	n/a		
	Top hubs	n/a		
	Highlights	Frost & Sullivan was not able to identify any deep tech startup		

Ecosystem overview

Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate).

Investment has been estimated.

Applications	Startups (for applications in scope)		Applied research Institutes	Interest level
Health & Wellness	Total number	n/a	<ul style="list-style-type: none"> Eijkman Institute for Molecular Biology, Jakarta 	Low
	Total investment	n/a		
	Top hubs	n/a		
	Highlights	Frost & Sullivan was not able to identify any deep tech startup		
Medical Devices	Total number	1	<ul style="list-style-type: none"> Centre of Pharmaceutical and Medical Technology, Indonesia University, Depok, West Java 	Low
	Total investment	USD 0.05 million →		
	Top hubs	Jakarta		
	Highlights	Tele-cardiotocograph (portable device). Only one startup identified		
Agriculture	Total number	8	<ul style="list-style-type: none"> SMART Biotechnology Center, Bogor Indonesian Agricultural & Environment Research Institute (IAERI), Central Java Indonesian Center for Food Crops Research and Development (ICFORD), Bogor 	High
	Total Investment	USD 5 million ↑		
	Top hubs	Jakarta		
	Highlights	Agritech is an emerging area for startups in Indonesia		
Food	Total number	1	<ul style="list-style-type: none"> SMERU Research Institute, Jakarta 	Med
	Total Investment	USD 0.15 million →		
	Top hubs	Jakarta		
	Highlights	Manufacturing edible oils from insects		

Ecosystem overview

Start-up Ecosystem in the Application Areas



1. Biotechnology (Biotech) Startups	Applied research Institutes
<p>Indonesia is a potentially big market for the biotech and life sciences industry. When compared to Singapore, research and development activities in the Indonesian life sciences and biotech sector is still relatively in the nascent stage. Indonesia therefore has a lot of potential to develop this high-technology sector amidst a stronger demand from the growing economy.</p> <p>One startup that has started operations in Indonesia:</p> <p>Evergen Resources started operations of its microalgae-based biotechnology facility in July 2019. The operation is managed by PT Evergen Resources, the first microalgae-based biotechnology firm in Southeast Asia. Evergen cultivates freshwater microalgae, which is capable to generate natural astaxanthin, which can be found in certain algae. It also has a high quantity of antioxidants. Astaxanthin produced by Evergen is a raw material to be used in several industries use as cosmetics, pharmaceutical and nutraceutical.</p>	<ul style="list-style-type: none">• SMART Biotechnology Center, Bogor• Research Center for Biotechnology LIPI, Bogor <p>Daewoong Pharmaceutical, a company based in South Korea, has launched its biotech research center at Universitas Indonesia (UI) located in Depok, Indonesia. The strategic move enables the company to expand its global reach and research network. The research center will collaborate with Indonesian professors to study on biopharmaceutical products such as epidermal growth factor, Caretropin and Novosis. The research center also intends to create pipeline of local talents by offering scholarships and training programs for UI's College of Pharmacy students focusing in biopharmaceutical expertise.</p>

Ecosystem overview

Start-up Ecosystem in the Application Areas



2. Digital (AI, VR, big data, Cloud) Startups	Applied research Institutes
<p>Digital Technology is an emerging area in Indonesia. However, most of the startups are in the e-commerce and fintech applications.</p> <p>A few interesting startups:</p> <p>Kata.ai's core strength is on conversational artificial intelligence. The technology focuses on understanding human conversation, thus enabling improvement of human collaboration with machines</p> <p>Nodeflux, a startup company based in Indonesia, has developed VisionAIre to address the urbanization challenges. The technology utilizes vision AI as the backbone, where it transforms unstructured visual data into structured data that provides meaningful insights.</p>	<ul style="list-style-type: none">• Digital Capability Center (DCC), Ministry of Industry Indonesia, Jakarta• AI Center of Excellence <p>The Indonesia Artificial Intelligence Society (IAIS) was established in 2019 with two main goals: to develop artificial intelligence roadmap for the country and to create local talents covering across academic, business and government. Three main foundations will help to achieve the goal namely research department, technology and innovation. Website indonesiaai.org was also launched with the purpose of enabling publication and acts as a platform for collaboration.</p>
3. Medical Tech (Health & Wellness) Startups	Applied research Institutes
<p>Health issue is becoming national concern thus many startups emerge as a result. However, startups such as The Fit Company is merely a platform as apposed to using deep tech technology.</p>	<ul style="list-style-type: none">• Eijkman Institute for Molecular Biology, Jakarta

Ecosystem overview

Start-up Ecosystem in the Application Areas



4. Robotics Startups	Applied research Institutes
<p>Startups in this application comes from university. The university provides the technologies to startups. As of now, Frost & Sullivan has identified only a few demonstration projects</p> <p>A group of students from University of Indonesia sucessfully created Afta B-ionic, which is a robotic prosthetic hand. Afta B-ionic offers unique proposition through its ability to control prosthetic hand by using brain waves. The technology uses Electroencephalography (EEG), where command is generated and feed into robotic prosthetic hand as desired by the user.</p> <p>Frost & Sullivan could not identify any deep tech startups in this application segment</p>	<ul style="list-style-type: none">EEPIS Robotics Research Centre, SurabayaResearch Center for ICT and Robotics, SurabayaAI Center of Excellence <p>Tokopedia, an e-commerce platform has collaborated with University of Indonesia to launch artificial intelligence center in order to address limited digital talents that the country is facing. The AI Center of Excellence is located in University of Indonesia's computer science building located in West Java. The research center is equipped with deep-learning super computer technology NVIDIA DGX-1. Talents are expected to have deep knowledge in AI, robotics and cloud computing.</p>
5. Chemicals / Materials / Textile / 3D printing	Applied research Institutes
<p>'Making Industry 4.0', a roadmap launched by President of Indonesia focuses on five key areas, two of them are textiles and chemicals. The president expects these sectors to massively contribute to Indonesia's economy and propel the country to the top 10 of the world economy in 2030.</p> <p>Frost & Sullivan could not identify any deep tech startups in this application segment</p>	<ul style="list-style-type: none">Research Center on Chemistry, Indonesian Institute of Sciences, Jakarta <p>Faculty of Engineering at the Gadjah Mada University has been involved with the development of 3D printers since 2014. To date, they have developed three types of 3D printers namely Cartesian, the Delta and the Scara. The team is in the production stage and has set a target of 1000 productions per year.</p>

Ecosystem overview

Start-up Ecosystem in the Application Areas

6.Medical / cosmetic devices	Applied research Institutes
<p>Indonesia's Health Ministry is currently in an effort to spur the growth of medical device industry that focuses on developing products instead of importing such devices from abroad.</p> <p>Investment into the sector is coming from local companies, foreign investors as well as local-foreign joint ventures. This includes the coronary stent manufacturing plant in Tangerang worth of around USD \$6.7 million and a surgical suture factory in Cikarang valued at \$1.2 million.</p> <p>Only one startup was identified by F&S:</p> <p>TeleCTG: This startup has developed a portable cardiotocographs (CTG). The conventional CTGs are only available in health centres in big cities</p>	<ul style="list-style-type: none">Centre of Pharmaceutical and Medical Technology, Indonesia University, Depok, West Java

Ecosystem overview

Start-up Ecosystem in the Application Areas



7. Environment Sustainability/Waste Management Startups	Applied research Institutes
<p>Waste management and Environment sustainability is a huge area of opportunity in Indonesia.</p> <p>One startups has an innovative solution for environment sustainability</p> <p>Evoware makes cups, as well as other containers, from farmed seaweed free of chemicals, is relying on its biodegradable alternative to plastic packaging to reduce contamination of the environment</p>	<ul style="list-style-type: none">Indonesian Agricultural & Environment Research Institute (IAERI), Central JavaSMERU Research Institute, Jakarta
8. Pharma Startups	Applied research Institutes
<p>In 2014, the government of Indonesia launched universal health coverage (UHC) program. The objective is to enable all Indonesians, regardless of income status, to have access to health services at affordable rates. However, its huge population of around 270 million people means Indonesia will face a number of challenges, most notable inadequate infrastructure development.</p> <p>This segment is dominated by big corporations</p>	<p>Eijkman Institute for Molecular Biology, Jakarta</p> <p>Indonesia International Institute for Life Sciences is a research institute located in the capital city, Jakarta. Its aim is to develop innovation and accelerate Indonesia to be at par with global leaders. It has global collaboration with academia, industry, government and community .</p>

Ecosystem overview

Start-up Ecosystem in the Application Areas

9. Agritech (Agriculture) Startups	Applied research Institutes
<p>Indonesia has enormous natural resources. It has a flourishing agricultural industry. Its no small wonder that many startups are gravitating towards Agritech. VCs have also started funding these innovative startups.</p> <p>A few interesting startups:</p> <p>eFishery is an integrated feeding solution for fish and shrimp farming.</p> <p>Pandawa Agri Indonesia is a startup focuses on pesticides innovation. The objective of the startup is to reduce farmers' pesticides usage up to 50% through its innovative products, Weed Solut-ion and Pest Solut-ion.</p> <p>Nuerafarm provides Precision Agriculture technologies for farmers</p> <p>Jala offers shrimp farmers the ability to monitor water quality in real time</p>	<ul style="list-style-type: none">• SMART Biotechnology Center, Bogor• Indonesian Agricultural & Environment Research Institute (IAERI), Central Java• Indonesian Center for Food Crops Research and Development (ICFORD), Bogor <p>Indonesian Agency for Agricultural research and Development (IAARD) is the research division of Indonesian Ministry of Agriculture. IAARD governs 11 research and development centers, where each of research centers focuses on critical issues such as food crops, horticulture, estate crops, agro-climate, biotechnology and agricultural technology assessments.</p>

Ecosystem overview

Start-up Ecosystem in the Application Areas



10. Consumer IoT (Sensors & Instrumentation) Startups	Applied research Institutes
<p>Startups in consumer IoT typically serve as platform connecting various data sources</p> <p>For instance, Qlue, an Indonesian company founded in 2014, has developed multiple technology solutions that enable cities to solve some of the most pressing issues. The solutions are designed in a way that could solve business challenges as well as issues related to citizens. One of the technology solutions that Qlue offers is Disaster Response Management which facilitates recovery efforts of post-disaster events. This however is not in the scope of this study.</p>	<p>Bandung Institute of Technology has established The Internet of Things (IoT) and Future Digital Economy Lab with aim to further develop innovation in the field of digital economy. Furthermore, the lab serves as a place for stakeholders to bring together ideas and bring it to the next stage.</p>

Ecosystem overview

Start-up Ecosystem in the Application Areas

11. Food Technology Startups	Applied research Institutes
<p>The Creative Economy Agency (Bekraf) recently held Food Startup Indonesia (FSI) in July 2019. There were a total of 719 registrants. However, only 50 startups were selected to advance to the next stage. These startups were mostly culinary startups.</p> <p>F&S has identified one interesting startup:</p> <p>Biteback is an Insect Bio-refinery company aiming to meet an increasing global demand for palm oil by creating a healthier and more sustainable alternative</p>	<ul style="list-style-type: none">SMERU Research Institute, Jakarta <p>Indonesian Center for Food Crops Research and Development (ICFORD) focuses on research and development of food crops which include rice, maize, legumes such as soybean peanuts and other cereals. Some of the researches by ICFORD cover plant genetics and resource management with aim to improve production systems, harvest and post-harvest handling.</p> <p>ICFORD is also responsible in coordinating Indonesian Center for Rice Research (ICRR) activities in performing research related to rice. Furthermore, ICFORD monitors research institutes such as Indonesian Legumes and Tuber Crops Research Institute (ILETRI) and also Indonesian Cereals Research Institute (ICRI) in conducting various research activities.</p>

Ecosystem overview

Start-up Ecosystem in the Application Areas



12. Cosmetics/Beauty Startups	Applied research Institutes
<p>Cosmetics sector in Indonesia recorded a strong performance in 2017 due to growing middle class. Implementation of halal regulations for cosmetics in Indonesia also contributes to the strong performance. Wardah is the first country's halal cosmetic manufacturer and it is also a leading cosmetics brand in Indonesia.</p> <p>Frost & Sullivan identified one deep tech startup in this application segment</p> <p>Base, beauty and wellness direct-to-consumer startup utilizes data to analyze how environment and lifestyle are affecting the skin conditions. The startup partners with research and development lab located in London and Seoul to assist the startup in product development.</p>	<ul style="list-style-type: none">• Research Institute for Food, Drugs and Cosmetics Indonesia, Jakarta

Ecosystem overview

Start-up Ecosystem in the Application Areas

Major VCs, Incubators and Accelerators for Deep Tech Startups in Indonesia

There are many VCs, Angel Investors, Accelerators & Incubators in Indonesia. Some of the important ones are:

VCs

- East Ventures is a regional VC with a large amount of its investment in Indonesia. It was one of the first investors that invested in unicorns such as Tokopedia, IDN Media and Traveloka.
- Venturra Capital is a CVC that focuses on early stage tech startups in the industries of e-commerce, FinTech, HealthTech, and EdTech.
- SMDV (Sinar Mars Digital Ventures) is a CVC under the network of Sinar Mars, a company that produces paper and palm oil, which has turned to investing in tech startups. SMDV has invested in Omise and HappyFresh.
- Convergence Ventures is another VC that focuses on investing in early stage startups and tech companies.
- Indogen Capital is a VC that focuses on investing in a wide range of startups. Interesting startups within its portfolio include Carsome and HijUp E-Commerce, a platform that sells fashionable Muslim clothing.

Accelerators

- **Digitaraya**: Google Developers Launchpad has partnered with Kibar, which is a startup ecosystem builder to be an accelerator.
- **Plug and Play Accelerator** is an accelerator where leading international VCs were invited to take part in launching the program in 2016 by Indonesian President Joko Widodo.
- **GnB Accelerator** is a partnership between Japanese IT companies Infocom Corporation and Fenox Venture Capital from the Silicon Valley. Prominent partners are Deloitte, Microsoft, and AWS.

Incubators

- **Techbator** is a technology incubator that supports several technology startup initiatives.
- **Indigo Incubator** is a sector agnostic incubator

Key growth drivers

1

PRESIDENT'S VISION TO ACHIEVE "MAKING INDONESIA 4.0"

- The president has set a target to foster 1000 startups by 2020 and the total valuation to be around \$10 billion.
- Ministries have also supported startups through grants allocation to incubators, thus allowing startups to have easier access to fund.

2

CO-WORKING SPACE THAT ALSO PROMOTES CROSS BORDER NETWORKING

- Many prominent global co-working space providers have entered or keen to enter Indonesia. They also promotes cross border networking with their other locations
- Some of the key players are; Wework Co-Working Space is a global co-working space, Cocowork an Indonesia based but expending overseas, Menara by kibar (partner with Google), Block71 Jakarta a partner with Block71 Singapore etc.

3

STRONG SUPPORT SYSTEM FOR STARTUPS

- Indonesia has reasonably strong startups support system, as evidenced by the presence of The Founder Institute, the Silicon Valley accelerator and also GNBA Accelerator and SKALA, which to date, has multiple successful investments.

4

LARGE HUB IN ASIA FOR VCS, CVCS AND ACCELERATORS

- Most of the investment comes from VCs from Japan, and USA eg. East Ventures, Angin, Convergence Ventures, Indogen Capital, Monk's Hill Ventures, CyberAgent Ventures etc.
- Meanwhile CVCs come from large corporations that are involved in various industries eg. GDP Ventures, Venturra Capital, SMDV etc.
- Indonesia is a magnet for prominent accelerators eg. **Digitaraya**, a Google Developers Launchpad with Kibar, **Plug and Play Accelerator**, **GnB Accelerator**, a partnership between Japanese IT companies Infocom Corporation and Fenox Venture Capital from the Silicon Valley - prominent partners are Deloitte, Microsoft, and AWS etc.

Government Initiatives



1

Initiatives on Blockchain

- In February 2019, the Indonesian government announced that it was creating **legal frameworks** through which **cryptos and digital asset futures** will operate
- Commodity Futures Trading Regulatory Agency (or Bappebti) announced that **bitcoin** and other **cryptocurrencies** would be classified as trading commodities
- These moves are giving **legitimacy to the crypto exchanges** that have already been operating in Indonesia
- The government announced a multimillion-dollar partnership with Singapore-based blockchain firm PLMP Fintech to improve the logistics industry using blockchain technology

2

Regulation Change by Indonesia Stock Exchange to attract Startups Listing

- Indonesia Stock Exchange (IDX) has amended rules in order to attract more startup companies to list in IDX
- IDX decided to change the requirements by eliminating the Non Tangible Assets requirements. Instead, the prospective issuers must have revenues. In some cases, the bourse will consider market capitalization of the company

3

Promotes nationwide university-based incubators

- In 2019, Minister of Research and Technology (Kemenristek) introduced a Science and Technology Park (STP) programme that includes the setup of incubator programmes in universities nationwide
- Focus more on the following sectors: Foodtech, transportation, **healthtech and medtech**, energy, defense and security, material and advanced material, and ICT

4

“Nexicorn”

- Indonesia's newest government initiative in support of its startup ecosystem
- It's an event that brings post-series A startups together with overseas investors with the aim of grooming the country's next billion-dollar companies
- The idea was hatched by the Ministry of Communication and Information Technology and the Indonesian Venture Capital Association (Amvesindo)

Potential Ecosystem Evolution – Overall View

How will the ecosystem evolve in the next five years (2020 to 2025) and what business opportunities will they create?



	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
1. Biotech	Biotech is facing a few hurdles related to government regulation, talent and funding shortage. For example, lengthy approval processes are required during custom handling. Strong talent network with individuals that have expertise in the domain are also lacking. Currently the sector is relatively in the nascent stage and is expected to grow slowly for the next 5 years.	
2. Waste Management	Indonesia is having a crisis with its waste management structure. In fact, almost half of 3.2 million tonnes of plastic generated ended up in the sea. As a result, the country is taking an aggressive measure to combat this issue. For instance, the country vows to reduce marine plastic debris by 70% by 2025. Since waste management has become among the top agendas, it will definitely attract investment for startups	
3. Digital	Digital, in particular AI, has strong presence in Indonesia. This segment is home to many tech start ups. However, only a few deep tech startups have been identified so far. One university has established hubs to further enhance development of skills related to digital. The sector is expected to grow with more deep tech startups in the next five years.	
4. Consumer IOT	Consumer IoT is gaining traction in Indonesia. Startup such as Qlue, although not involved in deep tech, demonstrate the potential benefits that IoT can bring. This sector will be important in the next five years.	

Potential Ecosystem Evolution – Overall View

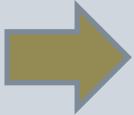
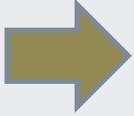
How will the ecosystem evolve in the next five years (2020 to 2025) and what business opportunities will they create?



	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
5. Robotics	One of Indonesia's unicorns, Tokopedia, has collaborated with Universiti of Indonesia to launch AI Center of Excellence. This center aims to produce talents in robotics sector, which is critical in bringing robotics ecosystem to the next stage.	
6. Chemicals, Materials, 3D printing	3D printing is among the key areas in "Making Industry 4.0" roadmap launched by President of Indonesia. Therefore, this sector should receive significant investment and initiatives from the government over the next five years.	
7. Cosmetics	Cosmetics market is huge in Indonesia thanks to its more than 250 million population. However, there is no deep tech startups in this area. Thus, this sector is expected to see slow growth over the next 5 years.	
8. Pharma	Indonesia is a growing country with an estimated 90 million additional middle class by 2030. This, together with chronic diseases and aging population, pharmaceutical will play major role to address the growing concern. However, this segment is expected to be dominated by big corporations	

Potential Ecosystem Evolution – Overall View

How will the ecosystem evolve in the next five years (2020 to 2025) and what business opportunities will they create?

	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
9. cosmetic device manufacturing	Huge investment from local and foreign companies in this sector. In fact, the investment in 2017 increased by more than six times as compared to the previous year. However there is no deep tech startups in this area at the moment. Given the high amount of investment, there might be a few within the next 5 years.	
10. Medical Devices	Government of Indonesia, in particular the Health Ministry, is working to reduce the country's dependency on imported medical devices. Instead, they want medical devices to be developed in the country.	
11. Agriculture	Agriculture sector is critical to the growth of Indonesia as it contributes significantly to the country's GDP. There has been a steady growth in the number of startups. VCs funding interest in this sector has increased. This trend is expected to continue.	
12. Food	Indonesia has a huge agricultural base and has a good startup ecosystem. A high number of startups are focusing on food marketing and commerce. Its just a matter of time, before deep tech startups are seen in this segment.	

Potential Opportunities for L'oreal (1/2)



Potential Opportunities for L'oreal	
1. Biotech	Extraction of natural astaxanthin from freshwater microalgae
2. Environment	Biodegradable cups and containers from farmed seaweed free of chemicals
3. Digital	Conversational artificial intelligence to understand human conversation which will enhance human interaction with machines. Computer vision with artificial intelligence to improve surveillance.
4. Medical Devices	A startup has designed and manufactured a prototype for portable cardiotocographs (CTG).
5. Agriculture	<ul style="list-style-type: none">eFishery is an integrated feeding solution for fish and shrimp farming.Innovative pesticides for farmsPrecision Agriculture technologiesMonitoring water quality in real time
6. Food	Insect Bio-refinery for manufacturing edible oils from insects

Growth Environment – Vietnam



The tech ecosystem is breathing change and innovation, a new chapter for Vietnam begins. In addition to being a tech-outsourcing destination, Vietnam is hungry and ready for R&D, technology innovation, and advanced product development.

Ecosystem overview



Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been estimated

Applications	Startups		Applied research Institutes	Interest level
Biotech	Total number	n/a	<ul style="list-style-type: none"> Institute of Microbiology & Biotechnology, Vietnam National University, Hanoi Institute of Biotechnology (IBT), Hanoi Biotechnology Center of Ho Chi Minh City Research Institute for Biotechnology & Environment, Ho Chi Minh 	Low
	Total investment	n/a		
	Top hubs	n/a		
	Highlights	n/a		
Pharma	Total number	n/a	<ul style="list-style-type: none"> Vietnamese Traditional Pharmacy Research Institute 	Low
	Total Investment	n/a		
	Top hubs	n/a		
	Highlights	n/a		
Health & Wellness	Total number	2	<ul style="list-style-type: none"> Vinmec Research Institute, Hanoi National Institute of Hygiene & Epidemiology, Hanoi Oxford Clinical Research Unit 	Med
	Total investment	USD 2 million ↑		
	Top hubs	Hanoi, HCM City		
	Highlights	Clusters focusing on digital health fitness platform.		

Sources: Crunchbase, e27, VC websites, Local Governments

Ecosystem overview



Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been estimated

Applications	Startups		Applied Research Institutes	Interest level
Medical devices	Total number	n/a	Research Centre for Medical & Pharmaceutical Technology, Can Tho University, Can Tho City	Low
	Investment	n/a		
	Top hubs	n/a		
	Highlights	n/a		
Environment / Sustainability / Waste Management	Total number	2	Research Institute for Biotechnology & Environment (RIBE),	High
	Total investment	USD 1 million ↑		
	Top hubs	Hanoi, HCM City		
	Highlights	Startups's main focus is biodegradable plastics and plant based food packaging.		
Digital (AI, VR, big data, Cloud, Blockchain)	Total number	1	Centre of Digital Excellence, RMIT University Vietnam	Low
	Total investment	\$1 million ↑		
	Top hubs	HCM City		
	Highlights	Cloud Technologies		

Sources: Crunchbase, e27, VC websites, Local Governments

Ecosystem overview



Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been estimated

Applications	Startups		Applied Research Institutes	Interest level
Robotics	Total number	n/a	<ul style="list-style-type: none"> • UTS-VNU Joint Technology and Innovation Research Centre, Hanoi • National Key Lab for Digital Control & System Engineering (DCSELAB), Ho Chi Minh City University of Technology 	Low
	Total Investment	n/a		
	Top hubs	n/a		
	Highlights	n/a		
Sensors and instrumentation (IoT)	Total number	n/a	UTS-HCMUT Joint Technology & Innovation Research Centre, Ho Chi Minh	Low
	Total Investment	n/a		
	Top hubs	n/a		
	Highlights	n/a		
Chemicals / Materials / Textile / 3D printing	Total number	1	<ul style="list-style-type: none"> • Institute of Chemistry • Polymer Research Center (PRC), Ho Chi Minh University 	Medium
	Total Investment	USD 1 million →		
	Top hubs	HCM City		
	Highlights	Advanced materials		

Sources: Crunchbase, e27, VC websites, Local Governments

Ecosystem overview



Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate). Investment has been estimated

Applications	Startups		Applied Research Institutes	Interest level
Cosmetics / Beauty	Total number	n/a	n/a	Low
	Investment	n/a		
	Top hubs	n/a		
	Highlights	n/a		
Agriculture	Total number	4	<ul style="list-style-type: none"> Biotechnology Center of Ho Chi Minh City Institute of Agricultural Sciences of South Vietnam Plant Protection Research Institute (PPRI) 	High
	Investment	USD 1.5 million ↑		
	Top hubs	Hanoi, HCM City		
	Highlights	IoT and productivity management of agriculture		
Food	Total number	n/a	<ul style="list-style-type: none"> National Institute for Nutrition, Ministry of Health Centre for Public Health & Ecosystem Research, Hanoi University 	Low
	Total investment	n/a		
	Top hubs	n/a		
	Highlights	n/a		

Sources: Crunchbase, e27, VC websites, Local Governments

Ecosystem overview



1
Hanoi (Biotech, Agri-Tech, Digital, Health & Wellness, Pharma, Robotics, Chemical/Material/Textiles/ 3D printing, Agriculture, AI and Food Tech)

2
Ho Chi Minh City (Chemicals, Environment & Sustainability, Digital, Health & Wellness, Chemical/Material/Textiles/ 3D printing S & I, Robotics, and Agriculture)

HIGHLIGHTS

- Saigon Innovation Hub (SIHUB) is located at Ho Chi Minh City. SIHUB has sought to become a gateway to global markets for local startups and, vice versa for foreign startups. 500 early-stage startups supported by SIHUB each year, some 30-50 were foreign startups.
- Fintech, food tech, and e-commerce received majority of the investments from VCs, with e-commerce accounting for 21 deals, worth US\$ 83 million, food tech accounting for two deals worth US\$65 million, and eight deals in fintech worth US\$57 million.
- A deep tech ecosystem to nurture startups is slowly emerging in Vietnam.
- Vietnam is also depending on Japan and Singapore to support its deep tech startup ecosystem formation

Ecosystem overview

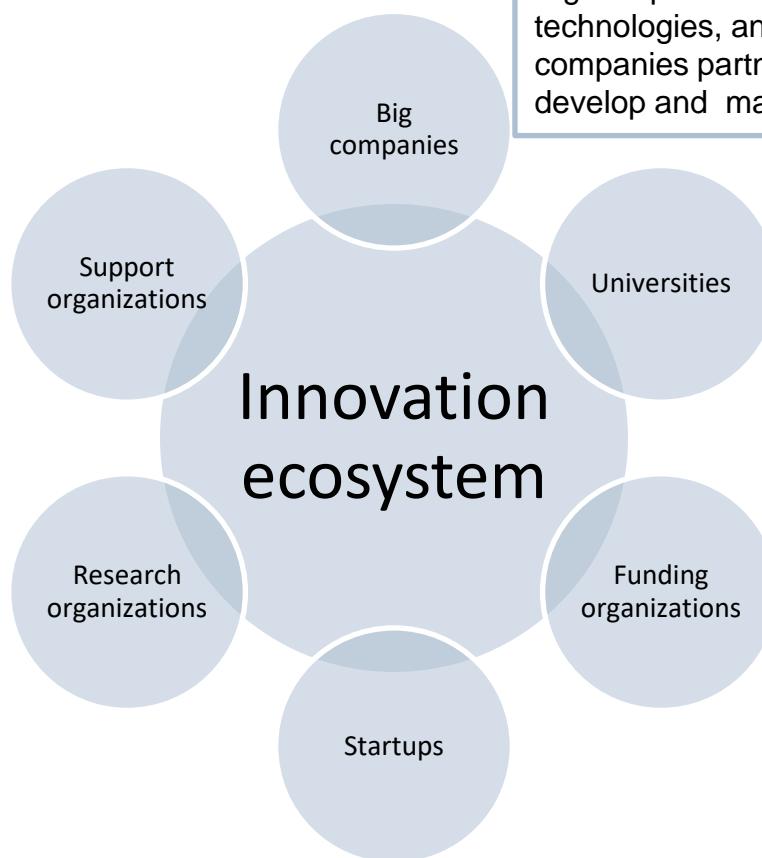
Innovation ecosystem stakeholders



Ministry of Investment and Planning and Golden Gate Ventures have signed MoU to support the growth of Vietnamese startups, besides another tie-up between the ministry and SGInnovate to develop Deep Tech companies in the country. YellowBlocks was founded in 2018 as the first emerging tech ecosystem connector for Vietnam

There are less applied research organisation in Vietnam focusing in the deep tech innovations.

Vietnam had about 400 startups in 2012. The number grew to 1,800 in 2015 and around 3,000 in 2018. The funding capital into the ecosystem has also been increasing over the years, reaching USD890 million in 2018. The Deep Tech ecosystem for most applications in scope is in a nascent stage



Big companies are leading robotics, food technologies, and pharmaceutical industries. These companies partnered with local companies to develop and manufacture products

Although there are many applied research institute in Vietnam, there are no significant innovations identified (within the application scope). University of Hanoi has applied research organizations.

- VCs commits USD 425 million of startups in Vietnam over the next three years.
- Some interesting VCs are Golden Gate, Ventures, Access Ventures, Burda Principal Investments, 500 Startups and Jungle Ventures, and Cyberagent Ventures.
- The VCs in Vietnam are primarily focusing on Ecommerce, Fintech, Logistics, Edtech, Health & Wellness and Agriculture.



Ecosystem overview

Start-up Ecosystem in the Application Areas

Biotech Startups	Applied Research Institutes
<p>New biotechnology research centres to tackle cancer, diabetes, and antibiotic-resistant infections are being planned or already up and running. These centres are working on proteomic and genomic research to develop treatments for unmet diseases such as diabetes, high blood pressure and cancer. The companies involved are Government owned or belong to large corporations</p> <ul style="list-style-type: none">• NanoGen Inc. in Ho Chi Minh City provides cheap cancer treatments by producing biosimilar monoclonal antibodies that can specifically target cancer cells.• Vabiotech Company in Hanoi uses a reverse genetics approach to synthesise vaccines <p>Frost & Sullivan could not identify any deep tech startups focusing in biotechnology.</p>	<ul style="list-style-type: none">• Hanoi University of Science and Technology (HUST)• VNU University of Science• Institute of Biotechnology (IBT), Hanoi• Institute of Microbiology & Biotechnology, Vietnam National University, Hanoi• Biotechnology Center of Ho Chi Minh City• Research Institute for Biotechnology & Environment, Ho Chi Minh• The Common Microbial Biotechnology Platform (CMBP) of the Vietnam Agricultural Genetics Institute (AGI)• International Center for Tropical Agriculture (CIAT)• French Center for Agricultural Research for Development (CIRAD)
Pharmaceutical Startups	Applied Research Institutes
<p>Large companies such as Bayer Healthcare, Abbott, Taisho Group, B.Braun are dominating the innovation in the pharmaceutical application areas.</p> <p>Frost & Sullivan could not identify any deep tech startups</p>	<ul style="list-style-type: none">• Vietnamese Traditional Pharmacy Research Institute, Hanoi

Ecosystem overview – Health & Wellness

Start-up Ecosystem in the Application Areas



Health & Wellness Startups	Applied Research Institutes
<p>There is considerable interest among VCs for health & wellness startups in Vietnam. However, most of them are providing platform based solutions.</p> <p>Two AI based health & wellness start-ups in Vietnam identified by Frost & Sullivan. However, both seem to be platform based but bringing in a AI or big data element</p> <p>Lily: Provides AI based solution for tracking women's health. This AI based solution can be used to track menstruation, ovulation, and maternity as well as for health inquiries.</p> <p>Med247, which operates its own clinic and integrates its technology in helping patients manage their medical records and appointments with doctors.</p>	<ul style="list-style-type: none">• Vinmec Research Institute, Hanoi• National Institute of Hygiene & Epidemiology, Hanoi• Oxford Clinical Research Unit, Ho Chi Minh
Medical device Startups	Applied Research Institutes
<p>Though an important area for Vietnam, most of the activity in this sector is in the domain of large corporations.</p> <p>Frost & Sullivan could not identify any deep tech startups</p>	<ul style="list-style-type: none">• Research Centre for Medical & Pharmaceutical Technology, Can Tho University, Can Tho City



Ecosystem overview

Start-up Ecosystem in the Application Areas

Environment / Sustainability / Waste Management Startups	Applied Research Institutes
<p>Environment sustainability and Waste Management is an area of interest for Vietnam.</p> <p>Frost & Sullivan identified a few environment sustainability startups</p> <ol style="list-style-type: none">1. Direct Imex – Developed biodegradable plastics that meet legislations in Vietnam2. Ecospark- Provides innovative food packaging solutions For example: Developed combination of bagasse (sugar cane) and bamboo fibers. Biodegradable and compostable. Refrigerable and microwavable.	<ul style="list-style-type: none">• Research Institute for Biotechnology & Environment (RIBE), Ho Chi Minh
Digital (AI, VR, AR, Big Data, Cloud, Blockchain, etc.) Startups	Applied Research Institutes
<p>Digital transformation initiatives is creating a need that can be met by startups.</p> <p>Frost & Sullivan was able to identify only one start up in the cloud services area</p> <p>689Cloud is a cloud-based platform and customized solutions for security, storage, management, and data sharing for businesses and governments.</p>	<ul style="list-style-type: none">• Centre of Digital Excellence, RMIT University Vietnam, Ho Chi Minh



Ecosystem overview

Start-up Ecosystem in the Application Areas

Robotics Startups	Applied Research Institutes
<p>The Robotics development is mainly for industrial applications. Also, this sector is dominated by large corporations.</p> <p>There is one interesting startup that make industrial robots (not in the scope of this study)</p> <p>ROBOT3T makes industrial robots (not in the scope of this study). ROBOT3T designs and builds industrial robots at an affordable price for small and medium enterprises in developing countries. The company has 500 clients in mechanical and heavy industries in 60 countries.</p> <p>Frost & Sullivan could not identify any deep tech startups</p>	<ul style="list-style-type: none">• UTS-VNU Joint Technology and Innovation Research Centre, Hanoi• National Key Lab for Digital Control & System Engineering (DCSELAB), Ho Chi Minh City University of Technology
Sensors and Instrumentation (Consumer IoT) Startups	Applied Research Institutes
<p>The importance of IoT for various applications is creating a large interest in VCs to fund startups.</p> <p>Frost & Sullivan could not identify any deep tech startups covering applications areas in scope</p> <p>.</p>	<ul style="list-style-type: none">• UTS-HCMUT Joint Technology & Innovation Research Centre, Ho Chi Minh



Ecosystem overview

Start-up Ecosystem in the Application Areas

Chemicals, Materials, Textile, 3D Printing Startups	Applied Research Institutes
<p>One interesting startup in Vietnam.</p> <p>Nano Life: Process to make graphene from recycled animal fat.</p>	<p>Vietnam Textile Research Institute</p> <p>Viet Nam; Institute of Applied Materials Science</p> <p>Institute of Chemistry, Hanoi</p> <p>Polymer Research Center (PRC), Ho Chi Minh University</p>
Cosmetics and Beauty startups	Applied Research Institutes
Frost & Sullivan could not identify any deep tech startups	n/a
Food Startups	Applied Research Institutes
Frost & Sullivan could not identify any deep tech startups	<ul style="list-style-type: none">National Institute for Nutrition, Ministry of Health, HanoiCentre for Public Health & Ecosystem Research, Hanoi University



Ecosystem overview

Start-up Ecosystem in the Application Areas

Agriculture Startups

Agriculture contributes 16% of Vietnam's GDP, while labourers in the sector account for 42% of the total workforce and up to 70% of the population in rural areas.

Ministry of Agriculture and Rural Development reportedly has planned for 500 hi-tech agricultural cooperatives and to increase the high-tech farming production value by five times by 2020.

Some interesting agriculture startups are:

1. Demeter – IoT based agriculture farming. Partnered with Intel Corp to expand its business.
2. MimosaTEK – Cloud based system that allow farmers to manage their crops effectively.
3. Hachi – uses sensors and a hydroponic system to grow clean vegetables, which has led to a 300 per cent rise in productivity.. The system using IoT helps in monitoring the soil's nutrition level.
4. RYNAN Technologies Pte Ltd develops innovative and sustainable agriculture products and smart farming solutions

There is a growing trend of startups in Agriculture but Frost & Sullivan was able to qualify the above four as relatively tech dependent.

Applied Research Institutes

- Vietnam Academy of Agricultural Sciences (VAAS)
- Biotechnology Center of Ho Chi Minh City
- Institute of Agricultural Sciences of South Vietnam, Ho Chi Minh
- Plant Protection Research Institute (PPRI), Hanoi



Ecosystem overview

Start-up Ecosystem in the Application Areas

VCs/Accelerators/Incubators

The Vietnam startup ecosystem is less than 5 years old. In this timeframe, around 3500 startups have sprung up. Around 1000 of these are tech based. A few of these are deep tech based too. The startup scene is supported by leading VCs, established incubators and accelerators. A few of them are listed here.

SpeedUP Venture Capital

Government agency under Ministry of Science and Technology to encourage start-ups in this region. It primarily invests in early stage deep tech startups in Vietnam.

The prominent funding companies, incubators and accelerators include:

Vietnam Silicon Valley, Expara, Innovatube are some of the incubators and accelerators in Vietnam

Softbank Vision Fund, CyberAgent Ventures, Mekong Capital, DT&I, IDG Ventures Vietnam, VinaCapital Ventures BCG Digital Ventures, Captil. Monk's Hill and Goldman Sachs are some of the funding companies in Vietnam

500 Start-ups

A VC that fund the start-ups in Vietnam. 500 has partnered with local investor in Vietnam and invested in interesting technology startups in Vietnam.

The Vietnam Smart Energy Incubation & Acceleration Program

Established for incubation and acceleration programs for startups in Vietnam.



Ecosystem overview

Start-up Ecosystem in the Application Areas

VCs/Accelerators/Incubators

Access Venture

Focuses on early stage technology startups in Vietnam, Indonesia, and Korea. Key focus areas include VR, AI, nano technology, and blockchain.

G & H Ventures

Focuses on Artificial Intelligence technology including commerce, enterprise solutions, healthcare, finance, and logistics

Vietnam Innovative Startup Accelerator (VIISA)

VIISA is a business acceleration program. and a seed-stage investment holding that invests to build global-ready startups in Vietnam..

TECH PLANTER is an acceleration and pitch competition focusing on Deep Tech. They conduct this program to provide startups with mentoring, fundraising and market expansion opportunities in Asia, especially in Japan. Winners will receive a trip to Singapore or Japan to pursue angel investment and corporate partnerships

YellowBlocks was founded in 2018 as the first emerging tech ecosystem connector for Vietnam. As the platform for collaboration for AI/ML, Blockchain, Cloud, BigData, IoT, AR/VR, YellowBlocks hosted The #Elite1010 Emerging Tech Cruise event in HCM City with key stakeholders in the ecosystem during July 2019



1

100% FOREIGN OWNERSHIP

- It openly welcomes foreign business ownership, giving a maximum of 100% ownership
- It is a place where foreigners have the full right to manage the business and ownership of the innovation

2

RISE OF VC AND INNOVATION LABS

- Some prominent VCs are; IDG Ventures Vietnam, Monk's Hill Ventures, 500 Startup, Dragon Capital etc.
- Rise of innovation labs to spearhead incubation testing. Some prominent incubators are; Vietnam Silicon Valley, VIIASA, Hatch! Ventures, Topica Founder Institute etc.

3

RISE OF CO-WORKING SPACE

- Co-Working Space is one of the key drivers behind the growth of the startup ecosystem in Vietnam
- Some of the key providers are; Circo, sYs Hatch! Nest, Saigon Innovation Hub

4

INTEREST IN BLOCKCHAIN TECHNOLOGIES

- Currently one of the leaders in blockchain technologies in South East Asia
- Apart from crypto, local experts and innovators are increasingly researching different ways that the blockchain can be used to solve problems in Vietnamese society, such as protecting land rights, improving conditions for agricultural workers in rural Vietnam, along with more high tech applications like insuretech, agritech, medical fields and Internet of Things (IoT) services

5

FAVORABLE GOVERNMENT POLICIES

- Recently liberising the Law on technology transfer and the Law on supporting SMEs in the tech startup industry
- The Government is currently looking to further liberalise other rules and regulations to support the ecosystem



1 Attracting Vietnamese who have emigrated abroad (“Viet Kieu”) to return to their home country and start new high tech ventures

- Since 2000, the government has been making a big push for this initiative
- Returning Vietnamese who have lived and worked abroad can bring back fresh ideas, and business knowledge from more developed business environments back to Vietnam

2 The Law on Technology Transfer

- Makes it easier for local startups to access new technology from abroad and to bring it back to Vietnam

3 The Law on Supporting Small and Medium Sized Enterprises (SMEs)

- A special emphasis has also been given to startups which are mostly SMEs
- Released in 2018, it provides additional legal protections to startups and allows increased access to state funding

4

Collaborated with countries and banks

- To develop funding and innovation programs, to provide loans, technical training, and business mentoring
- Some of the programs are; Vietnam – Finland Innovation Partnership Programme, Mekong Business Initiative is a partnership program between the Asian Development Bank and the Government of Australia etc.

5

Initiatives at provincial/city level

- Provincial/city level are actively developing their own initiatives for tech startups. They believe this industry could further develop the local economy
- Some of the initiatives are; SpeedUP fund started by Ho Chi Minh City, Startupcity.vn online platform to connect investors with entrepreneurs launched by Hanoi’s People Committee etc.



Potential Ecosystem Evolution – Overall View

	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
1. Biotech	Support from the government institutes in biotechnology has fostered deep tech startups in this region. Therefore, it is expected that start-ups focusing on the deep tech innovation will grow.	
2. Pharma	Large dominated by big MNCs. The startups are focusing more towards on the digital platform rather than innovation in Vietnam.	
3. Health & Wellness	Health and wellness are primarily focusing in the IoT platforms in terms of service provider platforms with mobile platforms.	
4. Medical devices	Frost & Sullivan could not identify any deep tech startups in Vietnam for this application. This area is likely to see investment in the future.	



Potential Ecosystem Evolution – Overall View

	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
4. Environment / Sustainability / Waste Management	There are significant potential in the innovations of startups in biodegradable plastics and plant based packaging.	
5. Digital (AI, VR, big data, Cloud, Blockchain)	There are heavy investments in blockchain, e-commerce, and fintech. However, there is potential for the emergence of AI start-ups focusing AI and machine learning related to skin care, cosmetics, and beauty.	
6. Robotics	Robotics is primarily focused on the industrial applications and largely dominated by large MNCs in Vietnam.	
7. Sensors and instrumentation (IoT)	Hoa Lac Hi-Tech Park in Hanoi is a IoT innovation hub open in Hanoi, Vietnam in 2019. to provide a platform for startups and to speed up research and development in IoT, especially within the context of Industry 4.0	



Potential Ecosystem Evolution – Overall View

	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
9. Chemicals / Materials / Textile / 3D printing	There are not many deep technology start-ups in Vietnam but there is big potential for this application areas.	
10. Cosmetics and Beauty	There are less innovation in cosmetics and beauty. Most of innovations are focused in the e-commerce and AI based digital marketing.	
11. Agriculture	The emergence of a few Agri-tech start-ups in Vietnam enables the high growth of start-ups in agriculture innovations.	
12. Food	Food platform is gaining momentum among startups in Vietnam. However, Frost & Sullivan could not identify any significant startups focusing on food innovations. There is potential for innovation in the food industry in Vietnam.	



Potential Opportunities for L'oreal

Potential Opportunities for L'oreal	
1. Environment	Biodegradable plastics for the cosmetics and beauty packaging.
2. Chemicals, Materials, 3D printing	Graphene made from recycled animal fat for lightweight material packaging for cosmetics and beauty products.
3. Health & Wellness	Healthcare IoT devices for tracking women's health
4. Agriculture	Digital platforms for improving crops yields for agriculture plantations that are related with cosmetics ingredients.

Growth Environment – Malaysia



Ecosystem overview



1 Kuala Lumpur, Cyberjaya
(ICT, IT, Digital Tech)
KL City (Agriculture)

2 Johor Bahru
• Bio-Xcell (Biotech,
Agriculture, BioIndustrial)
Waste Recycling

3 Penang
• CAT Penang (startup
incubation hub)
• MIMOS PSDC Innovation
hub
Textiles



The startup ecosystem in Malaysia is young and in the early phase of the startup cycle. The ecosystem might need a decade before it reaches mature stage. The considerable increased of startups number in Malaysia is an encouraging sign. The growth of startup ecosystem is primarily driven by two factors which are initiatives led by public sector as well as technological IPO's that have taken place in the previous years.

Bioeconomy Corp is the country's lead development agency for the bio-based industry in Malaysia. Going forward, startup ecosystem in Malaysia has tremendous growth opportunity as the country embarks on the digital transformation wave. Number of initiative to improve the infrastructure of the country is seen as a prove that the government is serious to ensure the growth of startup ecosystem remains relatively high.

HIGHLIGHTS

- Malaysia has three cities with relatively strong startups ecosystem - Kuala Lumpur, Penang and Johor Bahru.
- Most of the startups in Malaysia have strong foundation in digital application. These are centered in Cyberjaya, Kuala Lumpur
- Johor Bahru Bio-Xcell is incubating about 285 companies (agriculture business, biomedical and bioindustrial sector).
- Penang is emerging as an alternative to KL for startups

Ecosystem overview

Innovation ecosystem stakeholders



MaGIC (Malaysian Global Innovative & Creativity center) represents government where its main task is to provide training to Malaysian entrepreneurs with the intention of inculcating leadership mentality of the startup community. 1337 Ventures, on the other hand, is one of many private accelerators that assists startups during pre-seed and seed stage.

Large corporations are present in the Biotech, Digital technologies, Chemicals, Agriculture and Food processing sectors. Lotte Chemicals has a R&D facility in Malaysia. Petronas Research also investigates various new materials and environment technologies. India's Biocon also has a setup in Malaysia.



Various applied research institutes focus on biotech, digital technologies, agriculture. MIMOS, CAIT, MARDI are some of the renowned applied research organizations

A few universities in Malaysia are ranked in the Asia's top 50 by QS Asia University Ranking. These universities are also heavily involved in research activities. Nottingham University is carrying out applied research

Malaysia has strong ecosystem of startups in the area of digital application, mostly focusing on e-commerce. The deep tech ecosystem is in a nascent stage with innovative startups such as Glueck Technologies slowly gaining prominence. Fathopes Energy was able to scale up very fast once it was able to convince investors

Malaysia's startup ecosystem has strong support from governments and private sectors. Government's fund is provided in the forms of grants allocated by agencies such as Cradle Fund, TERAJU and MAVCAP (Malaysia Venture Capital Management Berhad). Cradle Fund has assisted more than 900 Malaysian tech startups since its founding year in 2003.

Ecosystem overview

Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate).

Investment has been estimated.



Applications	Startups (for applications in scope)		Applied research Institutes	Interest level
Biotech	Total number	10	<ul style="list-style-type: none"> • Biotechnology Research Institute, Universiti Malaysia Sabah, Kota Kinabalu • Malaysia Genome Institute, Selangor 	Med
	Total investment	USD 9 million ➔		
	Top hubs	Bio-Xcell at Nusajaya		
	Highlights	Incubated by Bioeconomy Corporation		
Environment	Total number	2	<ul style="list-style-type: none"> • Institute for Environment & Development (LESTARI), The National University of Malaysia, Bangi • Centre for Environmental Sustainability and Water Security, University Technology Malaysia, Johor 	Low
	Total Investment	USD 1 million ➔		
	Top hubs	Johor, Kuala Lumpur		
	Highlights	FatHopes Energy has been able to scale up fast		
Digital (AI, AR/VR, Cloud)	Total number	2	<ul style="list-style-type: none"> • Center for Artificial Intelligence and Technology (CAIT), The National University of Malaysia, Bangi • MIMOS, Kuala Lumpur • Centre for Global Business Enterprise and Cloud Analytics, University of Reading Malaysia, Johor 	Med
	Total Investment	USD 1.5 million ↑		
	Top hubs	Cyberjaya		
	Highlights	Digital is important area of focus for Malaysia		
Consumer IOT	Total number	1	<ul style="list-style-type: none"> • Institute of Microengineering & Nanoelectronics (IMEN), The National University of Malaysia, Bangi • Malaysia Automotive, Robotics & IoT Institute (MARii), Cyberjaya 	Low
	Total Investment	USD 3 million ↑		
	Top hubs	Kuala Lumpur		
	Highlights	Interest in consumer IoT is increasing		

Ecosystem overview



Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate).

Investment has been estimated.

Applications	Startups (for applications in scope)		Applied research Institutes	Interest level
Robotics	Total number	1	<ul style="list-style-type: none"> Malaysia Automotive, Robotics & IoT Institute (MARii), Cyberjaya Centre for Artificial Intelligence & Robotics, University Technology Malaysia, Kuala Lumpur 	Low
	Total Investment	USD 100 thousand →		
	Top hubs	Cyberjaya		
	Highlights	Only one startup has been identified in Robotics sector		
Chemicals, Materials, 3D Printing	Total number	1	<ul style="list-style-type: none"> Lotte Chemical R&D Centre, Kuala Lumpur Nanotechnology & Advanced Materials Research Centre, Nottingham University, Semenyih Petronas Research 	Low
	Total Investment	USD 1 million →		
	Top hubs	Kuala Lumpur		
	Highlights	4tify designs sustainable fabric		
Cosmetics/ Beauty	Total number	0	<ul style="list-style-type: none"> Celblos Dermal Research Centre, Kuala Lumpur Industrial Biotechnology Research Centre, SIRIM, Shah Alam 	Low
	Total Investment	USD million		
	Top hubs			
	Highlights	Frost & Sullivan was not able to identify any deep tech startup		
Pharma	Total number	0	<ul style="list-style-type: none"> UKM Medical Molecular Biology Institute (UMBI), The National University of Malaysia, Bangi Institute for Medical Research, Ministry of Health, Kuala Lumpur 	Low
	Total Investment	USD 0 million		
	Top hubs			
	Highlights	Frost & Sullivan was not able to identify any deep tech startup		

Ecosystem overview



Deep Tech Startups identified by Frost & Sullivan given here (conservative estimate).

Investment has been estimated.

Applications	Startups (for applications in scope)		Applied research Institutes	Interest level
Health & Wellness	Total number	1	<ul style="list-style-type: none"> Institute for Medical Research, Ministry of Health, Kuala Lumpur Clinical Research Malaysia (CRM), Kuala Lumpur 	Low
	Total investment	USD 1.75 million →		
	Top hubs	Kuala Lumpur		
	Highlights	Naluri focuses on addressing chronic diseases		
Medical Devices	Total number	n/a	<ul style="list-style-type: none"> Clinical Research Centre, Ministry of Health, Kuala Lumpur 	Low
	Total investment	n/a		
	Top hubs	n/a		
	Highlights	Frost & Sullivan was not able to identify any deep tech startup		
Agriculture	Total number	2	<ul style="list-style-type: none"> Malaysian Agricultural Research and Development Institute (MARDI), Serdang; Crops For the Future Research Centre (CFFRC), University of Nottingham, Semenyih 	Med
	Total Investment	USD 0.1 million →		
	Top hubs	Kuala Lumpur		
	Highlights	Precision Agriculture		
Food	Total number	1	<ul style="list-style-type: none"> Asian Food Validation Centre, UniKL, Kuala Lumpur Centre for Food & Bio-product Processing (CFBP), University of Nottingham, Semenyih 	Med
	Total Investment	USD 8.9 million →		
	Top hubs	Kuala Lumpur		
	Highlights	Alternate protein sources		

Ecosystem overview

Start-up Ecosystem in the Application Areas



1. Biotechnology (Biotech) Startups	Applied research Institutes
<p>Bio-XCell Malaysia was established in 2009 as a result of a stimulus to accelerate commercialisation of Biotechnology in the National Biotech Policy.</p> <p>BioNexus status is awarded to any qualified international and Malaysian biotechnology companies. The status enables firms to receive fiscal incentives, grants and other guarantees to facilitate growth.</p> <p>The ministry's long-term target is to have high involvement of local companies in the industry, with around 20 BioNexus companies to have global recognition.</p> <p>There have been a few exits also: Verdezyne, a biotech company closed its operations in 2018</p>	<p>Malaysian Government offers a conducive environment for biotech firms to operate in Malaysia by developing Bio-XCell biotechnology park. The biotechnology park and ecosystem are a result of a joint venture between Malaysian Bioeconomy Development Corporation and property developer UEM Sunrise Berhad. Indian firm Biocon Ltd is among foreign companies to have fully operated in Bio-Xcell since 2016. Some of the institutes or agencies are:</p> <p>Bioeconomy Development Corporation: Government agency that overviews the development of biotechnology industry and bioeconomy in Malaysia</p> <p>The Malaysian Biotechnoloy Information center: It is a not-for-profit organization that aims to increase engagement of all stakeholders in biotechnology area and create conducive environment for research and development, commercialization and industry development.</p>

Ecosystem overview

Start-up Ecosystem in the Application Areas



2. Digital (AI, VR, big data, Cloud) Startups	Applied research Institutes
<p>Malaysia has a few startups involve in blockchain and big data technology.</p> <p>Two interesting startups are:</p> <p>Luxtag is a startup that leverages Blockchain technology to enable businesses and customers detect counterfeit items. Additionally, the technology also ensures theft prevention through its ownership tagging feature. Customers also can track and trace their items across the supply chain from factory to distributors.</p> <p>Glueck Technologies, on the other hand, is another Malaysia's startup focusing on digital application. The technology can detect and analyze emotional state of people viewing advertisements.</p>	<p>MIMOS, Malaysia's national Applied Research and Development Centre is an agency under Ministry of International Trade and Industry (MIT). MIMOS has several key focuses areas namely big data analytics, internet of things, electrical & electronics as well as fintech. The past 12 years saw MIMOS filed intellectual properties of more than 2000 across various technology domains. MIMOS also aims to develop culture of innovation among Malaysian by enhancing relationships with internal and external stakeholders.</p> <p>Mimos PSDC in Penang will have facilities for research on Augmented Reality - Virtual Reality, Internet of Things (IoT), Nanotechnologies, Photonics and Wireless Communications, Big Data Analytics, Edge Computing, Artificial Intelligence, 3D-Printing and Smart Manufacturing.</p>
3. Consumer IoT Startups	Applied research Institutes
<p>Malaysia has the potential to become a regional hub for IoT, since the country is strong in the electronics and semiconductors manufacturing industries. At the moment, more than 140 IoT related technology are patented by Malaysian inventors and researchers.</p> <p>Atilze: IoT startup for agriculture and homes</p>	<ul style="list-style-type: none">Institute of Microengineering & Nanoelectronics (IMEN), The National University of Malaysia, BangiMalaysia Automotive, Robotics & IoT Institute (MARii), Cyberjaya

Ecosystem overview

Start-up Ecosystem in the Application Areas



4. Agritech (Agriculture) Startups	Applied research Institutes
<p>Agriculture and Agro-based Industry Ministry has recently unveiled plans to ensure food security and to boost revenue in the sector. The plans include modernizing agricultural sector to increase production. The ministry is also looking to increase private sector investment in agriculture. Additionally, the ministry aims to improve agricultural trade export.</p> <p>Some interesting startups:</p> <p>Plant OS: Vertically integrated digital precision agriculture solutions company</p> <p>AGR1: Hydroponic Farming Set-up</p>	<p>Malaysian Agricultural Research and Development Institute's (MARDI) main objective is to perform scientific research related to the production and processing of crops, livestock and food. Additionally, the institute also performs research on mixed farming. Furthermore, MARDI also acts as center that collect and distribute information and advisory services related to scientific and economic matters related to agriculture. Information is distribution in a number of methods such as through reports, technical papers, exhibitions, seminars and lectures.</p> <p>Crops For the Future is the center dedicated to research on under utilised crops for food and non-food uses.</p>

Ecosystem overview

Start-up Ecosystem in the Application Areas



5. Food Technology Startups	Applied research Institutes
<p>Startups in Malaysia related to food typically involves e-commerce and food delivery.</p> <p>An interesting startup in Food Technology:</p> <p>Nutrition Technologies: Nutrition Technologies produce sustainable insect proteins, oils and frass from black soldier fly larvae for aqua and animal feed.</p>	<p>Malaysian Institute of Food Technology (MIFT) was established with aim to achieve a number of objectives. For example, MIFT aims to stimulate scientific and technological research in various aspects of Food Technology. In addition, MIFT also aims to provide a medium for exchange , discussion publication and distribution of information related to food technology. Furthermore, MIFT also aims to increase public awareness of the basic role of Food Technologists in industry.</p>
6. Medical Tech (Health & Wellness) Startups	Applied research Institutes
<p>Health & wellness setcor is gaining traction among Malaysians. Naluri, for example is a startup focusing on digital treatment program to address chronic diseases such as heart problem.</p>	<ul style="list-style-type: none">Institute for Medical Research, Ministry of Health, Kuala LumpurClinical Research Malaysia (CRM), Kuala Lumpur

Ecosystem overview

Start-up Ecosystem in the Application Areas



7. Chemicals / Materials / Textile / 3D printing	Applied research Institutes
<p>The government is planning to establish Malaysia's first textile manufacturing hub. Currently, it is still in the early stage. However, there is one interesting startup worth mentioning which is 4tify.</p> <p>4tify: A fabric technology company that helps clothing brands design new sustainable fabrics for their production lines.</p>	<p>University Putra Malaysia's group of researchers has successfully developed 3D Medical Grade Print (MeG3rD) that is capable to replicated 3D anatomic printing of patients' actual defect organ with a 1:1 ratio. This enables doctors to perform medical procedure simulation using 3D medical grade printing typically use fro pre-treatment planning specially for complex cases. As a result, it enables doctors to have better understanding and a more realistic experience on medical procedures before the doctors actually perform the procedure on real patients.</p> <p>MIMOS Berhad has signed Memorandum of Understanding with Autodesk to encourage growth of 3D design technologies in Malaysia. The collaboration intends to establish 3D Smart Maker Labs in the five economic growth corridors of Malaysia.</p>

Ecosystem overview

Start-up Ecosystem in the Application Areas



8. Pharma Startups	Applied research Institutes
Pharma sector is dominated by global players such as AJ Research and Pharma. Deep tech startups ecosystem is very weak at the moment.	Malaysian Institute of Pharmaceuticals and Nutraceuticals (IPharm), established in 2006, has set a target to become Biotechnology's Centers for Excellence by taking advantage of Malaysian natural resources to be used for the development of new drugs. Furthermore, the company aims to increase the rate of discovery, development and commercialization of pharmaceutical and nutraceutical products. IPharm plants to position itself as an integrated institute for applied research and development of new pharmaceutical and nutraceuticals. IPharm has executed a number of projects such as developing national natural products repository.
9. Med / Cosmetic Device Manufacturing Startups	Applied research Institutes
In 2018, foreign direct investment in Malaysia's medical technology sector suffered 62% reduction. However, a US-based MedTech firm, Edwards Lifesciences decided to invest \$24.7 million as the company will establish a regional business service center in Kuala Lumpur. This will cover functions such as finance, IT, supply chain, human resource, digital health, marketing and quality assurance.	Malaysian Investment Development Authority (MIDA) approved projects worth of \$160 million in 2018. This includes a \$24.2 million project by JLL Malaysia to manufacture balloon and electrophysiology catheters. Additionally, \$18.9 million project by Pentax Medical to produce endoscopic and surgical devices are among the approved projects. Lastly, a project to establish a production facility for cardiac rhythm management devices by Japan Lifeline worth of \$17.4 million was also approved.

Ecosystem overview

Start-up Ecosystem in the Application Areas



10. Cosmetics/Beauty Startups	Applied research Institutes
<p>Local cosmetics startups are popular among Malaysians as it is relatively easy to hear of the launching of new collections from local cosmetic brands. However, these products are considered generic since there is no involvement of innovation and technological breakthrough during the process of products' development.</p>	<p>Standard and Industrial Research Institute of Malaysia, commonly refer as SIRIM Berhad, has Industrial Biotechnology Research Center (IBRC) that conducts cosmetic product test. IBRC is specialized in extraction of plants through solvent, aqueous and supercritical fluid extraction. Furthermore, it can also perform purification and isolation of bioactive metabolites from plants extracts.</p> <p>Safi Research Institute is the first and largest halal skin care research institute. Around 100 scientists and researchers conduct activities to create halal skin care products. Its products meet regulatory requirements from world bodies such as federal Drug Authority (FDA).</p>

Ecosystem overview

Start-up Ecosystem in the Application Areas



11. Environment/Sustainability/Waste Management Startups	Applied research Institutes
<p>Malaysian's waste management startups still revolve around 'platform's business model' instead of applying technological breakthrough. However, there are a few startups related to sustainability which are explained below:</p> <p>Indochine Bio Plastiques develops biodegradable bio plastic resin for the global market.</p> <p>FatHopes Energy focuses on developing sustainable fat, oil, and grease solutions for the purpose of advanced biofuel production.</p>	<ul style="list-style-type: none">Institute for Environment & Development (LESTARI), The National University of Malaysia, BangiCentre for Environmental Sustainability and Water Security, University Technology Malaysia, Johor

Ecosystem overview

Start-up Ecosystem in the Application Areas



12. Robotics Startups	Applied research Institutes
<p>Robotics sector is starting to develop in Malaysia and interest in this area is ever increasing.</p> <p>One interesting startup is:</p> <p>Robopreneur Sdn Bhd, founded in 2015, is a service robotics company that has experience in research and development. The company specializes across various sectors such as professional and service robotics products and solutions, research and development and artificial intelligence applications, additive manufacturing solutions and digital media products and services. The startup claims that its key industries are education, healthcare, hospitality and service, manufacturing, oil and gas and agricultures.</p>	<p>Center for Artificial and Intelligence Robotics is located in one of Malaysia's public universities, Universiti Teknologi Malaysia. To date, it has received research grants worth of \$4 million and also has 300 indexed journal publications.</p> <p>Malaysia Robotics and Automation Society (MyRAS) is an NGO based in Cyberjaya. The objective of MRS is to facilitate the advancement of Malaysian Robotics and automation industry through the creation of ecosystem. MyRAS aims to bring stakeholders ranging from industry players, policy makers ad administrations, academia and most importantly the public.</p>

Ecosystem overview

Start-up Ecosystem in the Application Areas



Major VCs, Incubators and Accelerators for Deep Tech Startups in Malaysia

There are a few VCs, Angel Investors, Accelerators & Incubators in Malaysia. Among the top are:

VCs

Gobi Partners: The VC has regional presence across China, Hong Kong, and ASEAN

Teak Capital: Venture capital management firm based in Malaysia

Catcha Group: Investment across media, property and many others

Cradle Seed Ventures: The VC manages an early stage venture fund

Incubators and Accelerators

Malaysian Global Innovation & Creativity Centre (MaGIC)

MaGIC is an innovation and creativity center under the Ministry of Finance. It offers bootcamp, online academy, social entrepreneurship development and many others.

Location: Cyberjaya (Malaysia)

Malaysian Technology Development Corporation (MTDC)

MTDC involves in Fund Management, Incubation, Advisory, and Nurturing Services. The corporation is also key in technology commercialization in Malaysia.

Location: Kuala Lumpur (Malaysia)



Key Growth Drivers

1

ROBUST GROWTH ENVIRONMENT FOR STARTUPS

- Malaysia has a robust environment for startups in the form of VCs, Incubators and Accelerators

2

ASEAN'S FIRST EQUITY CROWDFUNDING PLATFORM FOR STARTUPS

- Is up and running in Malaysia. It's known simply as CrowdPlus.asia but brims with lofty goals backed by Netrove Ventures Group, a regional tech-based venture capital firm and Propellar Corporation Ltd, an equity crowdfunding operator based out of Hong Kong

3

SILICON VALLEY COMES TO MALAYSIA

- A unique event marked by strong partnership between the Malaysian government and the private sector in motivating Malaysian startups to create global brands

4

FAVORABLE GOVERNMENT POLICIES & REGULATIONS

- Financial Technology Regulatory Sandbox
- Global Testbed Initiative
- Equity Crowd Funding
- Angel Tax Incentives
- Cradle Fund
- It is also easy to bring in foreign talent for startup in Malaysia



Government Initiatives

1

Financial Technology Regulatory Sandbox

- The Central Bank of Malaysia (Bank Negara) has established the financial technology (fintech) regulatory sandbox framework in 2016
- Players say it gives them the credibility to operate their business models, the opportunity to compete with more established players and the space to push the boundaries of their offerings

2

Global Testbed Initiative

- To attract next-gen emerging technologies in the country to innovate
- Malaysia Digital Economy Corporation (MDEC) will accelerate development in the fintech, **blockchain** and drone sectors by attracting global digital talents and interest from investors

3

Cradle Fund

- Launched with an initial funding of US\$24 million and a later addition of \$42 million, has, so far, assisted more than 700 startups, representing the Government's effort at boosting quantity and quality of innovations and technology start-ups

4

Equity Crowd Funding

- Equity crowdfunding in Malaysia was brought to the mainstream when Securities Commission Malaysia became one of the first within the region to introduce guidelines to regulate the space
- It is a regulator's strategy to provide a more diverse investment portfolio to the Malaysian public and provide more access for startups and SMEs to raise capital
- Currently there 7 players operating in the equity crowdfunding space in Malaysia

5

Angel Tax Incentives

- A new initiative approved by the Government to encourage more early stage investments by the private sector
- This incentive hopes to reduce the risks usually associated with early stage investments by giving back in the form of tax exemption to the investors

Potential Ecosystem Evolution – Overall View

How will the ecosystem evolve in the next five years (2020 to 2025) and what business opportunities will they create?



	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
1. Biotech	The ministry has set a long-term target to have more local companies involve in biotech sector. Thus, the sector is expected to have stable growth over the coming years.	
2. Waste Management	Ministry of Housing and Local Government recently announced an effort to have more organized and effective solid waste management system. Corporation and startups will have strong opportunities in the development.	
3. Digital	There are two deep tech startups in the areas of blockchain and artificial intelligence. The established innovation hubs are also focusing on nurturing talents related to Digital. Thus, this application is expected to fastest growth amongst the rest.	
4. Consumer IOT	Malaysia has strong base in electronics and semiconductors manufacturing industries, which are integral parts in IoT development. Expect to have high growth in the long term but not in the short term.	

Potential Ecosystem Evolution – Overall View

How will the ecosystem evolve in the next five years (2020 to 2025) and what business opportunities will they create?



	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
5. Robotics	Robotics has one startup involvement specialising in servicing, researching and development of robotics. Additionally, Malaysia Robotics and Automation Society (MyRAS) has established a hub to encourage innovation in this area. However, lacking in funds to develop technologies might discourage innovation.	
6. Chemicals, Materials, 3D printing	MIMOS Berhad, the country's national applied research and development center has been the key figure that drives 3D printing adoption in Malaysia. However, investment is still low in this area.	
7. Cosmetics	Safi Research Institute is the first halal research institute set up to cater for increasing demand of halal skincare in Malaysia. However, the rest cosmetics startups are mostly focusing on e-commerce and marketing strategy.	
8. Pharma	Frost & Sullivan was not able to identify any deep tech startup involvement in the pharma ecosystem.	

Potential Ecosystem Evolution – Overall View

How will the ecosystem evolve in the next five years (2020 to 2025) and what business opportunities will they create?



	Ecosystem Evolution in the next 5 years (2020 to 2025)	Growth Indicator for Startups
9. Health & Wellness	Citizens are becoming more aware on the states of their health. Thus, this sector is becoming more relevant in the country.	
10. Medical Devices	Foreign direct investment reduced by 62% in 2018. The industry is currently in a downturn in Malaysia. Not expected to be a strong area for startups	
11. Agriculture	Malaysia is in an effort to modernize agriculture. The ministry is welcoming private sector involvement. The growth should accelerate but not the next five years.	
12. Food	One interesting startup was identified in Malaysia. The startup currently involves in sustainable insect protein. At this moment, the ecosystem is in nascent stage and is expected to grow in the next 5 years	



Potential Opportunities for L'oreal (1/2)

Potential Opportunities for L'oreal	
1. Biotech	Biotechnology products
2. Digital	Blockchain technology to address issues such as counterfeit items and theft issues. Additionally, this technology enables tracking activities from factory and distributors to customers.
3. Consumer IOT	Internet of things – smart sensors for agriculture and homes
4. Agriculture	Utilizing data, visual analytics and machine learning to help farmers optimize their crops yield and at the same time reducing cost by improving efficiency and production planning.
5. Food	Sustainable insect proteins, oils and frass to be used for aquaculture feed, agriculture and animal feed.

F R O S T & S U L L I V A N

Donatien Gamba

Principal Consultant

Consulting Strategy and Implementation

 +33(0) 6 03 10 15 07

 donatien.gamba@frost.com

F R O S T & S U L L I V A N

Nicolas Votano

Vice President

Global Accounts

 +33(0) 6 23 31 83 92

 nicolas.votano@frost.com

F R O S T & S U L L I V A N

Emeline Goujon

Account Executive

Global Accounts

 +81 3 4550 2203

 Emeline.goujon@frost.com

F R O S T & S U L L I V A N

Subbu Bettadapura

Senior Director

Techvision APAC

 +603.6204.5859; Mobile: +601.6906.7331

 sbettadapura@frost.com