Open Innovation

How Corporate Giants Can Better Collaborate with Deep-Tech Start-ups. The Case of East and Southeast Asia

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Index

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Corporate Venturing

Corporate Giants Innovating with Deep-Tech Start-ups
The Case of East and Southeast Asia

The Term Deep Tech Is Not New

Understand this concept to implement, measure and improve it properly.

Deep tech is "a group of emerging technologies based on scientific discoveries or meaningful engineering innovations, offering a substantial advance over established technologies, and seeking to tackle some of the world's fundamental challenges."

- Artificial intelligence
- Advanced materials
- Biotechnology
- Blockchain
- Robotics and drones
- Photonics and electronics
- Quantum computing

Corporate Venturing In Deep Tech Is Growing at Speed

Don't miss the opportunity: Consider partnerships in this field with (and from) East and Southeast Asia too.

Some examples: Alibaba Group 阿里巴巴集团, Lenovo, SAMSUNG, SCB ไทยพาณิชย์, Tencent 腾讯, TOYOTA

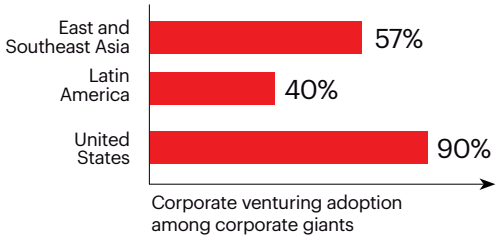
Among the analyzed companies:

Past

x2.8
Growth of corporate venturing (past 5 years)

x4.2
Growth of CV in deep tech (past 5 years)

Now



Future

71%
Growth of companies expecting to increase CV in deep tech (next 5 years)

What Keeps Chief Innovation Officers Up at Night

This study sheds light on some of the major challenges faced by East and Southeast Asian corporations, when innovating with deep-tech start-ups. These problems are related to governance, hierarchy and risk.

14% **Technology evaluation.** Who and how should be done?
Deep-tech start-ups have higher complexity.

11% **Short-term view.** How can time horizons be matched?
Deep-tech start-ups have longer gestation periods.

11% **Internal alignment of KPIs.** How can expectations be managed?
Deep-tech start-ups may not be a priority for business units or headquarters.

10% **Regulation.** How can regulatory barriers be tackled?
Deep-tech start-ups are often facing barriers related to intellectual property.

9% **Regional fragmentation.** How can regional differences be managed?
Deep-tech start-ups need market proof. Diversity in East and Southeast Asia (languages, cultures, currencies, etc.) may complicate this validation.

8% **Silos between R&D and corporate venturing teams.** How can these teams be coordinated?
Deep-tech start-ups can be seen as competitors of corporate R&D teams.

6% **Top-down management.** How can the best of both approaches be combined?
Deep-tech start-ups can be undervalued if upper management doesn't have the right knowledge.

Open Innovation:
How Corporate Giants Can Better Collaborate with Deep-Tech Start-ups. The Case of East and Southeast Asia

Executive Summary

Companies such as Toyota, Samsung, Alibaba, and Lenovo are already innovating with start-ups in the deep-tech field—a group of emerging technologies based on scientific discoveries or meaningful engineering innovations, offering a substantial advance over established technologies, and seeking to tackle some of the world's fundamental challenges. Currently, this group usually encompasses artificial intelligence, advanced materials, biotechnology, blockchain, robotics and drones, photonics and electronics, and quantum computing.

This phenomenon is increasing at speed. In past years, deep-tech start-ups have received increased attention among corporations, entrepreneurs, investors, and media. Investment in deep-tech start-ups has more than quadrupled over a five-year period, from $15 billion[i] in 2016 to more than $60 billion in 2020, approximately. The average disclosed amount per private investment event for these start-ups and scale-ups has grown 3.4 times between 2016 and 2020.[ii]

In East and Southeast Asia, some of the corporate venturing activity is concentrated in nine regions: mainland China, Hong Kong, Indonesia, Japan, South Korea, Singapore, Thailand, Taiwan, and Vietnam. On average, this region has a higher adoption rate of corporate venturing (57%), compared to that of Latin American countries (40%), while having room for growth compared to the adoption rate in other regions such as the United States (90%).

In the analyzed companies, not only has the adoption of corporate venturing increased by 2.8 times in the past five years but their deep-tech start-up collaborations have also gone up by 4.2 times during the same period. Moreover, in 71% of the cases, the weight of deep-tech start-ups in corporate venturing portfolios is expected to grow in the next five years.

Based on 77 interviews with innovation executives during this study, complemented by the review of previous literature, there are seven issues cited as the biggest challenges for corporations when it comes to collaborating with deep-tech start-ups. These are technology valuation, short-term view, internal alignment of key performance indicators, regulation, regional fragmentation, silos between research and development (R&D) and corporate venturing teams, and top-down management—aspects all related to innovation governance, cultural hierarchy, and risk perception. Meanwhile, three departments are usually reported to be bottlenecking this relationship: finance, legal, and R&D.

Innovation Governance

What is the best way to manage cross-region and -departmental corporate venturing teams, when working with deep-tech start-ups? Having these teams in multiple business groups and regions, within the same company, it becomes challenging to coordinate and align efforts to maximize value creation and impact integration, while minimizing redundancy in the implementation. The five most common models are owner, coordinator, optimizer, catalyzer, and hybrid. Other aspects frequently used to tackle this challenge are recurrent meetings, joint databases, scouting missions segmented by region or technology, a combination of pull and push strategies on terms of identification of opportunities, and internal alignment among the executive committee, the business units, and the corporate venturing team.

What is the best way to deal with the R&D department? Who should do the technology valuation? R&D is sometimes biased toward the "this has not been invented here" mantra, especially in working with deep-tech start-ups. The decision as to who should do the technology valuation can be simplified considering two variables. First, who has the technical knowledge for conducting the valuation? That would likely be the corporate venturing team; or it may be the R&D department or an expert outside the corporation. Second, is the

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i. In this study $ refers to US$.
ii. Since this is the executive summary, it excludes references because they are included in the document.

R&D department biased toward its own developments? The latter can be avoided by having a shared mandate across both teams (venturing and R&D) and having a joint boss with expertise in both the venturing and the technical side.

Cultural Hierarchy

How do East and Southeast Asia affect corporate venturing? The region is fragmented, sometimes challenging local and foreign corporate venturing initiatives. The analyzed territories combined the use of the six most frequent languages (Mandarin, Indonesian, Thai, Japanese, Vietnamese, and Korean), nine regulation frameworks, nine currencies, and nine management approaches that directly impact the corporate venturing approach. Regarding management approaches, for instance, the avoidance of uncertainty is quite diverse: while Japan and South Korea have the highest levels, Singapore and Hong Kong have the lowest levels.

What is the best way to mitigate the cons of a top-down approach for corporate venturing in deep tech? This approach can erode staff motivation and learning orientation, reducing the creation of new ideas, an aspect especially relevant when upper management doesn't have expertise in deep tech. In parallel, in this approach, management usually has to deal with more projects, reducing the speed of the decision-making for approvals of proposals coming from the bottom. Yet the company can complement staff motivation with other incentives, set decision-making thresholds (e.g., the seniority level required to approve depends on the size of the resources required), supplementing with internal radars to sense the insights generated from employees and outside the organization, and shortcutting approvals (e.g., securing a sponsor among the executive committee). Likewise, the company can complement the existing status quo with bottom-up approaches by convincing upper management of the pros of bottom-up models to then enhance upper- and middle management to seed the change in their business units, and by securing a structural enhancement on the internal policies regarding information, processes, and incentives toward the new approach.

Risk Perception and Control

How much does the perceived corporate risk differ by mechanism, implementer, and relation to the control taken over the start-up? Each corporate venturing mechanism has a different risk perception, and a different level of corporate control over the start-up. Start-up acquisition, corporate venture capital, and venture builder are the mechanisms with the highest average risk perceived. Hackathon, scouting mission, and challenge prize are those with the lowest. On average, the risk perceived is almost the same either implementing the mechanism within the corporation or through a corporate venturing enabler outside the corporation. The same happens with corporate control over the start-up: there are almost no differences by mechanism or implementer (inside and outside the corporation).

What is the best way to mitigate the risk perception of non-venturing departments? One route is showcasing internal success stories, showing them to other business units. Run background checks of the entrepreneurs and the start-up. Tailor your internal pitch: while the executive committee may prefer arguments related to the connection to its long-term strategy, business units may prefer a reasoning more related to short- or mid-term impact on their profitability and available resources. Do not start with the technology (or solution) but with the pain point (or use case) of business units. Identify the problem that you are going to solve in your company through a clear use case, and then prototype to show the quantified value. To do this, it may be helpful to create a sandbox for the minimum proof of concept, while gradually increasing resource allocation.

In short, companies have the opportunity to combine an emerging trend in terms of practice (corporate venturing in deep tech) and region (East and Southeast Asia). Innovation governance, cultural hierarchy, and perceived risk are highlighted as major challenges that currently keep corporate innovation leaders up at night.

1. Introduction: The Stories of Toyota, Samsung, Alibaba, and Lenovo

Key takeaways of this section:

- Toyota is improving autonomous driving with the artificial intelligence start-up Pony.ai.
- Samsung is enhancing capabilities collaborating with the quantum-computing start-up IonQ.
- Alibaba is advancing in blockchain with QEDIT's entrepreneurs.
- Lenovo is augmenting battery life with the advanced materials company CosMX.

Toyota Accelerates Autonomous Driving through Artificial Intelligence Start-up

After working at Baidu and Google for eleven years, and holding studies from the universities of Stanford and Tsinghua, Dr. James Peng—cofounder and CEO of Pony.ai—received a $400 million investment from the Japanese automaker Toyota[iii] to speed up the commercialization process of a self-driving technology, according to a recent interview in Bloomberg.[1] Supported by investors such as IDG Capital and Sequoia Capital China, and founded in Silicon Valley in 2016, the start-up applies artificial intelligence to support the driverless pact, combining heuristic[iv] and deep-learning[v] models to boost performance.[1,2] (See **Figure 1**.)

Without requiring exclusive access to the technology, the corporation investment in the start-up enables a stronger integration of Pony.ai's technology with Toyota's vehicles. It is an extension of the existing partnership both companies already had for two years, when they announced to jointly conduct autonomous driving tests on open roads in Beijing and Shanghai, using Lexus RX vehicles and Pony.ai's autonomous driving system, becoming one of the first start-ups to offer a public-facing robotaxi service in China and California. The start-up has several testing sites, including a pilot service with the South Korean automaker Hyundai.[3]

Carmakers are striking pacts with driverless system providers to gain expertise and fend off competition from tech companies seeking to enter the transport business. For Pony.ai, a relationship with Toyota is a vote of confidence as it seeks to take on rivals such as Alphabet Inc.'s Waymo.[1]

With close to $278 billion in annual revenue, Toyota Motor Corporation boasts a diverse ecosystem of collaboration with start-ups, encompassing corporate acceleration, challenge prize, start-up acquisition, coworking space, and corporate venture capital through mechanisms such as Toyota AI Ventures.[4,5]

Figure 1. Toyota and Pony.ai

Source: Reuters.[6,7]

James Peng, cofounder and CEO of Pony.ai, speaking at the third China International Import Expo in Shanghai. The Pony.ai hardware is attached to the white Toyota car.

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iii. Pony.ai raised this funding round in 2020.

iv. In mathematical optimization and computer science, a heuristic technique is one designed for solving a problem more quickly when classic methods are too slow, or for finding an approximate solution when classic methods fail to find any exact solution.

v. Deep learning is part of a broader family of machine-learning methods based on artificial neural networks with representation learning. These architectures (e.g., deep neural networks, graph neural networks) have produced, in some cases, results comparable to or surpassing human expert performance.

Samsung Upgrades Technologies with Quantum Computing Entrepreneurs

After more than 25 years of academic research, the start-up IonQ was founded in 2015 by professors Christopher Monroe and Jungsang Kim with $2 million in seed funding from the venture capital firm New Enterprise Associates (NEA), a license to core technology from the universities of Maryland and Duke, and the goal of taking quantum computing (with trapped ions[vi]) out of the lab and into the market (see **Figure 2**). It entered in a race somewhat dominated by companies such as Google, Intel, IBM, and Microsoft.

In the following three years, these two scientific entrepreneurs raised an additional $20 million from GV,[vii] Amazon Web Services, and NEA, building some of the world's most accurate quantum computers. Later on, they raised another $55 million in a round co-led by the South Korean tech conglomerate Samsung through its Catalyst Fund.[8,9]

With the potential to process exponentially more data compared to classical computers by leveraging the properties of matter at nanoscale, IonQ differs from competitors because of their four already operational quantum computers made from standard components available in the computing supply chain, without using the common superconducting quantum bit.[viii,ix], Moreover, using a cooling technology,[x] these bits are kept at a low temperature, avoiding placing the machine in a refrigerated environment at a temperature close to absolute zero.

According to Samsung Catalyst Fund cohead Francis Ho, "Quantum computing is not yet a practical commercial technology [...] but some of its first commercial applications will be to design better materials [and] plan better logistics [...] capabilities very valuable for Samsung." Moreover, it "will lead to many new inventions and uses that we cannot yet imagine."[9]

With near $198 billion in annual revenue, Samsung has built a global ecosystem for start-ups that integrates mechanisms from corporate accelerators to corporate venture funds, start-up acquisitions, hackathons, and coworking spaces, to name a few.[xi 10–12]

Figure 2. Samsung and IonQ

Source: The Science Monitor and TEC.[13,14]

IonQ cofounders and professors Jungsang Kim (left) and Christopher Monroe (right).

Alibaba Combines Enterprise Blockchains with Zero-Knowledge Proofs

Being among the Crunchbase top-50 hottest global tech companies and a World Economic Forum Technology Pioneer are just a couple of the recognitions blockchain Israeli start-up QEDIT is proud of. Their cofounders encompass a Ph.D. in computer science at the Hebrew University of Jerusalem, serial entrepreneurs, and electrical engineers from the Israel Institute of Technology. QEDIT's development of privacy technology for enterprise blockchains[xii] recently closed a $10 million series A round from investors including Ant Financial, the payments affiliate of Chinese e-commerce giant Alibaba, to explore a collaboration combining enterprise blockchains with zero-knowledge proofs.[15]

According to Alibaba's Ant Financial president of advanced technology business group, Geoff Jiang, "Ant Financial shares a common vision with QEDIT to protect data privacy and security . . . as part of our blockchain services."[16]

The group, formerly known as Alipay, has already applied blockchain to remittances between Hong Kong and the Philippines and tracking the provenance of rice grown in China. According to QEDIT cofounder Jonathan Rouach, "We hear about it less in the West, but there is a lot of progress happening

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vi. A trapped ion quantum computer is an approach to scale a quantum computer. Ions, or charged atomic particles, can be confined and suspended in free space using electromagnetic fields. Qubits are stored in stable electronic states of each ion, and quantum information can be transferred through the collective quantized motion of the ions in a shared trap.
vii. Formerly Google Ventures.
viii. A quantum bit is the basic unit of quantum information—the quantum version of the classic binary bit physically realized with a two-state device.
ix. Rather they use a version based on ionized ytterbium atoms. Ytterbium is a chemical element with the symbol Yb and atomic number 70.
x. Doppler cooling is a mechanism that can be used to trap and slow the motion of atoms to cool a substance.
xi. The names of just some of these Samsung mechanisms are Samsung Next, Ventures, Catalyst Fund, C-Lab, and Venture Investment.
xii. Blockchain is based on a shared and immutable ledger that stores transactions and tack assets, enhancing security and transparency.

between companies and countries in East Asia [...]. Zero-knowledge schemes provide a way of proving possession of a secret without revealing the secret itself."

This concept may tackle a relevant challenge. Says Rouach, "Banks have no way of knowing whether collateral[xiii] has already been accounted toward other finance because the banks cannot collaborate on private information [...]. We worked out a mechanism on a blockchain where the banks can check collateral has only been used once without having to share client information [...]. It is what can allow competitors to be part of the same network without having to rely on some central authority."[16,17]

With $71 billion in annual revenue, Alibaba aggregates corporate acceleration, corporate venture funds, sharing resources to entrepreneurs (e.g., cloud services), running hackathons, hosting challenge prizes (see **Figure 3**), and more.[xiv 16,18–23]

Figure 3. Alibaba start-up pitch competition

Source: Alibaba, Gobi Partners, and CxGlobal.[24-26]

Part of the team of venture capital firm Gobi Partners attending the start-up competition Jumpstarter.

Lenovo Augments Battery Life through a Unicorn in Advanced Materials

Becoming one of the world's largest lithium-ion battery[xv] suppliers for laptops and tablet computers in just twelve years since its founding in 2007 is one of the achievements of the grown start-up Zhuhai CosMX Battery (formerly known as CosMX).

With production bases in the city of Chongqing and in India, CosMX has been recently incorporated in the unicorn[xvi] repository in the city of Zhuhai; and it continues its expansion in "lithium-ion batteries for laptops, cell phones, smart wearable devices, unmanned aerial vehicles, vacuum cleaners, and electric tools," according to CosMX CEO Xie Bin.[27–29]

What started nine years before as a company setting up in a research lab nowadays employs more than 600 engineers for R&D, 200 of them with a Ph.D. or master's degree, focusing on material innovation for battery development (e.g., increasing the battery standby time). Its list of investors includes institutions such as the technology company Lenovo and the venture capital firm GF.[30,31]

This type of collaboration with start-ups is not new for Lenovo (see **Figure 4**), whose annual revenue is upwards of $51 billion. It encompasses a rich environment to innovate with start-ups through corporate incubation and acceleration, corporate venture funds, and more.

According to Lenovo Venture Capital president He Zhiqiang, "Technology breakthroughs are changing the way all of us live today. With our long industry history and experience of driving and developing core innovations, we are well-prepared to shape the future of game-changing technologies through funding and nurturing start-ups and bringing incubator projects to market."[31, 32]

Figure 4. Lenovo and CosMX

Source: CosMX and Wikipedia.[33]

In short, what can we learn from East and Southeast Asian companies such as Toyota, Samsung, Alibaba and Lenovo? They are examples of East and Southeast Asian corporate giants innovating with start-ups based on scientific discoveries or meaningful engineering innovations.

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xiii. The term collateral refers to an asset that a lender accepts as security for a loan. It acts as a form of protection for the lender.

xiv. The names of Alibaba mechanisms are Alibaba Jumpstarter, Entrepreneurs Fund, Capital Partners, and Accelerator, to name a few.

xv. In these rechargeable batteries, lithium ions move from the negative electrode through an electrolyte to the positive electrode during discharge, and back when charging.

xvi. A unicorn is a privately held company valued at over $1 billion.

2. Corporate Venturing in Deep Tech: An Emerging Trend

Key takeaways of this section:

- There is a need to align the definition of deep tech among practitioners and academics, and to better identify and tackle major challenges that corporations are facing in collaborating with deep-tech start-ups.
- Deep tech is a group of emerging technologies based on scientific discoveries or meaningful engineering innovations, offering a substantial advance over established technologies, and seeking to tackle some of the world's fundamental challenges. This encompasses artificial intelligence, advanced materials, biotechnology, blockchain, robotics and drones, photonics and electronics, and quantum computing.
- Corporate venturing with deep-tech start-ups is increasing at speed. Investments have more than quadrupled in the past five years up to more than $60 billion.

2.1. What Is Deep Tech?

Definition of Deep Tech

The term *deep tech* (or *deep technology*[xvii]) is widely prevalent in industry and government, but limited in its definition in the literature. It encompasses multiple and ambiguous characterizations from academics and practitioners.[34-44]

Businesses, investors, and entrepreneurs sometimes use this term as a messaging enhancer for their offerings, designed to captivate and engage. When pressed, few can define it, and fewer still agree upon all but its basic elements. If organizations can't agree on what exactly deep tech is, how can they implement it properly?[43]

Unifying existing definitions from academics and practitioners, this study assumes that deep tech is "a group of emerging technologies[xviii] based on scientific discoveries or meaningful engineering innovations, offering a substantial advance over established technologies, and seeking to tackle some of the world's fundamental challenges."

This definition uses the notion of *emerging technology*,[45-58] based on the definition provided in academic publications for several decades in this way: "A relatively fast-growing and radically novel technology characterized by a certain degree of coherence persisting over time and with the potential to exert a considerable impact on the socioeconomic domain(s) which is observed in terms of the composition of actors and institutions, and the patterns of interactions among those, along with the associated knowledge production processes. Its most prominent impact, however, lies in the future and so in the emergence phase is still somewhat uncertain and ambiguous."[46] The characteristics of an emerging technology are radical novelty, relatively fast growth, coherence, prominent impact, and uncertainty and ambiguity. Overall, this is a characterization based on scientometrics, complemented with qualitative analysis on the socioeconomic domain.[59]

Now, segmenting the five aspects of the definition: First, radical novelty is identified with the appearance of new clusters of documents (or words) in citation (or co-word analyses),[50] while other studies point to the importance of also considering the extent to which the new cluster is connected to clusters in the same year of observation or to clusters identified in previous years.[60]

Second, relatively fast growth is operationalized in many studies and often evaluated by counting documents over time (such as news articles, publications, and patents).[51] Third, coherence is indicated by entropy measures on the appearance of new categories (e.g., journals, technological classes, terms in institutionalized vocabularies).[55]

Fourth is the potential to exert a considerable impact on the socioeconomic domain, observed in terms of the composition of actors and institutions, and the patterns of interactions among those, along with the associated knowledge-production processes, keeping in mind that the most prominent impact of the technology lies in the future.

This aspect, combined with the fifth one—uncertainty and ambiguity—can be developed through the mapping

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xvii. It is sometimes also called hard tech.

xviii. This definition assumes that technology refers to "the application of scientific knowledge for practical purposes, especially in industry."

of expectations of emerging technologies by means of qualitative analysis of documents such as news, review articles, and policy documents which can, for example, provide important insights on the uncertainty and ambiguity, and the prominent impact attributes of emergence, especially in the case of contemporary analyses. This, combined with a scientometric approach, can also provide meaningful interpretation, thus potentially reducing the likelihood of detecting false positives or missing patterns.

How Does This Definition Tackle Some of the Challenges of Existing Definitions?

Misconnection between academics and practitioners (this is not a new concept). Some practitioners think *deep tech* is a completely new term,[35] disregarding years of research. Meanwhile, some academics continue with their existing definitions,[45] while few are connecting with the definition by practitioners.[42-44] This not only produces redundant efforts but loses the years of inherited research. This is not a new concept. This process of commercializing scientific discoveries with the potential to disrupt a market—also called technology transfer—has happened for many years with examples such as computers, global positioning systems (GPS), the Internet, and medical imaging, to name a few. Furthermore, although receiving more attention recently, the term *deep tech* was first cited many years ago, in 1998.[61]

Misalignment among practitioners, by years and by stakeholders (technology, approach, or start-up). Depending on the year or the stakeholder, practitioners commonly use the term *deep tech* in three different ways: as a type of technology, as an innovation approach, and as a category of start-up. Those using it as a category of start-up, implying that the term *deep tech* is a subset of start-ups,[35-62] struggle to be coherent when analyzing innovation ecosystems in this category (e.g., universities, corporations, policies, private investors). For example, if deep tech is a deep-tech start-up, then what is a deep-tech corporation? Is it a corporation that is a start-up? Is it a corporation that works with start-ups? When can the term be used? What then is a deep-tech product?

Once they realize the limitations of this definition, some practitioners have tried to pivot the definition over time, considering it an innovation approach enabled by problem orientation and by the convergence of approaches and technologies, powered by the design–build–test–learn cycle.[63-66] Thus, what is the difference between deep tech and with well-established concepts such as technology transfer, scientific commercialization, and linked or pull innovation?[63-67] To develop this deep technology; science, engineering, and design may be required, yet development refers not to the *what* but to the *how*.

Unclarity when defining boundaries (you can't measure correctly what you can't define clearly). Some practitioners try to measure what deep tech is, to then identify patterns in deep tech, to then define deep tech,[62] producing a potential cyclical definition. It is challenging to measure something with accuracy when the definition is not clear.

It is on purpose that existing definitions allow for flexibility, because some scientific discoveries that were once challenging to develop, which had potential to become an easy-to-implement solution in the future, today are mainstream. Then, while the concept should be clear, the content within it evolves over time, according to several characteristics. To make a long story short, what is defined as deep tech today may not be in 20 years from now. Keeping this in mind, some practitioners' definitions are so open that almost anything can fall within this category. Furthermore, it is sometimes difficult to pinpoint the difference between concepts such as deep, high, disruptive, or general tech. (See **Section 2.1.**)[xix]

Categories of Deep Tech

Since the technologies within this concept evolve, it is challenging to define them, especially because the literature appears fragmented in both concepts and geographies. At the time this study is written, several publications commonly refer to seven categories.[40, 79-88](See **Table 1.**)

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xix. Why is this concept different from other established terms in the literature such as *disruptive technology* or *high tech*? First, Clayton Christensen's term *disruptive technology* refers to an "innovation that significantly alters the way that consumers, industries, or businesses operate."[68-70] This concept has a higher connectivity to the recipient of the technology (the company) than the technology per se, compared to deep tech.[71] For instance, the Internet is disruptive to some firms but sustaining to others, depending on whether it is consistent with their business model. Moreover, this definition focuses less on humankind's fundamental challenges.[72]

Second, the term *high tech* is characterized by rapid adoption of knowledge, very superior to other technologies. Due to its degree of complexity, "it demands constant progress in R&D, as well as a robust technological base."[73-77] Relatively high investments in R&D activities, combined with high degrees of innovation and skilled employees are the key attributes distinguishing high-tech industries from others.[78] Nonetheless, there are two main differences: the development and adoption of the technology in high tech is somehow in a later stage compared to deep tech; and, while high tech is commonly focused on selective problems for business and industries, deep tech focuses on solving humankind's problems by tackling societal and environmental issues.[41]

Lastly, some international governments are starting to use the term *key enable technology*, referring to "investments and technologies that will allow . . . industries to retain competitiveness and capitalize on new markets." For instance, the European Commission used this term in the funding program Horizon 2020 to focus on the following technologies: nanotechnologies, advanced materials, advanced manufacturing, production technologies, and biotechnology.[208]

Table 1. Seven common deep tech categories: Definitions and examples of use cases (2021)

Category	Definition	Examples of use cases*	Value of the use case
Artificial intelligence	The ability of a machine or computer system to perform cognitive functions that are usually associated with humans.	In **healthcare** for improving the diagnosis accuracy with imaging devices (e.g., Samsung developed a tool based on ultrasound images. Its AI algorithms facilitated an about 5% increase in the diagnosis accuracy of breast lesions).	To enhance the relationship with the customer by suggesting better deals, trying virtual products, managing and reviewing subscriptions, notifying of payments, and conducting follow-ups in a safe and privacy-friendly way.
Advanced materials	New materials and modifications to the existing ones to reach a superior performance.	In **automotive and transportation** sectors for the production of environmentally friendly batteries for electric vehicles (e.g., Tesla, General Motors).	To support climate change impact and eco-friendly sustainable transformations.
Biotechnology	Technology that aims to create or develop existing products by the use of living processes and organisms.	In **energy and utilities** for the production of liquid biofuels and methane from organic waste (e.g., ENI, ExxonMobil).	To improve climate change impact and eco-friendly sustainable developments.
Blockchain	Shared and immutable ledger that stores transactions and tack assets, enhancing security and transparency.	In the **financial sector** for tracking negotiating conditions of a loan, between borrowers and lenders, to understand the process (e.g., consultancy Indra borrowed €75 million from BBVA).	To enhance tracking, traceability, and safety in the area of distribution; to achieve greater transparency in negotiations and the supply chain, for example.
Robotics and drones	The use of machines to perform automated tasks. As a subcategory, drones are remotely piloted flying crafts employed in several activities such as maintenance and transportation.	In **retail** for managing stores via an automated system that retrieves products from shelves (e.g., Amazon Robotics, a pre-acquisition of Kiva Systems, or its announcement of the use of drones for home delivery).	To speed up traditional processes such as the movement of pallets or the barcode scan, and to enhance the customer experience by improving order accuracy and decreasing waiting periods.
Photonics and electronics	Technology that enhances the properties of photons, the quantum unit of light, to transmit information in milliseconds. As a subset, a similar process is followed by electronics with electrodes.	In the **food and beverage** sector, it incorporates monitoring elements such as advanced cameras, thermal or hyperspectral sensors for food safety (e.g., PepsiCo installs vision-inspection system responsible for the detection of color defects in whole potatoes).	To increase transparency and customer trust.
Quantum computing	Another way of processing information, leveraging the properties of matter at nanoscale.	In **telecommunications** to optimize radio cells (e.g., the operator Tim, optimized with a QUBO[xx] algorithmic model, in collaboration with the hardware producer D-Wave).	To ensure reliable mobile services with high performance; to increase transparency and general trust.

Source: Prepared by the authors (IESE Business School) based on several publications, complemented with IESE databases.[89]

Differences between Deep- and Non-Deep-Tech Start-ups

Based on **Section 2.1,** a deep-tech start-up is a recently created company founded on "emerging technologies based on scientific discoveries or meaningful engineering innovations, offering a substantial advance over established technologies, and seeking to tackle some of the world's fundamental challenges." **Figure 5** illustrates the difference between deep-tech, high-tech, and general-tech start-ups. The technology adoption life cycle shows the adoption rate for technology throughout its development: starting with no adoption and followed by early adopters put up with imperfections and challenges, while the majority and large adopters require technology to be ironed out. The second variable -perceived value- shows how the start-up's product is perceived as a delighter to later become a basic need for customers.

Deep-tech products are usually scientific discoveries and engineering innovation, developed by highly qualified (Ph.D. and post-graduate) experts that require multiple in-depth trials and regular approvals.[34] In fact, many deep-tech companies have their roots in academia and drew early support from government grants.[41,89]

Several studies have described the unique challenges that deep-tech start-ups face compared to others due to their nature. The time to market is long (even above five years) and requires high capital allocation, the technologies are risky and often complex, and above all, business expertise is sometimes lacking.[34,,41,42,,44,89]

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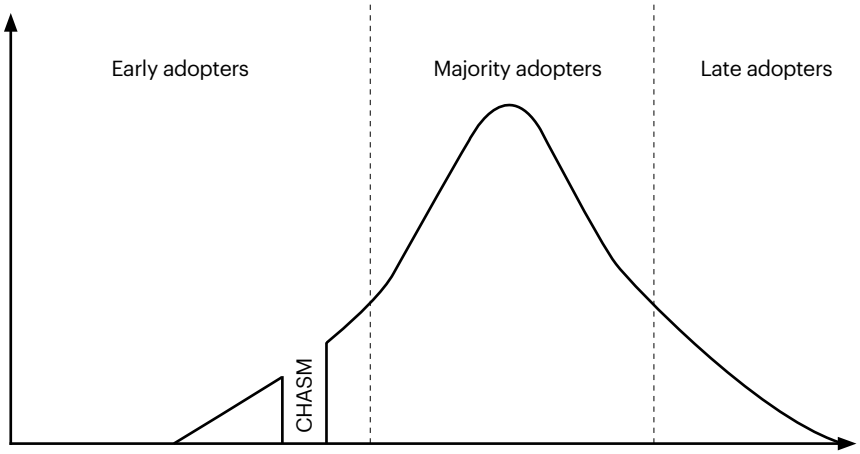
xx. QUBO refers to quadratic unconstrained binary optimization.

* These are not necessarily the most important use cases or sectors. These are just some examples.

Figure 5. Common differences in the product (or service) of deep-, high- and general-tech start-ups

Aspect	Deep tech	High tech	General tech
Adoption of the technological product	 New adopters (y-axis) vs time-elapsed (x-axis)		
Perceived value by the customer		Delighter	Need
Hard to reproduce (science-based related)	High	Medium	Low
Time and capital required			
Technical expertise relevance			
Gestation period	More than 5 years	Between 1 and 3 years	Fewer than 2 years
Example	Drone	Domotized light	Webcam

Source: Prepared by the authors (IESE Business School) based on several publications.[89,90]

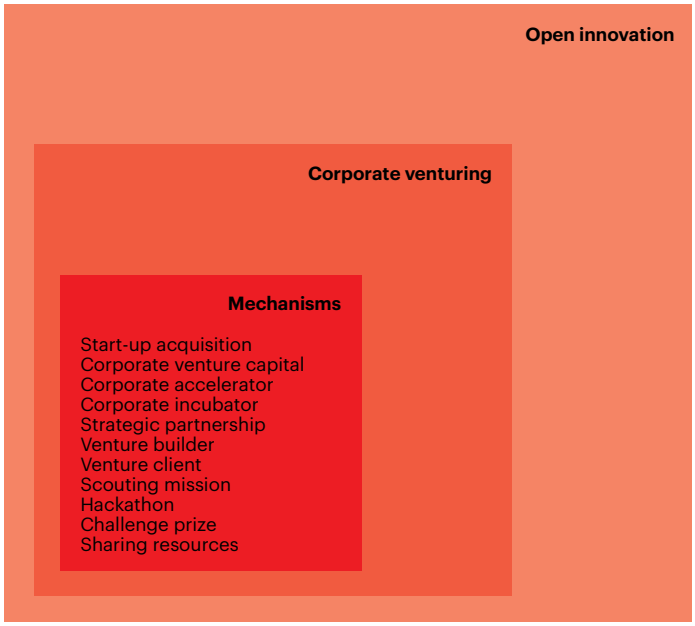
2.2. What Is Corporate Venturing and What Is Its Connection to Deep Tech?

Corporate venturing is defined as the "collaborative framework that acts as a bridge between established firms and innovative start-ups," a "means through which corporations participate in the success of external innovation."[91]

In a world where start-ups are flourishing fast and disrupt the market with their ideas and technologies, corporate venturing mechanisms (see **Figure 6**) become tools for a company "to source new innovative opportunities and to speed up a solution that is already showing successful results."[91]

The adoption of corporate venturing has increased fourfold since 2013: more companies than ever are innovating with start-ups through corporate accelerators, corporate venture capital, venture builders, venture clients, and more (corporate venturing mechanisms are explained in **Section 6.2.**)[xxi] For instance, corporate investments in start-ups soared to an all-time high of $73.1 billion in 2020, increasing 24% from 2019.[92-95]

Figure 6. Framework of corporate venturing



Source: Prats, J., Siota, J., IESE Business School (2018).

What is the role of corporations in the rise of deep tech?[xxii] Corporate venturing mechanisms such as corporate venture capital funds, corporate incubators, and hackathons, have become prevalent players in the technology transfer process. Corporate–start-up strategic partnerships are enhanced with the likes of co-developments, joint proofs of concept, and more.[xxiii 67,92,96] Corporations are, as a matter of fact, preferred partners when start-ups look to reduce the time to access the market or get access to technical expertise.[91,92,97,98]

In some regions, this phenomenon of corporate venturing has been even more profound because of an intersection of needs. On the one hand, deep-tech start-ups sometimes have a financial gap. Private investors tend to be unwilling to take on scientific projects, which are usually characterized by high risk, huge expenses, and long-term gestation periods. As a consequence, researchers often lack the resources required to locate and validate the right market for their discoveries—an innovation gap sometimes referred to as the valley of death. On the other hand, there is a growing corporate need to innovate. This creates an intersection between the scarcity of resources that deep-tech start-ups face, coupled with the growth of corporate interest in working with new ventures to innovate.[99]

When discussing corporate venturing in the deep-tech field, analyzing the collaboration between corporations and research institutions becomes crucial. The systematic exposure to start-ups and discoveries has become an important incentive for interacting with research institutions, enhancing the companies' R&D capabilities and allowing corporations to access a broader innovation ecosystem through their corporate venturing teams.[66,99,100]

Successful innovation depends on the development and integration of new knowledge in the innovation process. Part of that comes from external sources, creating a complementarity between internal and external innovation activities. The integration allows the firm to capture the positive effects "each innovative activity has on the marginal return of the other." [64,101]

Several studies present unanimity on the idea that R&D backs the increasing use of corporate venturing, in contrast with its use as a substitute of the internal R&D. Firms that are engaged in only a single innovation activity, either internal R&D activities or sourcing technology externally, introduced fewer new or substantially improved products compared to firms which combine internal and external sourcing.[66,101,102]

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xxi. For further information, data or best practices about corporate venturing, there are available previous studies of the authors, cited in this study in **Section 6.4**.

xxii. Simplified Chinese is the most frequent written language—by the absolute size of the population—in the analyzed regions. Locals may dissent on the translation of the terms discussed in this study, which has assumed that 企业冒险 refers to "corporate venturing," while 深科技 and 初創企業 refer to "deep tech" and "start-up," respectively.

xxiii. In this case, the term *proof of concept*—because of its relevance in this field—has been also evaluated in this study among the other corporate venturing mechanisms. The term is quite relevant in deep-tech start-ups, whose technology readiness level (TRL) is between 3 and 4. TRLs can be segmented in several stages: (1) basic principles observed, (2) technology concept formulated, (3) experimental proof of concept, (4) technology validated in lab, (5) technology validated in relevant environment, (6) technology demonstrated in relevant environment, (7) system prototype demonstration in operational environment, (8) system complete and qualified, and (9) actual system proven in operational environment.[210,211]

2.3. The Case of East and Southeast Asia

Overview

After the pandemic shock and the global paralysis, some companies responded to the crisis by closing venture activities, others accelerated them, maintaining corporate venturing levels.[94,103]

Geographically, the United States hosted the largest number of funding rounds (318), followed by Japan (134), and China (88). The giants Alphabet, SoftBank, and Tencent were the top corporate investors by number of deals in the third quarter of 2020 with 34, 20, and 17 deals, respectively.[103-105]

The tendency among corporate giants to spend more on innovative start-ups has emerged, particularly in Asia, as a corporate tool to explore ideas, attract talent, and enhance their revenue flows.In 2019, Asia accounted for 40% of all the corporate-backed deals in 2019, leaving North America behind. Nevertheless, over the past five years, China has been the country with the second most private venture capital investments in deep-tech start-ups worldwide, preceded by the United States and followed by the United Kingdom.[93,104,106]

These phenomena are growing at speed in East and Southeast Asia. Regional governments and firms are playing an increasingly active role as promoters and new sources of this type of innovation.[106] Yet there is a lack of a sophisticated and connected deep-tech investing community mainly attributed to the long gestation period of this type of start-up, the inherent complexity and risk related, and often a lack of technology evaluation capability. This is why, for decades, governments have frequently complemented—or even covered—this financial gap between research and investment funds.[107-110]

Geographically, while recent studies have mainly focused on China and Singapore, scarce or fragmented information on corporate venturing in deep-tech activity is available for the other seven regions analyzed.

Regional Perspective

China

With a population of 1.4 billion, China generated an annual $15.4 trillion in gross domestic product in 2020.[111] The country is the world's second-largest economy, expected to overtake the United States by 2028.[112] Its innovation ecosystem is ranked 14th globally.[113]

The government has made the development of indigenous innovation a top priority in its national development plan since 2008, with new policies to stimulate corporate innovation such as the Thousand Talent Plan to recruit international talent. Meanwhile, corporate in-house R&D investment has been soaring during the past two decades.[114-117] China's recent plans, such as the China's New Generation Artificial Intelligence Development Plan, launched in 2017, have also encouraged the use of deep technologies across strategic industries.[106]

Following the global innovation tendency, the Chinese industrial ecosystem has focused on deep tech in order to meet the increasing demand of automation technologies such as artificial intelligence, robotics, self-driving vehicles, and health-tech tools. Meanwhile, corporate investments have increased from companies such as Alibaba and Xiaomi, to name a few.[112]

Hong Kong

With a population of 7.5 million, Hong Kong generated an annual $320 billion in gross domestic product in 2020.[111] Its innovation ecosystem is ranked 11th globally.[113]

Hong Kong has seen extensive activity in its start-up ecosystem, with an estimated 3,000+ start-ups in 2019.[118,119] Backed by a solid network of stakeholders and builders, the ecosystem has seen a remarkable rise in the number of private accelerators, incubators, and coworking spaces. With access to cutting-edge technologies and prominent talent, the regional start-up ecosystem is expected to reach increasing growth in the next few years, in light of initiatives such as policies introduced by the government to support innovation and technology, allocating over HK$100 billion in the past three years.[120]

Indonesia

With a population of 270 million, Indonesia generated an annual $1.2 trillion in gross domestic product in 2020.[111] Its innovation ecosystem is ranked 85th globally.[113]

The start-up ecosystem has recently skyrocketed in light of the several unicorns disrupting the regional economy such as Go-Jek, Tokopedia, Traveloka, and Bukalapak.[121,122] Out of the 847 start-ups created in 2019, 46 raised a total of $4.07 billion across 18 industries, with an average deal size of $88 million per start-up.[122]

Compared with other regions, Indonesia remains focused on consumer-facing services rather than moving to deep tech.[123] Moreover, organizational agility in innovation processes has increased in relevance: now it is not enough to just launch a hackathon, a corporate accelerator, or a corporate venture capital but it is also important to do it at speed and make it financially sustainable.[118]

Japan

With a population of 126 million, Japan generated an annual $4.9 trillion in gross domestic product in 2020.[111] Its innovation ecosystem is ranked 16th globally.[113] It has often ranked in surveys as a hard place to open a new business, but it is getting easier because big companies of all stripes—such as Toyota, Honda, and Mitsubishi—are now investing in start-ups as a way to get ideas faster and burnish their high-tech credentials.[124,125]

Previous studies reported the consolidation of corporate venture capital (one of the mechanisms) in the region, on the wave of the late 1990s dot-com boom, when retail and telco conglomerates such as NTT and Panasonic opened funds in Silicon Valley.[124] Furthermore, a recent strong enthusiasm for open innovation initiatives has spread throughout the Japanese industry.[126]

This is not new for the region, which has a long history of corporate innovation. Its innovation process is highly interactive and involves comprehensive organizational intelligence, quick organizational learning, rapid technology diffusion, horizontal information flow systems, fusion of different technologies to obtain innovations quickly, concurrent engineering, and quick utilization of core competence for new business development. There is historically prominent spending in R&D, combined with a small tolerance to risk-taking.[127]

Singapore

With a population of 5.7 million, Singapore generated an annual $337 billion in gross domestic product in 2020.[111] Its innovation ecosystem is ranked 8th globally.[113]

Corporate venturing in Singapore has greatly increased over the past five years, with corporate investors such as the telecommunications company Singtel Innov8 and the electronics manufacturing company Flex Limited.[128] Across Southeast Asia, Singapore has one of the most developed start-up ecosystems, valued[xxiv] at $21 billion.[129] Between 2020 and 2021, the country recorded over 3,600 tech start-ups and near 184 private accelerators and incubators, and other intermediaries such as angel networks.[130]

With more than 35,000 research scientists and engineers working in the city-state, the ecosystem faces the investors' impatience with the long technology transfer process—a tendency that the Singapore government aims to curb with $19 billion committed to the development of deep-tech businesses.[106,107] Meanwhile, corporate innovation may be somehow limited by corporate bureaucracy.[131-133]

South Korea

With a population of 51.7 million, South Korea generated an annual $1.6 trillion in gross domestic product in 2020.[111] The Republic of Korea's innovation ecosystem is ranked 10th globally.[113]

In 2020, the South Korean innovation ecosystem recorded 12 unicorns, ranking 6th globally in terms of number of $1 billion-valuation start-ups, behind the United States, China, the United Kingdom, India, and Germany.[134] However, the South Korean law blocked non-financial holding companies from setting up corporate venturing capital. This is because of the concerns over *chaebol* (large family-owned business conglomerates) owners using assets of their financial subsidiaries to tighten their grip on their companies.[135] There was a turning point in 2020, when the government decided to restrictively allow holding firms to own corporate venture capital funds and planned the allocation of $62 billion in funding for the New Deal plan, targeting the digital and green economies.[136]

On the one hand, arguments presented in the literature may not suggest that the chaebol is a favorable setting for innovation. Chaebols pursue economies of scale and mass production of standard models, while innovation sometimes requires disintegrated structures to enhance product differentiation and face challenges from global competitors.[137-138] On the other hand, the literature also suggests it as a favorable setting for innovation: a "one-man control" can be quicker and more decisive in making R&D investments of large sums than corporations with decentralized decision-making structures.[137]

Taiwan

With a population of 23.6 million, Taiwan generated an annual $696 billion in gross domestic product in 2020.[111] [xxv] In light of its dynamic economy, Taiwan is becoming a promising innovation and start-up hub in Asia. Because Taiwan is historically well-known for its hardware companies, such as Foxconn, there has been a growing interest there in e-commerce and deep technologies such as robotics and artificial intelligence, a movement boosted by government support to develop a strong Internet of Things ecosystem.[139]

Corporate venturing is playing an important role, with a focus on corporate venture capital. Among the 729 investments in the region's local start-ups between 2015 and 2019, 52% of them were corporate investments—4% more than venture capital investments.[140]

Thailand

With a population of 69.6 million, Thailand generated an annual of $528 billion in gross domestic product in 2020.[111] Its innovation ecosystem is ranked 44th globally.[113]

Starting from the early 2000s, the Thai government started initiatives to foster digitalization in the country, such as the True Digital Park, a tech and start-up hub located in the heart of the Bangkok CyberTech District, created in partnership with Google.[139] In addition, the National Innovation Agency announced the Deep Tech Regionalization, a program meant to propel economic growth and groom 100 start-ups in the field by 2023. These are initiatives that mirror the general interest that deep-tech start-ups received in Thailand over the past ten years, from both private and corporate investors.[140]

Vietnam

With a population of 96.5 million, Vietnam generated an annual $329 billion in gross domestic product in 2020.[111] [xxvi] The existence of two start-up hubs—Ho Chi Minh City and Hanoi—combined with government and private fund investments in the creation of private incubators, venture capital investors, and innovation projects,[123] has increased entrepreneurial opportunities and deals within the country.[142]

Previous studies also examined empirical data on Vietnam's corporate sector to explore the problem of the "resource curse"[xxvii] as a counterexample of local firms' determination to seek innovation and creative performance. An abundance of resources, both physical and financial, may be a curse on corporate performance when a clear strategic goal for pursuing innovation is absent.[143-145]

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xxiv. In this case, *ecosystem value* refers to quantified value of exits and start-up valuations.
xxv. Since Taiwan doesn't appear in the Global Innovation Index, a ranking has not been included.
xxvi. Since Vietnam doesn't appear in the Global Innovation Index, a ranking has not been included.
xxvii. The resource curse—also known as the paradox of plenty—is the phenomenon of countries with an abundance of natural resources (e.g., fossil fuels) having less economic growth, less democracy, or worse development outcomes than countries with fewer natural resources.

3. Corporate Venturing in Deep Tech: What We Don't Know

Key takeaways of this section:

- East and Southeast Asia make up a promising region in which to study corporate venturing in deep tech. Some of the corporate venturing activity is concentrated in nine regions: mainland China, Hong Kong, Indonesia, Japan, Singapore, South Korea, Thailand, Taiwan, and Vietnam.
- Some of the unsolved (in the literature) and relevant (keeping chief innovation officers up at night) questions to be tackled are: What is the best way to manage multi-region and -department corporate venturing teams and their connection to the R&D department? What are the cons of a top-down innovation approach in Asian corporations? What is the perceived risk and control over the start-up?

3.1. Unsolved Questions in the Literature

Besides the consolidation of the definition of deep tech (see **Section 2.1**), what are some of the as-yet-unanswered questions in previous publications that are relevant to chief innovation officers?

What is the state of corporate venturing in deep tech in East and Southeast Asia? The existing literature corresponding to corporate venturing in the East and Southeast Asia lacks information. It is often limited to corporate venturing capital (almost excluding other corporate venturing mechanisms), in specific countries, and fragmented—triggered by language barriers, some lack of transparency (e.g., real value of corporate investments), and regulation.[146-147]

What are the major challenges in corporate venturing with deep-tech start-ups? In corporate collaborations with deep-tech start-ups, previous publications have described the challenges that corporations face when working with start-ups, the problems that corporations encounter when working with research institutions, and the issues that research institutions and start-ups come up against when working with corporations.[41,67,83] Yet, there is scarce information on the challenges that corporations must deal with when innovating with deep-tech start-ups, especially in mechanisms different from the corporate venture capital.

What is the best way to manage cross-region and -departmental corporate venturing teams? *Silo mentality* is a metaphor used in business to describe an attitude that occurs when several departments or groups avoid sharing information or knowledge with other individuals in the same company, operate independently and generate dysfunctional organizational fragmentations, disconnectedness, and dissociation.[148–150] Thus, silos mentality destabilizes the operation of the business and may be summarized such as "a lack of communication and common goals between departments in a company."[151]

The literature on organizational behavior distinguishes three types of boundaries: (i) organizational, (e.g., business units), (ii) spatial (e.g., office locations, inter-office distances), and (iii) social (e.g., gender). Previous studies demonstrated how communication patterns within Asian companies tend to be extremely hierarchical. Thus, most of the employees communicate with others in their group.[152,153]

Silo formation is mitigated in environments where employees are co-creators who advocate for the best ideas, regardless of their individual roles in the company.[148] How can this type of creativity in top-down hierarchical cultures be enhanced? Since the core of this hierarchy is upper management, the change should start from there by aligning the company's functional goals and strengthening the interdepartmental dependencies to be linked with customer experience.[154,155] In this sense, a unified leadership team will encourage trust, create empowerment, and break managers out of the "my department" mentality and into the "our organization" mentality.[156]

As a practical solution, studies also suggested the application of agile methodologies. These are gaining traction in one industry after another as companies, organizing around cross-functional teams and replacing protracted projects with short, iterative sprints can break down silos.[157,158] Agile methodologies are stepping away from the traditional organization and encouraging multidisciplinary teams, enhancing work environments with a high degree of knowledge transfer, and reducing the "culture of tribalism between professionals."[159,160] Additional challenges arise when dealing with global teams that run into complexity with scheduling and limited time together. The co-location of teams during the transformation period is one solution.[60,101,102,158,162] However, less attention has been put on how to apply these principles into corporate venturing teams spread across business units, regions, and mechanisms.

What is the best way to deal with the R&D department? Who should do the technology evaluation[xxviii]? Several studies present unanimity on the idea that R&D backs the increasing use of one of the corporate venturing mechanisms (i.e., corporate venture capital), in contrast with this mechanism's being used as a substitute of the internal R&D.[66,101,102,161] Nonetheless, how can the connection among R&D and corporate venturing teams be managed?

What's more, when it's time for the valuation of the deep-tech start-up arrives, who does it? The indicators are usually under three axes: strategic evaluation, market evaluation, and technology evaluation.

In the first aspect, when measuring the impact of corporate venturing collaborations, strategic value is defined as "the value extraction of direct investments into portfolio companies, many of which are made with a partnership, co-development, some form of working relationship, or simply access to IP that is of worth to the corporate parent of the corporate venturing arms."[163]

How can these goals be measured? One way is to brainstorm a list of possible business goals for your corporation that could be delivered by the corporate venturing program; prioritize that list to the top five most important goals; and describe each goal in qualitative and quantitative fashion, creating key performance indicators to measure the progress of your program are best practices for identifying and measuring the strategic goals of corporate venture capital.[162] Meanwhile, the second aspect—the evaluation of the market—may require a validation, depending on the maturity of the offer, and the product of service.

However, for the third aspect—technology evaluation—the corporate venturing team may not have the knowledge required to carry this out. Keeping in mind that the R&D team may have a biased opinion towards its own developments and technologies, who should do the technology evaluation to avoid these biases between the corporate venturing team, the R&D team, and the deep-tech start-up?[164-167]

What are the pros and cons of top-down management in corporate venturing? The organizational structure shows a decisive impact on the company's innovation outcomes;[168,169] that is, how decisions are made and implemented. While some argue that centralized decision-making and formalized processes of implementation are factors to impede innovation,[170] others think that it may serve for implementing a top-down strategic renewal or deploying predetermined innovation goals, according to the company size and the industry.[171-173]

A top-down innovation approach usually features a centralized decision-making, with standardized processes—defining a clear vision and objectives to later mobilize teams behind innovation projects. In contrast, in a bottom-up context, there is more decentralized decision-making, and less standard processes.[180–182]

On the other hand, not all organizations can accept bottom-up innovation. Pursuing any idea requires resources. Without organizational support, bottom-up innovators need to be creative and find the required resources and knowledge to demonstrate feasibility.[180] Several actions can be taken towards this end: creating an empowering climate; promoting information sharing, employee suggestions, self-management teams, cross-functional teams, and job rotations to obtain autonomous and creative human capital; unleashing the creativity of employees; and generating bottom-up innovation.[186-188]

In short, previous literature discussed generic pros and cons of top-down management and innovation. However, how does this affect corporate–start-up innovations where two complete approaches—that of the corporation and the start-up—are mixed? How does this affect deep-tech collaborations in corporations with a top-down approach? Are there any patterns, in this matter, among Asian countries?

What are the differences in perceived risk when picking (i) among corporate venturing mechanisms, and (ii) between internal or external implementation of these mechanisms? What is the relationship between risk perceived in these mechanisms, and the desired control over the start-up? Risk is defined as "an uncertain event or condition that, if it occurs, it has a positive or negative effect on at least one of the project objectives" such as scope, schedule, cost, or quality. Novelty is central to innovation, but this inevitably implies risk, which should be monitored and managed.[189] Yet, corporate venturing teams sometimes struggle to convince business units (or the executive committee) to innovate because of differences in knowledge, risk perception, and more.[xxix] This is also enhanced by biases on risk perception.[191] Moreover, it is mixed with the corporate desired control[xxx] over the start-up.

Managerial risk perceptions are typically shaped by two socially determined aspiration levels, namely critical performance targets (e.g., break-even or budget constraints) and survival. In practice, this means that managers who are doing well (i.e., meeting performance targets) will avoid risks that may put them below the performance target. However, managers rely less on precise probability estimates than on cruder approximations. As a result, high-impact outcomes with extremely low probability tend to be systematically ignored, and growth opportunities can be missed.[191-193] So what is the right level of control over the start-up?

The benefits of investing directly in start-up companies are maintaining complete control over the investment decision and exerting much more influence in the company. The direct investment can garner the highest level of control determined by the size of the investment (e.g., even in some cases, the right of first purchase).[192] Moreover, different control mechanisms such as autonomy and incentive schemes may influence the knowledge flows between the parents and their new ventures.[194,195]

But what happens with other corporate venturing mechanisms, such as venture client, or a partnership? Is the same control applied over a start-up, or does it come with the same risk perception? How is the implementation of the corporate venturing mechanism affected when implemented within the corporation or outside through a corporate venturing enabler? What is the mechanism's connection with the control taken over the start-up? How can the potential challenges related to this risk be mitigated?

In summary, there are several questions to answer: providing geographical perspective in East and Southeast Asia on the phenomenon of corporate venturing in deep tech, identifying major challenges corporations are facing in this process to identify a research agenda and support the industry, shedding light on how to manage multi-region and -department corporate venturing teams and their connection with the R&D department, evaluating the top-down management approach in corporate venturing for Asian corporations, and assessing the risk perceived in corporate venturing by mechanism, implemented inside and outside, and the relationship between perceived risk and desired control over the start-up.

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xxviii. This evaluation often involves the assessment of the market, the strategy and the technology.
xxix. This can happen especially in teams where local culture has a high avoidance to risk (see **Figure 19.**)
xxx. Corporate controls are mechanisms that corporations use to ensure that the processes and outcomes of their business units meet corporate expectations.[211]

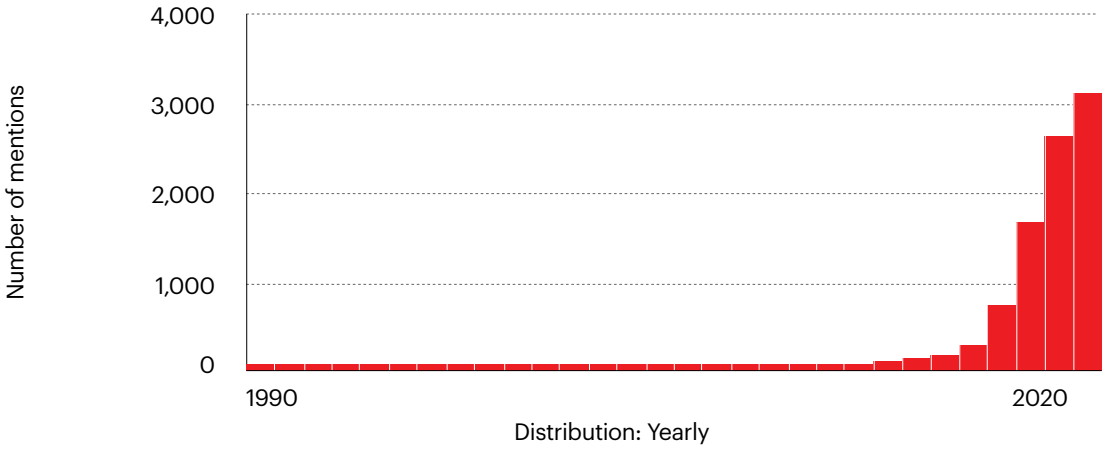
3.2. A Relevant Field

In past years, deep tech has been getting increasing attention among corporations, entrepreneurs, investors and media. Investment in deep tech (including private investments, minority stakes, mergers and acquisitions, and initial public offerings) has more than quadrupled over a five-year period, from approximately $15 billion in 2016 to more than $60 billion in 2020. The average disclosed amount per private investment event for these start-ups and scale-ups has grown 3.4 times between 2016 and 2020.[62,81] Furthermore, as a measure of attention, in Factiva, media mentions of the term have increased by 35% in just one year between 2019 and 2020. (See **Figure 7.**)[186]

The economic growth of Asia, specifically in the East and Southeast regions, is under the international spotlight. In parallel, the adoption of corporate venturing has expanded globally both in terms of number of companies and number of mechanisms available to foster the collaboration. Moreover, deals backed by corporate venture capital (as one of the corporate venturing mechanisms) in Asia continue to rise (more than 14% year-over-year in 2019), as does Asia's deal share, passing North America and Europe. (See **Figure 8**).

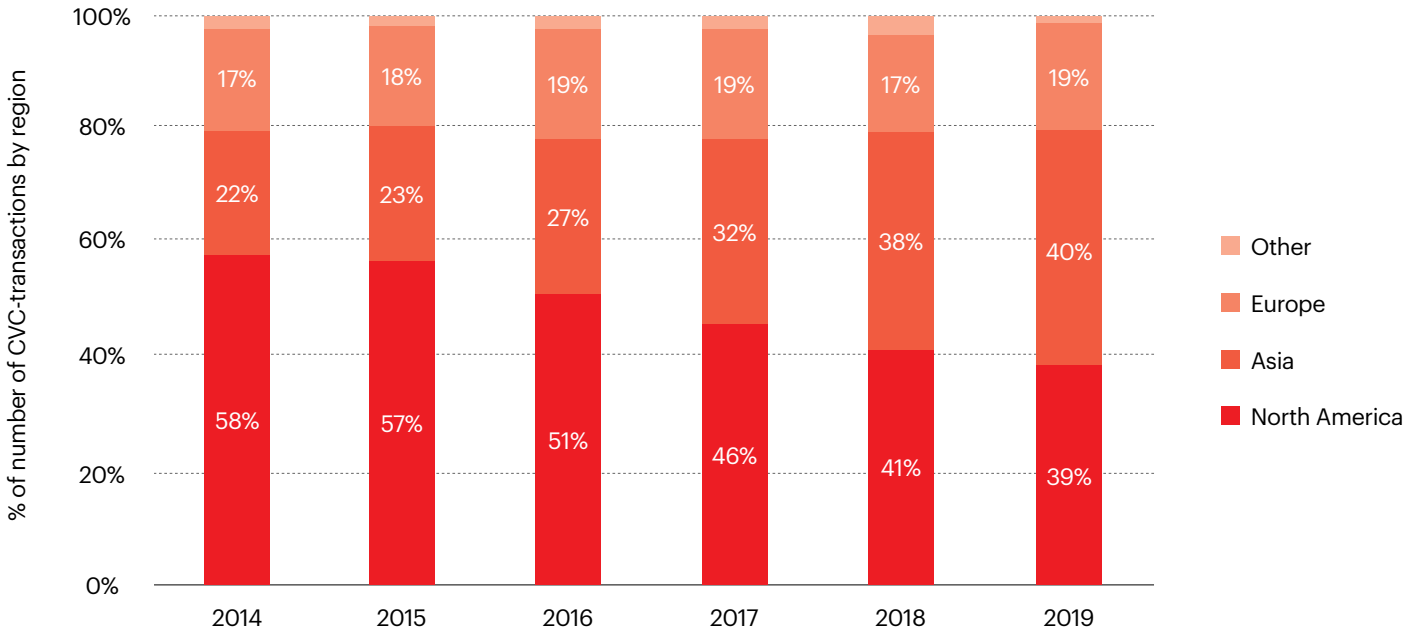
Combining corporate venturing and deep tech in the fruitful East and Southeast Asian regions, this study tackles some of the most frequent problems acknowledged by chief innovation offers in this topic (see **Figure 15**), also shedding light on corporations, entrepreneurs, venture capital investors, research institutions, governments, and more.

Figure 7. Media mentions of deep tech



Source: Prepared by the authors (IESE Business School) based on data of Factiva, retrieved in 2020.

Figure 8. Segmentation of number of corporate venture capital (CVC) investments by region



Source: Prepared by the authors (IESE Business School) based on data of CBInsights.[187]

4. Our Results

Key takeaways of this section:

- On average, the anazlyed region has an adoption rate of corporate venturing (57%) higher than that of Latin America (40%) and lower than that of the United States (90%).
- In the analyzed companies, the adoption of corporate venturing and deep-tech start-up collaborations has increased by 2.8 and 4.2 times, respectively, in the past five years. Likewise, in 71% of the cases, the weight of deep-tech start-ups in corporate venturing portfolios is expected to grow in the next five years.
- Major challenges in these collaborations, ordered by frequency, are technology evaluation; short-term view; internal alignment of key performance indicators (KPIs); regulation; regional fragmentation; silos between R&D and corporate venturing teams; and top-down management—aspects related to innovation governance, cultural hierarchy, and risk perception.
- Innovation governance. In managing cross-region and -departmental corporate venturing teams, the five most common models are owner, coordinator, optimizer, catalyzer, and hybrid. In deciding who does the tech evaluation (R&D or corporate venturing teams), what must be considered is who has the technical knowledge for conducting it and whether the R&D department is biased.
- Cultural hierarchy. Fragmentation (e.g., language, currency, legal framework, management approach) in East and Southeast Asia sometimes challenges local and foreign corporate venturing initiatives. Top-down approaches can erode staff motivation, reduce new solutions coming from staff, and increase bureaucracy in approval processes. This approach can be complemented with other incentives, and having decision-making thresholds and internal radars of information.
- Risk perceived. While corporate risk perceived varies by corporate venturing mechanism, it remains similar whether it is implemented inside or outside the corporation via enablers. This also happens with the corporate control applied over deep-tech start-ups. Some mechanisms to mitigate risk perception, when doing corporate venturing, are showcasing how other business units did it first, running background checks, tailoring the internal pitch, starting not with the technology (or solution) but from the pain points (or use case) of business units, showing the quantified value, and gradually increasing resource-allocation.

4.1. Analyzed Population and Sample

This study takes a deep dive into corporate giants,[xxxi] headquartered in East and Southeast Asia, that are already publicly[xxxii] collaborating with start-ups (population 1 or P1). They are among the top 20 (on annual revenue) in each of the analyzed regions: mainland China,[xxxiii] Hong Kong, Indonesia, Japan, South Korea,[xxxiv] Singapore, Thailand, Taiwan, and Vietnam. These territories have been selected based on the concentration of corporate venturing activity and the size of their corporations. These two values (size and concentration) have been secured to increase the insights of corporate venturing gathered from interviews.

A subset of these companies (sample 2 or S2) has been interviewed[xxxv] to complement the literature review and gather deeper insights about P1. (See the methodology in **Section 6.1**). The entirety of **Section 4** shows the results of analyzing S2, except **Figure 9** and **Figure 10**, which uses P1 to better understand S2.

Section 4 provides the results obtained to the questions identified in **Section 3.1**.

4.2. Corporate Venturing in Deep Tech: Adoption Rates

4.2.1. Regional Adoption of Corporate Venturing

Figure 9 shows S2: the list of corporate giants (top 20 in revenue by region) in the analyzed territories that have publicly collaborated with start-ups during the past two years.

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xxxi. The list includes corporations owned by the government.

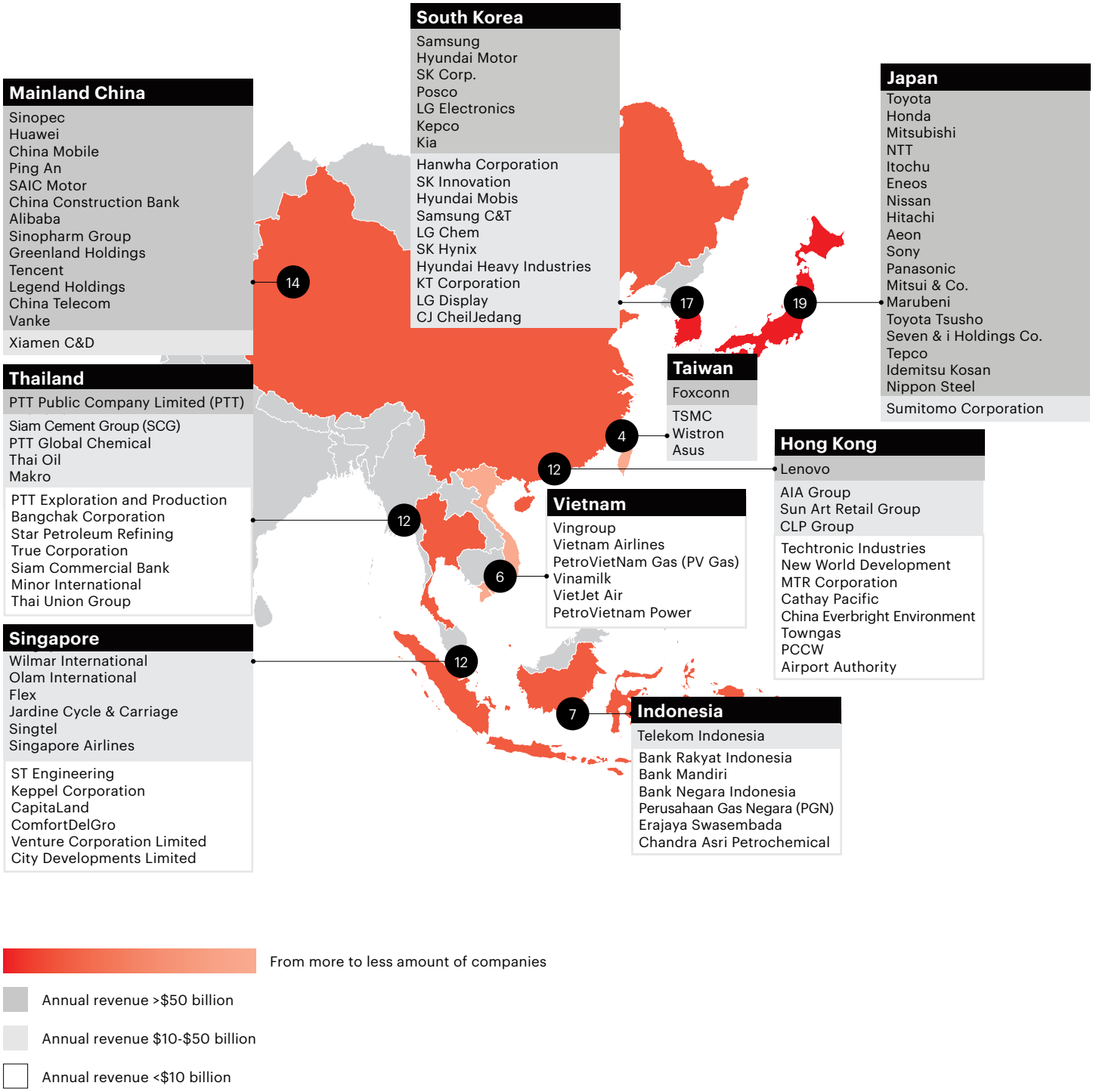
xxxii. In this case, *public* refers to openly known rather than funded by a government.

xxxiii. "One country, two systems" is a constitutional principle of the People's Republic of China (PRC) describing the governance of Hong Kong and Macau since they became Special Administrative Regions of China in 1997 and 1999 respectively, establishing that they can have different economic and political systems from that of the PRC, while being part of it.[212]

xxxiv. The Korean Peninsula formerly was a single nation that was annexed in 1910; the Korean Peninsula has been divided since the end of 1945 into North and South Korea. Both nations claim the entire Korean Peninsula, joined the United Nations in 1991, and are recognized by most member states.[213]

xxxv. In several cases, to strengthen the understanding of the company, several interviews were conducted to each company to profiles in different departments, regions or seniority.

Figure 9. Corporate giants (out of the top 20 in annual revenue), publicly engaging in corporate venturing, that are in the East and Southeast Asian regions analyzed



Source: Prepared by the authors (IESE Business School) with public data sources.

The unit of analysis is not corporate subsidiaries but global ultimate owners (GUO). In most cases, the commercial (rather than the legal) name of the company has been used. The region refers to the location of the GUO. The companies are ordered by annual revenue based on data from Orbis database.[xxxvi] In this figure, the listed companies have publicly collaborated with start-ups during 2020 with any of the available mechanisms (i.e., start-up acquisition, corporate venture capital, corporate accelerator, corporate incubator, strategic partnership, venture builder, venture client, scouting mission, hackathon, challenge prize, or sharing resources).

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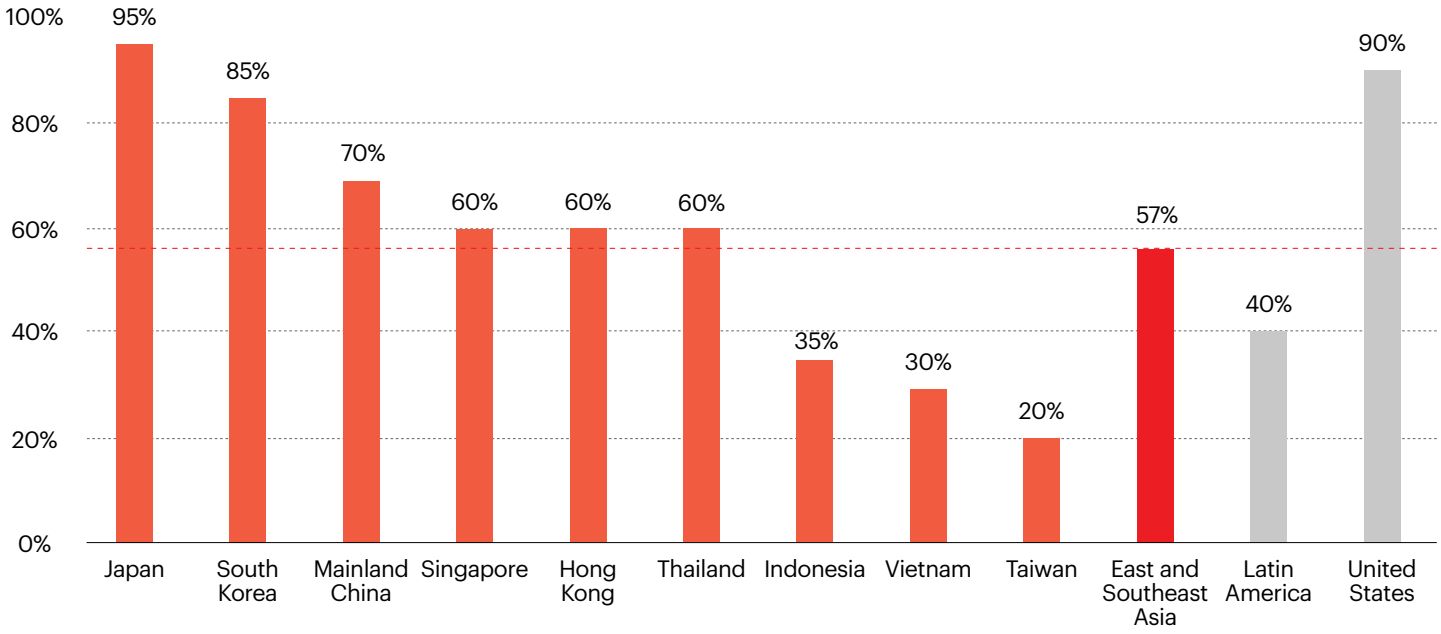
xxxvi. Data of Orbis database has been used for the regional classification of the GUOs, which is the individual or entity at the top of the corporate ownership structure. A few clarifications based on Orbis data: i) In some cases, the companies listed present similarities in their names such as LG Electronics, LG Display, and LG Chem as well as Hyundai Motor and Hyundai Mobis. Despite this resemblance, these companies are registered in Orbis as different GUOs; ii) LG Electronics owns 37.9% of LG Display; iii) Toyota Motor owns 21.69% of Toyota Tsusho; iv) Although Softbank invests in start-ups, its type of engagement is not included in the corporate venturing definition of this study; v) Lenovo Group Limited was incorporated in Hong Kong in 1988; vi) Although China Mobile was incorporated in Hong Kong in 1997, it has been classified in Mainland China because it is a Chinese stated-owned company; and vii) Fosun International, Swire Pacific, China Jinmao, Sinotruk and BYD Electronic have not been included in the Hong Kong region because their GUOs are located in other regions.

In this study, adoption rate is the percentage of companies (out of the top 20 in annual revenue by territory) that is innovating with start-ups. The nine regions with the highest level of adoption rate of the managerial practice of corporate venturing are Japan (95%), South Korea (85%), Mainland China (70%), Singapore (60%), Hong Kong (60%), and Thailand (60%) (see **Figure 10**). Moreover, they are above the average adoption (57%) in the analyzed regions.

When compared to other parts of the world, the regional average is higher than that of Latin America (40%) and lower than that of the United States (90%), spotting room for growth in an emerging trend. Meanwhile, Japan's adoption rate is the only that surpasses that of the United States. Yet, it is important not to misinterpret the data: this is just an indicator of adoption but not necessarily of absolute impact.[xxxvii]

Figure 10. Adoption rate of corporate venturing among giants (top 20 in annual revenue) classified by the analyzed region



Source: Prepared by the authors (IESE Business School).

Each region shows a list of companies (out of the biggest 20 per territory, on annual revenue) that have publicly collaborated with start-ups during 2020 with any of the available mechanisms (i.e., start-up acquisition, corporate venture capital, corporate accelerator, corporate incubator, strategic partnership, venture builder, venture client, scouting mission, hackathon, challenge prize, or sharing resources). Company revenue has been extracted from Orbis database.

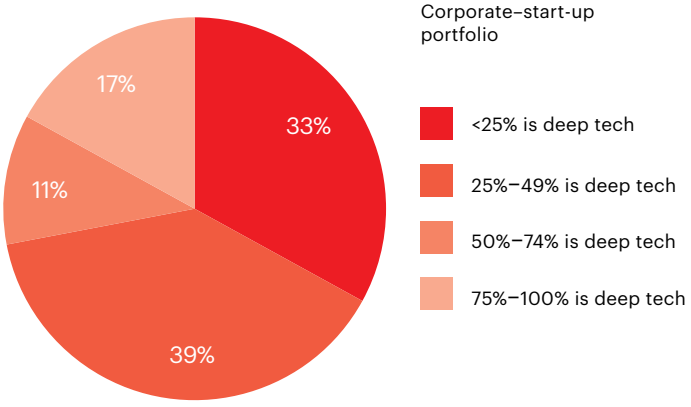
4.2.2. Company Portfolio Adoption of Deep-Tech Start-ups

East and Southeast corporations interviewed in this study are working with start-ups. About 95% of these corporations are collaborating with deep-tech start-ups through some corporate venturing mechanisms such as corporate accelerator, corporate venture capital, hackathon, and more (See **Section 2.2**). The start-ups involved in these mechanisms form their corporate–start-up portfolios of collaboration.

In each corporation, how many of these start-ups are deep tech? On average, within the corporate–start-up portfolios of collaboration, 47% of them are deep-tech start-ups and 53% of them are non-deep-tech start-ups. Almost 70% of the analyzed companies have more than 25% of deep-tech start-ups in their corporate venturing portfolios. (See **Figure 11.**)

Moreover, during the next five years, 71% of these corporations expect an increase in the percentage of deep-tech start-ups in their portfolios, while none of them expect a decrease (see **Figure 12**).

Figure 11. Percentage of deep-tech start-ups in the corporate–start-up portfolio of collaboration



Source: Prepared by the authors (IESE Business School).

The corporate-start-up portfolio of collaboration includes not only the corporate investment portfolio but also the other mechanisms (e.g., corporate accelerator, venture builder, venture client). The results 49%–50% and 74%–75% have been classified by rounding the number to the first decimal.

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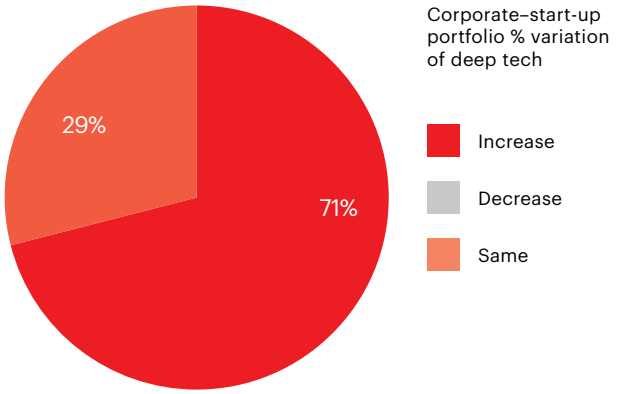
xxxvii. For example, if we compare for one of the corporate venturing mechanisms (e.g., corporate venture capital), considering the number of corporate investments in start-ups, in 2019, Japan has the highest sum (382), followed by China (324).[214]

Figure 12. Future variation, in five years' time, of percentage of deep-tech start-ups in the corporate–start-up portfolio of collaboration



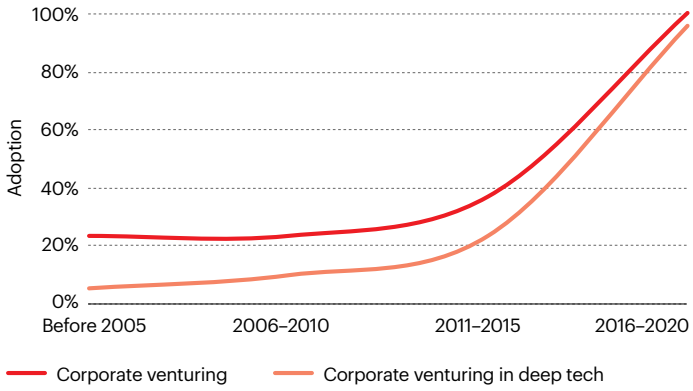
Source: Prepared by the authors (IESE Business School).

Their reasoning to either start or increase collaborating with deep-tech start-ups is centered in the value generation that usually comes with this type of ventures. First, they can adopt new expertise, especially in complex problems that the company is not able to solve or that require a niche skill set, thus saving time. Second, they can develop competitive differentiation based on intellectual property (IP), building competitive barriers of entry or an IP-related revenue stream. Third, they can produce high growth opportunities in the mid- or long-term; this may prove more challenging in the beginning, but there is a later potential to have a bigger impact. Last, they can improve the corporate business intelligence, anticipating market trends outside the corporate comfort zone.

4.2.3. Evolutive Adoption of Corporate Venturing in Deep Tech

The adoption of corporate venturing in deep tech continues to rise exponentially. In the analyzed companies, corporate venturing has increased by 2.8 times in the past 5 years: more corporations are innovating with start-ups. Moreover, about 4.2 more corporations are doing these collaborations with deep-tech start-ups, during the same time period (see **Figure 13**).

Figure 13. Historical evolution in which corporations started to apply corporate venturing and work with deep-tech start-ups



Source: Prepared by the authors (IESE Business School).

4.3. Corporate Venturing in Deep Tech: What Keeps Chief Innovation Officers Up at Night

4.3.1. Most Frequent Pain Points

While this phenomenon is increasing at speed, chief innovation officers still struggle to implement this type of collaboration. In this process, what are the major pain points that keep corporate innovation leaders up at night when innovating with deep-tech start-ups? (See **Figure 14**). In order of relevance and frequency,[xxxviii] there are 12 aspects. Each aspect gathers some of the practical questions these leaders face:

Technology evaluation. How can strategic value in the technology evaluation be defined and measured? How can the proper use case for it be identified? How can the value of the technology be understood and communicated?

Short-term view. In the tension between the short- and long-term horizon, how can corporate venturing teams convince business units to consider long-term growth, in addition to the quarterly short-term results? What if a long-term plan and vision is missing? Deep-tech start-ups frequently need long gestation periods. A short-term perspective can be a bottleneck to innovate with this type of start-up.

Internal alignment of KPIs. How can coordination of expectations be secured? How can the corporate venturing team be aligned with the business units and with corporate headquarters? How can corporate KPIs be aligned with start-up KPIs? Aligning indicators is puzzling. Attempting to do so with deep-tech start-ups that commonly are more difficult to understand, it creates extra challenges for venturing teams when it comes to aligning internal expectations.

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xxxviii. Frequency is the rate at which something occurs or is repeated over a particular period of time or in a given sample.

Regulation. There are challenges related to the ruling of some sectors and countries, and the connection to the regulation of countries outside Asia. Highly regulated sectors—such as banking and healthcare—have mentioned the barriers they face to implement deep technologies including having the ability to use their assets (especially state-owned companies that may not be able to use their assets without restrictions), or a law requiring a minimum equity ownership by the local government in some cases. Others have highlighted the connection between local and foreign regulations; for instance, the case of some Asian corporations that can't be the lead investor in Silicon Valley deep-tech start-ups sometimes missing investment opportunities because of foreign regulation.[xxxix]

Regional fragmentation. From the corporate perspective, how can regional differences in processes of corporate venturing with deep tech—language, culture, and more—be overcome? From the start-up perspective, how can the start-up's barriers to scale in a fragmented market be reduced? How can corporate teams work overseas, keeping in mind cultural differences? One of the priorities of deep-tech start-ups is market validation. When fragmented, the market may raise additional obstacles to the entrepreneur.

Silos between R&D and corporate venturing (CV) teams. How can corporate venturing and R&D teams coordinate to avoid seeing each other as competitors, when working with deep-tech start-ups? How can multiple corporate venturing teams in different regions and business units be coordinated? How can the "this was not invented here" syndrome be avoided with technologies that have been already developed in-house?

Top-down management. In a highly hierarchical culture with waterfall implementation, how can bottom-up innovation be enhanced? What if the highest paid person's opinion (HiPPO) is wrong or that person doesn't have the right knowledge about deep tech?

Limited speed for running a proof of concept (PoC). The level of bureaucracy and the number of approvals are usually high. How can the corporate–start-up proof of concept for deep-tech start-ups (whose gestation periods are already long) be sped up?

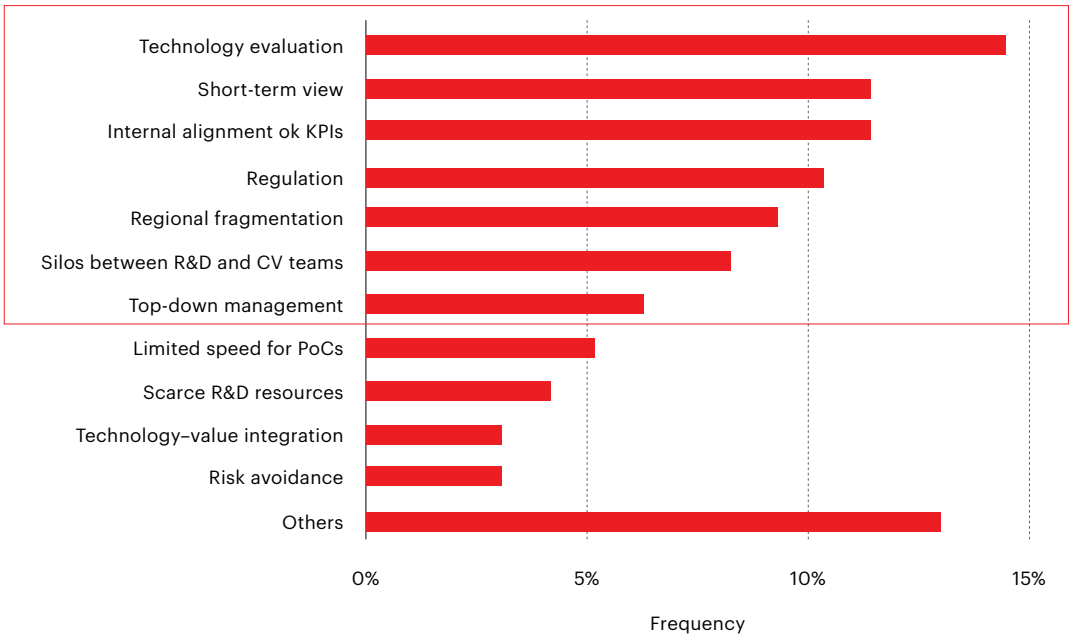
Scarce R&D resources. What if the corporate venturing doesn't have access to an R&D department for the technology evaluation? What if business units don't want to invest time in R&D tasks? What if there is neither time nor budget allocated for R&D?

Technology-value integration. How can the value generated from a deep-technology integration be "digested" when the start-up is too small compared to the corporate giant?

Risk avoidance. Traditional and conservate companies prefer to be quick copy-and-pasters rather than creators, thereby avoiding risk. Moreover, there is additional complexity in understanding some of the technologies behind some deep-tech start-ups. How can this mentality of risk avoidance be managed?

Others. In order of relevance, and related to knowledge, value proposition, processes, ownership and talent: What if the start-up that the company wants to work with doesn't have the knowledge of the company, its sector, or its regulation? How can the minimum internal corporate decision-makers be identified

Figure 14. Major corporate challenges when collaborating with a deep-tech entrepreneur



Source: Prepared by the authors (IESE Business School).

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xxxix. To tackle this perceived bottleneck in investments in Silicon Valley, some of the analyzed companies use a fund-of-funds strategy (investing in private venture capital funds) to gain access to those otherwise inaccessible deals.

and mapped for conducting a proof of concept at speed? How can the corporate value proposition offered to an entrepreneur be differentiated compared to the one offered by a private investor or a corporate competitor? How can relevant information from different departments and regions be synthesized in an automated and filtered way? How can the right level of ownership that an employee should have in a corporate–start-up collaboration be selected or enhanced? What if the executive committee doesn't understand the local environment in terms of regulation or the entrepreneurial ecosystem? How can the right corporate sponsor be found among business units at speed? What if the required talent isn't accessed to implement a desired technology?

4.3.2. Departments to Have on the Radar

These aspects are sometimes related to corporate departments. Once a corporate venturing team has decided to start a collaboration with a deep-tech start-up, what are these corporate departments, besides business units or the executive committee, that may be considered sources of tension or possible barriers to this collaboration? According to the interviewees, in order of relevance or frequency, they are finance, legal, R&D, compliance, human resources, procurement, and IT (see **Figure 15**).

Investment and budget approvals are usually related to expected value. However, finance departments face not only the challenge of understanding the characteristics of valuing a start-up collaboration—in a different way than corporates frequently do—but also the complexity of the technology value behind this start-up, blocking the requested budget in some cases.

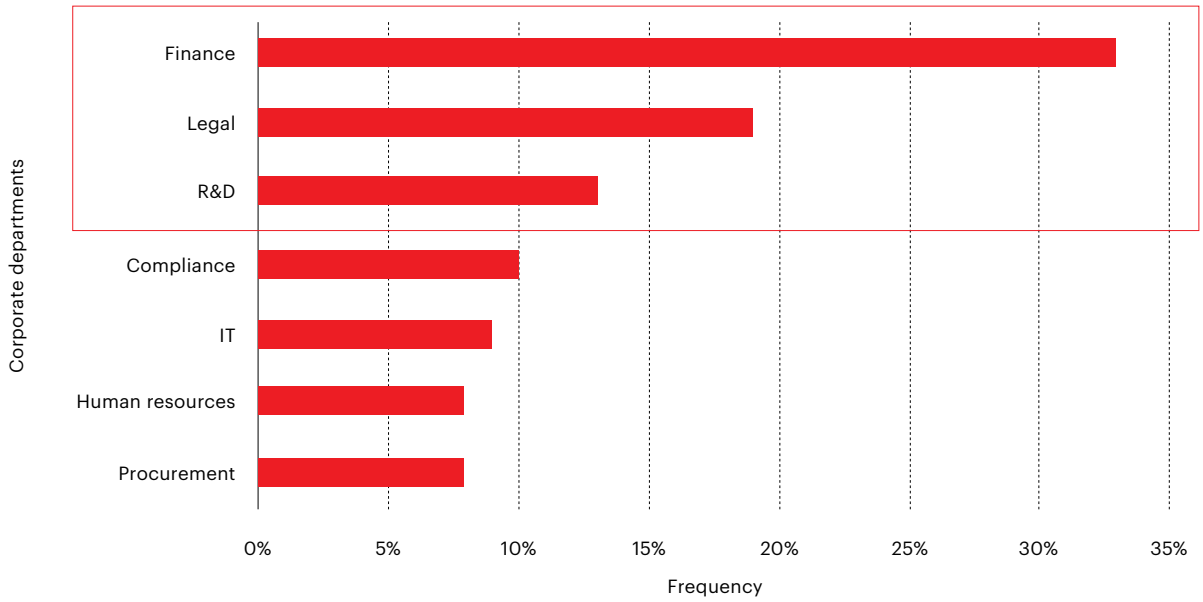
Legal departments sometimes slow down the processing response, and are sources of bureaucracy and long non-disclosure agreements. These are some of the ingredients that reduce the speed in these collaborations, and that reduction can be enhanced by the complexity and stage of legal maturity stage of some deep-tech start-ups.

There are also frequent challenges in aligning priorities: internal competition with the corporate venturing team with the "this was not invented here" argument, separate mandates with different time horizons and KPIs, physical distance between corporate venturing teams in subsidiaries and the headquarters' R&D team.

Leading control activities related to risk management, the compliance department may also extend processes in time due to regulations. These challenges are common in companies that are in highly regulated sectors, and with governance issues between subsidiaries and headquarters, with standard and bureaucratic processes of human resources, to name a few.

In the procurement department, slow processes of due diligence with multiple layers, and an internal need for identifying a long-term scalable supplier are some of the challenges. Finally, since the IT department can be where technology activity–related issues from entire company are concentrated, when provided with limited resources, it can become overwhelmed and slow in its response. Moreover, additional sanity checks are conducted related to risk (in addition to those in compliance) and cybersecurity.

Figure 15. Departments considered sources of tension when innovating with deep-tech entrepreneurs



Source: Prepared by the authors (IESE Business School).

In this classification, the finance department also includes risk management, and the legal department also encompasses regulatory issues.

4.4. Corporate Venturing in Deep Tech: Tackling Problems with Architecture

Is there a way to tackle some of the challenges described in **Section 4.3**, combined with the unsolved questions of **Section 3.1**? **Section 4.4** aims to shed some light, covering three areas: innovation governance, cultural hierarchy, and risk perception.

4.4.1. Innovation Governance

4.4.1.1. Cross-Region and -Department Silos in Corporate Venturing

When there are corporate venturing teams in multiple business groups and regions, within the same company, it becomes challenging to coordinate and align efforts to maximize value creation and impact integration, while minimizing redundancy in the collaboration with deep-tech start-ups. What is the secret to making this happen?

When working with several corporate venturing teams, there is usually one that coordinates. How much weight should this coordinating team have in terms of the approval and the implementation of the corporate venturing process in any of the mechanisms through the identification (and consent), collaboration, and integration of value?[xl] What should the connection to headquarters be?

According to the interviews, the identification of deep-tech opportunities was usually conducted globally, and the integration of value was frequently implemented either in headquarters or next to the business unit. But, what happens with the approval and the implementation of the collaboration? The results provide five frequent models (see **Figure 16**). To explain the models, this section has assumed that headquarters denotes a team in central offices. For approval, it refers to a committee composed of either (i) a senior management team of all global corporate venturing teams, or (ii) senior members from the corporate venturing team, business units, and the executive committee. For implementation, it refers to a team with capability to implement some of the corporate venturing functions.

Owner. In this setup, the corporate venturing team, in headquarters, coordinates the strategy and identification of deep-tech opportunities, implements the collaboration with the start-up (in any of the mechanisms), and leads the value integration into business units.

Coordinator. The corporate venturing team, in headquarters, coordinates the strategy and identification of opportunities, and supports the value integration into business units. Meanwhile, the other corporate venturing teams in other regions serve as an amplifier for deal-flow identification and ecosystem development and implement the collaboration with the start-up.

Optimizer. In this case, approval is directly managed by independent corporate venturing teams that are related to segmented regions or connected to a business unit. Meanwhile, one corporate venturing team, usually in headquarters, centralizes the majority of frequently applied processes in order to optimize them (e.g., creation of legal agreements, and public communications of new collaborations).

Catalyzer. There are multiple corporate venturing teams either in different regions or in different business units. These teams are sometimes already connected to a specific business unit or even within the business unit, with financial performance indicators. The search fields are selected directly by the business units, who approve the collaboration, and later support the integration of value. The coordinating corporate venturing team oversees all the operations and serves as a "one-stop shop" for external stakeholders (i.e., a place where they can go for everything), and connects opportunities within the internal corporate venturing ecosystem of the company.

Hybrid. This model combines several models that are activated by triggers. The corporate venturing team in headquarters has a holistic perspective of what is happening and approves certain collaboration depending on thresholds (e.g., if an investment is required that passes a certain threshold, if it directly affects the core business, if there is a direct command from the executive committee). Meanwhile, the other corporate venturing teams have a certain level of approval and implementation autonomy, without surpassing those thresholds (e.g., for investments below $10 million, no headquarters approval is required).

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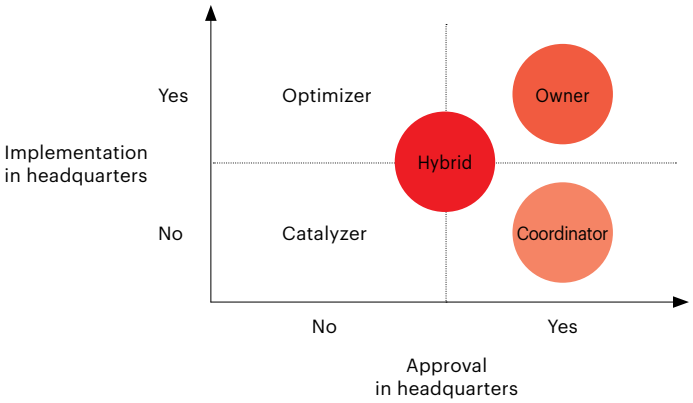
xl. This section doesn't cover the connection between corporate venturing teams and business units. Although it is a relevant aspect, it has already been covered by the authors in previous studies.[215-216]

Figure 16. Corporate venturing governance models classified by location of approval and implementation of corporate–start-up collaborations in deep tech



Source: Prepared by the authors (IESE Business School).

In this chart, headquarters denotes a team in central offices. For approval, it refers to a committee composed of either (i) a senior management team of all global corporate venturing teams, or (ii) senior members from the corporate venturing team, business units and the executive committee. For implementation, it refers to a team with capability to implement some of the corporate venturing functions. The three highlighted models are more often in the analyzed region than the others.

What about East and Southeast Asia? Following a top-down corporate venturing approach, the analyzed companies have frequently provided relevance to headquarters in terms of who approves a corporate venturing action, a model that may miss growth opportunities in deep tech, depending on the expertise hosted in headquarters and how the decision-making process is designed, as it is explained in **Section 4.4.2.2.**

The three most common models identified were coordinator, owner, and hybrid. The owner model was common in companies that either were starting their corporate venturing activity or have a high top-down hierarchical innovation approach. The coordinator model was frequent among that wanted to provide autonomy to the corporate venturing team to innovate with start-ups at speed and have the capabilities to later integrate the value generated into business units. The hybrid model was common in companies with either more years of experience in corporate venturing activity or those that wanted to combine the insight and capabilities to integrate value from headquarters with the autonomy and quality of deal flow of start-ups in foreign ecosystems.

In terms of deal flow identification, except in the owner model, many of the analyzed companies frequently complement, with part of the corporate venturing team (or at least a few scouts living locally, connected to the venturing team), core entrepreneurship and innovation ecosystems such as Silicon Valley, Tel Aviv, London, and Munich to increase the identification of deep-tech start-ups and partnership opportunities. For other parts of the implementation, with decentralized models, companies may have more redundancy in terms of resource allocation if it is not segmented properly in a mutually exclusive and collectively exhaustive (MECE) classification. Yet they may increase speed of implementation.

In short, there are multiple options to structure the governance of corporate-venturing teams that usually consider approval and implementation. There is not one solution for everyone. Yet, there are other patterns found across these five approaches, when innovating with deep-tech start-ups.

Building a business environment where employees support and advocate for the best ideas, regardless of their individual roles in the company or the source of the opportunity (in this case, a deep-tech start-up). In terms of incentives, the analyzed companies complemented individual KPIs with team (or company) KPIs to reinforce co-innovation. For example, in a few cases, a percentage of the corporate venturing scouter's salary was based on team or group performance.

Starting from upper management with the alignment of the company's functional goals and interdepartmental dependencies. A unified leadership team encourages trust, creates empowerment, and breaks managers out of the "my department" mentality into the "our organization" mentality. In some cases, companies were using methodologies (e.g., agile) to secure cross-functional teams working in short, iterative sprints, and enhancing knowledge transfer. In the case of innovating with deep-tech start-ups, this is especially relevant, where knowledge from different departments is usually required (e.g., carrying out the strategic, market, and technology evaluations).

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xli. Authors' previous study[215] about this topic can be referred in order to expand the explanation.

Having segmented and coordinated information of collaborations with deep-tech start-ups. Groups usually meet with everyone every three weeks for an hour to share opportunities and keep everyone on track. Moreover, many of them have an internal unified database of deep-tech start-ups (e.g., Salesforce) to provide a holistic perspective. International corporate venturing teams have a mandate often segmented by regions or functions with MECE principles, securing the geographical coverage while minimizing redundancies, and clarifying the boundaries to increase speed (e.g., some segment by technology: blockchain, quantum, biotech, and more). In these cases, incentives are related not to the person who enters the opportunity in the database the first time but the one who actually created value in the collaboration. Coordination is especially relevant in Asian corporations where there is sometimes a language barrier, as much within Asian countries as with those outside Asia. (See **Section 4.4.2.1.**)

Combining push and pull opportunities. Business units' KPIs usually focus on quarterly or annual financial results. However, business challenges are usually identified by business units and passed on the corporate venturing teams to find solutions. Consequently, business units may miss long-term opportunities related with deep tech, which usually require dealing with knowledge in complexity. It is difficult to know what you don't know. To mitigate this, corporate venturing teams frequently combine this process with the pull process, in which they identify a growth opportunity in deep tech for the company and try to "sell" it internally to the business unit, translating the impact that they can generate in their departments.

Having an innovation committee, depending on the decision. Depending on the decision and level of centralization (see **Section 4.4.2.2**) provided to corporate venturing teams,[xli] an innovation committee can be formed by three axes (corporate venturing team, business unit, and headquarters' executive committee). For instance, one of the companies was including the CEO, CFO, CINO, and managing directors of business units and corporate venturing teams. This can be a route to provide a better-aligned decision, especially when dealing with deep-tech start-ups (see **Section 4.4.1.2.**)

Complementing rather than cannibalizing. In the analyzed companies, corporate venturing teams try to communicate complementarity rather than cannibalization when working with other departments, especially with the R&D department, with deep-tech start-ups. The venturing team usually thinks, how can we provide value to existing initiatives?

Yet this complementarity may create a bias between departments, especially between the corporate venturing and R&D teams. What is the best way to deal with that?

4.4.1.2. The Technology Valuation War between R&D and Corporate Venturing Teams

How can the value of a deep-tech start-up for a corporation be measured? According to the analyzed companies in this study, corporate venturing teams usually value deep-tech start-ups with strategic or financial indicators. These indicators are usually under three axes: market evaluation, strategy evaluation, and technology evaluation. The corporate venturing team either does the three evaluations by itself or it may delegate them; for example, market to the business units or market teams, strategy to the senior management, and technology to the R&D department. These indicators can be both qualitative and quantitative.

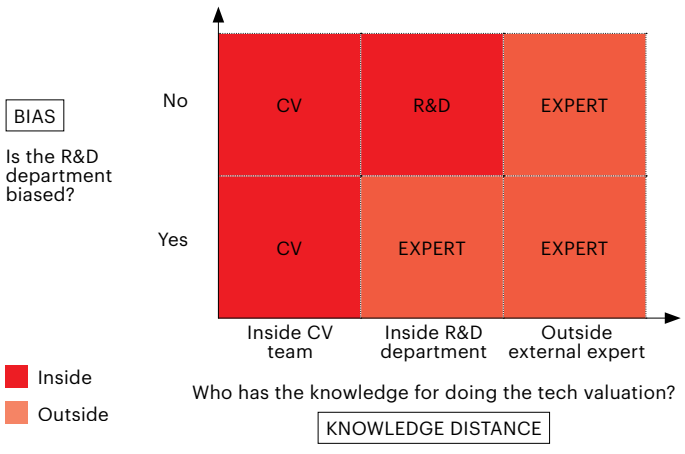
Examples of them include return on value investment (time and cost), how many business cases are handled per business unit, how many business contracts the deep-tech start-up will generate, how it compares to existing technologies, how many relevant market problems it could solve, how much it will improve an existing business, how many new businesses will be created, and more. However, what if the R&D department is biased in the evaluation towards its own developments and technologies (the "this was not invented here" syndrome)? Then, who should do the technology evaluation?

According to the analyzed companies, this decision can be simplified using two variables. Firstly, who has the technical knowledge for conducting the technology evaluation? That would most likely be the corporate venturing team; and if not, the R&D department or an expert outside the corporation. Secondly, is the R&D department biased towards its own developments? If so, that issue can be avoided by having a shared mandate across both teams and having a joint boss with expertise in both the venturing and the technical side. These provide the possible valuators (see **Figure 17**).

Once the triple evaluation of market, strategy and technology has been conducted, who usually makes the decision: the corporate venturing team, the R&D team, or headquarters? In many of the analyzed companies, when either corporate venturing or R&D teams are biased because they may have different mandates, and the executive committee doesn't want to prioritize one over the other, then a joint boss with expertise in both the venturing and the technical side aims to provide a safe solution.

After all these processes, the next question is: make or buy? To answer this, according to the analyzed companies, they usually try to granulate technologies in a subset of modules. They ask

Figure 17. Who should do the technology evaluation of a deep -tech start-up?



Source: Prepared by the authors (IESE Business School).

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xli. Refer to the authors' previous study[227] about this topic for an expanded explanation.

internal R&D teams how much cost and time would be required to build it in-house. This information makes for an easy way to compare, decide whether the company has time enough to wait, and make R&D accountable for deliveries in time and cost of certain modules, keeping in mind that if they don't reach their goal, the corporate venturing team is allowed to get external help through the deep-tech start-up. This modularity will also support and facilitate the identification of new intellectual property generated or shared between the corporation and the deep-tech start-up. In addition to time and cost, corporate venturing teams also evaluate whether the technology should be part of the core business and therefore should be kept in-house.

4.4.2. Cultural Hierarchy

4.4.2.1. Regional Fragmentation

Regional differences make up one of the challenges described by the analyzed companies in terms of language, regulations, and management approaches. The companies combined the use of many languages and dialects, as happens in foreign regions such as Europe but not in others such as in the United States. The most frequent languages used in the analyzed regions are (from the highest to the lowest): Mandarin, Japanese, Vietnamese, Cantonese, Thai and Korean. This diversity is combined with nine regulation frameworks, nine currencies,[xlii] and nine management approaches.

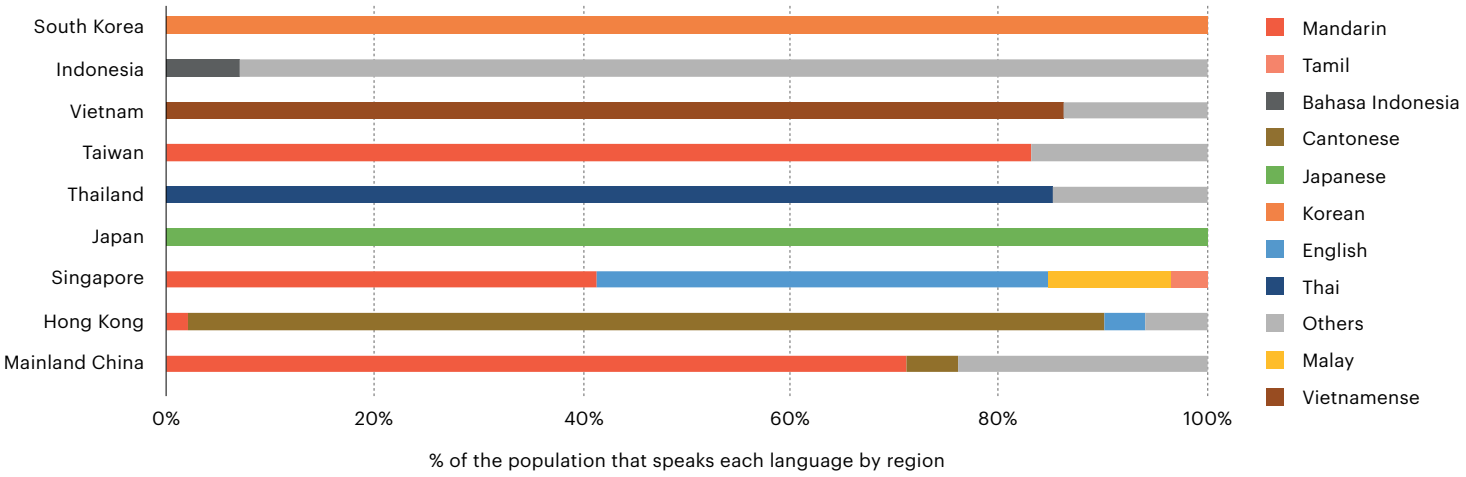
Finding a common way to work is often challenging. For instance, in the case of language, while each country typically has several languages (see a simplification in **Figure 18**), there are few languages that are present among all the analyzed regions. The most spoken languages worldwide in terms of number of speakers are Chinese (1.3 billion), Spanish (460 million) and English (379 million).[xliii] Nonetheless, Chinese (Mandarin and Cantonese)[xliv] is mainly spoken in mainland China, Hong Kong, Singapore, and Taiwan; Spanish is not common in these regions; and English is known (either as a first or second language) by just 100 million out of the near 2 billion people that make up the analyzed regions.

There are also regional differences related to cultural hierarchy. **Figure 19** compares the differences under four variables describing this, applying some of the variables of the Hofstede model of cross-cultural management: power distance, individualism, uncertainty avoidance, and long-term orientation.

Power distance refers to the extent to which the less-powerful members of institutions and organizations within a country expect and accept that power is distributed unequally. The subordinate-superior relationship tends to be polarized. Individuals are influenced by formal authority and are in general optimistic about people's capacity for leadership and initiative. This can provide a proxy on how much hierarchical, employees of corporate subsidiaries in these regions are often.

Individualism is the degree of interdependence a society maintains among its members. It has to do with whether people's self-image is defined in terms of "I" or "we". In individualist societies, people are supposed to look after themselves and their direct family only. In collectivist societies, people belong to "in groups" that take care of them in exchange for loyalty. This can provide a proxy for how individualistic employees of corporate subsidiaries in these regions are habitually, and how they are related to the corporate group.

Figure 18. Most common spoken languages (% of speakers out of the population) in each analyzed region



Source: Prepared by the authors (IESE Business School) from several databases such as Statista and.

In this count, only one language per speaker has been considered. The languages listed are those that are most common and used for business, not the official languages. For instance, Chinese and English are the official languages in Hong Kong, but most of the population speaks Cantonese.

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xlii. The nine currencies are Chinese yuan renminbi, Hong Kong dollar, Singapore dollar, Japanese yen, Thai baht, New Taiwan dollar, Vietnamese dong, Indonesian rupiah, and South Korean won.

xliii. Counting and censuses about spoken languages in these countries differ by languages. Therefore, these numbers have been estimated, gathering (and comparing) several data sources.

xliv. Although Mandarin and Cantonese use the same alphabet, they are not mutually intelligible, meaning that a Hongkonger may not understand a Mandarin speaker and vice versa.

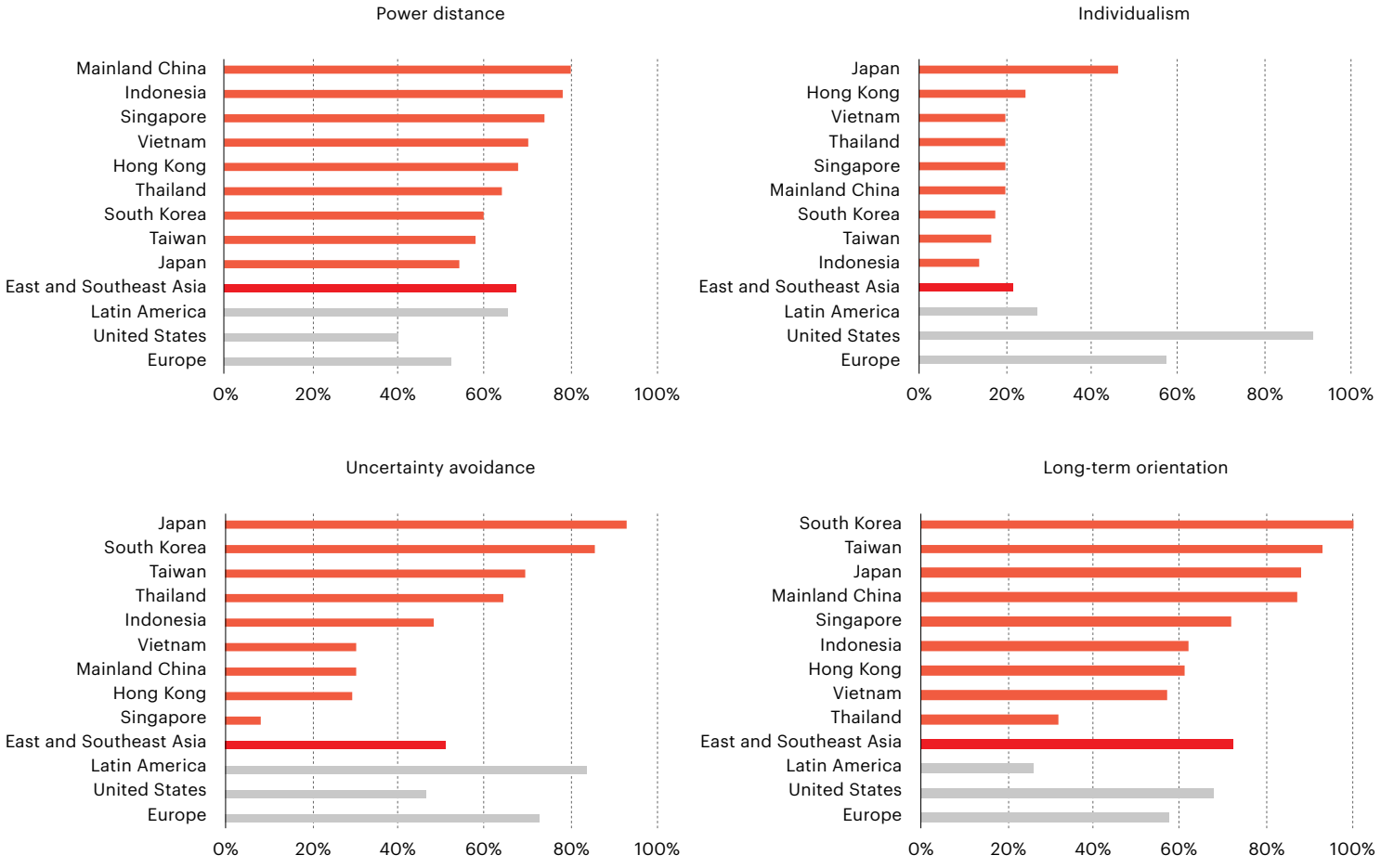
Uncertainty avoidance is the extent to which the members of a culture feel threatened by ambiguous or unknown situations. Should we try to control the future or just let it happen? The extent to which the members of an organization feel threatened by ambiguous or unknown situations and have created mechanisms to avoid them. In corporations with high levels of uncertainty avoidance, a lot of effort is put into feasibility studies and all the risk factors must be worked out before any project can start. Managers ask for all the detailed facts and figures before taking any decision. This sometimes makes challenging to make changes. In other words, this can provide a proxy on how much ambiguity, employees of corporate subsidiaries in these regions are usually able to tackle.

Long-term orientation describes how every society maintains some links with its own past while dealing with the challenges of the present and future, and societies prioritize these two existential goals differently. Societies with low scores in this dimension prefer to maintain time-honored traditions and norms while viewing societal change with suspicion. Those with high scores encourage thrift and efforts in modern education as ways to prepare for the future. This can provide a proxy for how traditional employees of corporate subsidiaries in these regions often are. Corporations with long term orientation prioritize steady growth of market share rather than quarterly profit, and so on. They all serve the durability of the companies. The idea behind it is that the companies are not here to make money every quarter for the shareholders, but to serve the stakeholders and society at large for many generations to come.

The East and Southeast Asian analyzed regions have a high level of long-term orientation. South Korea, Taiwan, Japan and mainland China are the four regions with the highest level, while Thailand is the only one with a low level. Uncertainty avoidance is quite diverse: while Japan and South Korea have the highest levels, Singapore and Hong Kong have the lowest levels. As a whole, these regions have a low level of individualism, with Indonesia and Thailand as the lowest, while Japan has the highest (yet, quite far from the United States). They give high relevance to their personal networks. The power distance is quite high in all regions, with mainland China, Indonesia and Singapore having the highest. The analyzed regions usually have a top-down management approach that impacts on how companies do corporate venturing to innovate.

Comparing the nine analyzed regions with foreign regions such as Europe, the United States, or Latin America: the biggest gaps between them and the East and Southeast Asian regions are with the level of individualism and power of distance of the United States, and the long-term orientation of Latin America. While low level of uncertainty avoidance may make more difficult for corporate venturing teams to convince business units to take the risk associated of working with deep-tech start-ups, the long-term perspective may provide a route to explain the high growth potential that this type of start-ups may trigger in the long run.

Figure 19. Hierarchy level by region, measuring power distance, uncertainty avoidance, individualism, and long-term orientation



Source: Prepared by the authors (IESE Business School) based on the data from Hofstede Insights.

4.4.2.2. Pros and Cons of Top-Down Innovation

Although the analyzed regions are quite diverse, the level of hierarchy is quite high, as seen in metrics such as power distance (see **Figure 19**), whose average is above the one of Latin America, the United States and Europe. This is usually related somehow to a top-down management approach, which is quite common among the analyzed companies, where teams usually follow a mandate. Is this good or bad for collaborating with deep-tech start-ups? The drivers of top-down and bottom-up innovation styles are different (see **Figure 20**). The former is triggered by the vision of top management, supported by staff, and fueled by processes and ambition; the latter is triggered by a staff idea, supported by management, and fueled by an entrepreneurial culture.

These drivers have consequences. In a top-down approach, there is higher clarity on goals, expectations and processes, which usually triggers speed in the implementation, once the decision has been made. However, it can erode staff motivation and learning orientation, reducing the creation of new ideas and solutions coming from employees. In the case of innovating with deep-tech start-ups, this challenge is more relevant if the upper management doesn't have the knowledge of the technology and characteristics of deep-tech start-ups, possibly missing growth opportunities. Finally, the centralization of decision-making may reduce the speed of requested approvals coming from the bottom.

An example in one of the analyzed companies is the hierarchical approval chain to invest $5 million in one deep-tech start-up, once the strategic, market, and technology evaluations have been conducted. When a corporate scout in Silicon Valley, London, or Tel Aviv finds a relevant start-up to invest in from a corporation with headquarters in Asia, the scout first asks the approval of his direct manager in the region outside Asia, and this manager in turn ask her director. Later, the director asks for approval from someone of his same seniority level in headquarters. The director in headquarters asks the headquarters' investment committee, which finally accepts or declines the investment. Lastly, the decision made goes back in the approval chain in the opposite direction, taking several weeks (and sometimes months), and sometimes missing the opportunity window.

There is also strategic volatility, an aspect more common in some Asian corporations. In the top-down innovation approach, moved by the leader's vision, if the leader is changed frequently (which is the case in several Asian corporations), the vision and strategy may also change, possibly eroding long-term signed agreements. This may erode long-term collaboration with deep-tech start-ups, whose gestation period is longer. For example, imagine that corporation A invests (according to strategic objectives) in deep-tech start-up B. Over time, the corporation changes its strategy, and it is no longer interested in the deep-tech start-up B. However, corporation A doesn't want to leave the cap table (start-up B's equity) because a corporate competitor may profit from its investment and insight, limiting the growth of start-up B.

Figure 20. Drivers, pros, and cons of a top-down management approach to innovate through corporate venturing in deep tech

	Top-down innovation	***(vs. bottom-up)***
Drivers	• Initiated by **management with a vision** • Driven by **processes and ambition** • Supported by staff	*(vs. staff with an idea)* *(vs. culture and entrepreneurship)* *(vs. management)*
Pros	• **Clarity**: In goals and expectations. Simplified process by centralizing decision-making. • **Implementation speed**: Faster, once the decision has been made.	
Cons	• **Motivation**: Staff may lack stimulus as they can't choose projects, they want. It may also reduce individuals' learning orientation. • **Creativity**: Reduces opportunities to express ideas and explore alternative solutions. This can be a relevant challenge when the upper management lacks relevant expertise in deep tech. • **Speed in bottom-up approvals**: Decisions coming from staff may take longer as the process is centralized top-down, and may have more layers, making the communication of complex topics—a common in deep-tech start-ups—more difficult. • **Time consuming**: Management may want to follow-up closely on some core projects. • **Strategic volatility**: Since the vision is very related to upper management, if leaders are changed frequently, the vision and strategy may also change, possibly eroding long-term signed agreements.	

Source: Prepared by the authors (IESE Business School).

So how can the cons of a top-down innovation approach be mitigated when innovating with deep-tech start-ups? Learning from the analyzed companies, the following are four of the mechanisms used.

Complementing staff motivation. One route is by being able to choose projects where employees are involved within a selection or scope designed by upper management (e.g., being in a corporate accelerator vs. a corporate venture capital or working with a deep-tech start-up A vs. B). Another is by having a clear professional- and learning-development plan tailored to each employee and supported with a professional mentor within the organization to secure the growth of that employee. A third is by providing other types of incentives. For instance, one of the

companies created a CEO's core-projects portfolio. Employees were motivated to get involved in some of those projects that were tagged and branded within the organization, garnering internal visibility and upper-management interest. A fourth is seen in the example of a company that was using mandatory rotations across departments for all employees (including upper management) every two or three years, investing in their professional development, and providing them with a holistic perspective of the company.

Establish thresholds for time allocation. One method that companies are using is creating layers of decision-making; this solution sometimes increases the time required for bottom-up approvals in a top-down approach, while it may reduce the time allocation required by the upper management. Another process that companies are using is having thresholds of decision-making. For example, if a corporate venture capital investment of less than $10 million in a deep-tech start-up is to be done, there may no be no need to involve headquarters, whereas headquarters may be involved in those investments above $10 million.

Supplement with radars. Some companies have radars both internal and external to sense the ideas and insights generated within their employees and outside their organizations. For some, there is an internal strategic consulting department who does this. Others count on the corporate venturing team to spot internal challenges and external solutions, centralizing opportunities and insights in one database nurtured by the staff.

Shortcut approvals. Besides having the threshold to trigger when to pass the decision to the level above (*see the two previous paragraphs*), companies try to secure a sponsor in the executive committee to speed up corporate venturing decisions. Moreover, corporations are trying to empower corporate venturing teams, facilitating their access to not only the executive committee but also to the departments in the company.

What, if there is a desire to change? Can these companies move from a top-down to a bottom-up innovation model when innovating with deep-tech start-ups? According to the analyzed companies, some of them are working to complement their existing models toward a more bottom-up innovation approach, usually focusing on three areas: upper management, inside/outside autonomy, and structural change.

The first step they follow is convincing the upper management that the change is needed. Companies usually follow two approaches. From outside, the company brings external experts who can provide an unbiased perspective to the company, showing trends based on data (e.g., what industry leaders are doing in other regions, what are their takeaways). From inside, the company can leverage the CEO's inner circle, such as a few sponsors in the executive committee, some trusted managing director of relevant business units, or a few members of the advisory board.

Once this has been achieved, the second step is that the company can enhance upper and middle management to seed the change in their business units and departments. In parallel, it can be helpful to introduce a corporate venturing team to not only inform the upper management on the external opportunities but also to start bringing external innovation (e.g., deep-tech start-ups) to the company. The decision on whether this team should be located physically inside, or outside headquarters, would be related to two questions: Can the company ensure its corporate venturing team will have internal autonomy? Will external innovation be easily integrated into a business unit?[xlv]

The third step would be a structural change on the internal policies regarding information, processes, and incentives. The reduction of silos and the flow of information can be ensured in three directions: horizontally, among departments (e.g., having recurrent department presentations explaining each department's activity); vertically, bottom-up and top-down (e.g., the company's internal newsletter, open recurrent meetings where staff can propose ideas and ask questions to the upper management, and an opportunity database gathering the ideas and insight of the institution, completed and accessible by employees); and outside-in and inside-out (e.g., business units sharing the challenges with the corporate venturing team, who can identify deep-tech start-up solutions outside the company, or the same team identifying opportunities outside the company that have been missed business units).

Then, and especially relevant in deep-tech start-ups whose gestation period lasts longer than a non–deep-tech start-up's, the question is how to you secure an agile process to prototype an integrate value from external (and staff[xlvi]) ideas. For example, having a cross-departmental team to collaborate and prototype with deep-tech start-ups, and having an internal budget for investments in proofs of concepts managed by the business units but supported by the corporate venturing team.

How can employees be incentivized and motivated to adopt (and propose) identified opportunities with deep-tech start-ups? Examples are providing visibility, in upper management, about successful collaborations between corporations and deep tech start-ups within the company, giving ownership of some of the collaborations to the team that initiated them, generating professional growth opportunities for those who invest time in these endeavors, and more.

4.4.3. Risk Perception and Control

4.4.3.1. Reducing Risk Perceived by Mechanism and Origin

Assuming the definition of risk in this study (see **Section 2.1**), what is the risk perceived by each corporate venturing mechanism when collaborating with a deep-tech start-up? **Figure 21** (left side) shows the average corporate risk perceived by each corporate venturing mechanism, where 10 is extreme and 0 is no risk perceived.

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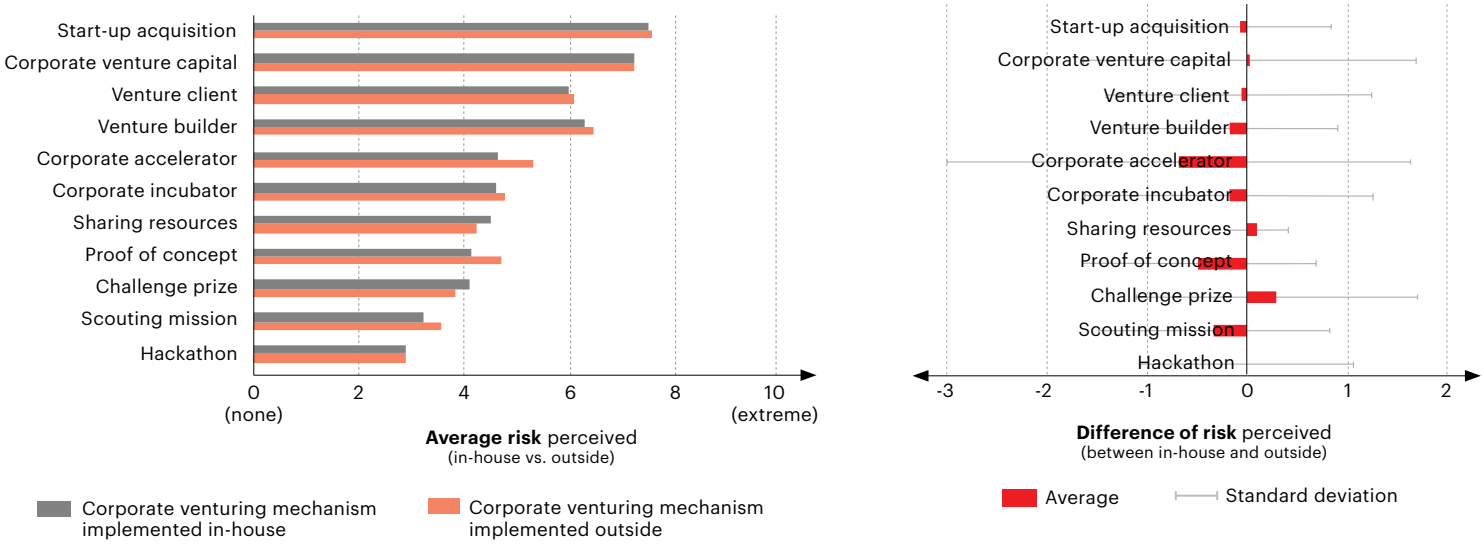
xlv. The answer to these two questions will give companies the right answer on where to locate the corporate venturing team. To read the details, see the authors' previous study about autonomy in corporate venturing.[214]

xlvi. In this transformation, it can also help to create an intrapreneurship program. Yet, this study will not cover this topic because it is out of the scope[216] and there is already existing literature about it.[217-218]

Each mechanism is perceived differently in terms of risk, with start-up acquisition, corporate venture capital, and venture builder having the highest perceived risk, and hackathon, scouting mission, and challenge prize having the lowest. The risk perceived, in these cases, is sometimes related to metrics such as cost (of building the mechanism and of each implemented opportunity), time (required to deploy the mechanism and each opportunity), and bounce rate (number of opportunities required to integrate value in the corporation). One way to reduce cost or time in implementing a corporate venturing mechanism may be outside the corporation with a corporate venturing enabler[xlvii]. However, is the same risk perceived when implementing inside vs. outside? On average, there is almost no difference—all of them are below 0.7 (in absolute value), which is the case of the corporate accelerator (see **Figure 21**, right side). However, the deviations in opinions are quite high.

Figure 21. Corporate risk perceived by corporate venturing mechanism implemented in-house compared to outside, via a corporate venturing enabler: average (left side) and difference (right side)



Source: Prepared by the authors (IESE Business School).

While the left side illustrates the pure difference of averages, the right side calculates the difference between implementing the corporate venturing mechanism in-house or do it outside, through a corporate venturing enabler. It shows the average of differences by mechanism. Moreover, a Student's t-test was conducted to determine if the means of the two datasets (in each mechanism) were significantly different from each other. In a confidence interval of 95% of the cases, they were the same.

Is there a way to reduce the risk perception that sometimes blocks corporate venturing teams to launch a new opportunity or integrate value within the corporation? In the case of convincing the executive committee and the business units, there are a few steps to follow regarding information, communication, design, and resources, keeping in mind that different corporate departments, subsidiaries, and teams may have different perceptions of risk.

Gathering information about what others did, and about the start-up to work with. First, understand how others did it, their challenges and lessons learned. Gather insights on how competitors have applied the technology to later be able to quantify and explain the positive impact they are having. Then, once you achieve a use case within your corporation, in one business unit, show the success story to the other business units. Second, do your due diligence work. Run background checks of the entrepreneurs and the company, check the state of any patents, secure signing a non-disclosure-agreement when needed, and so on.

Getting external support and tailor your internal pitch. One way to do this is to enlist a trusted external sponsor, an expert who backs the deep-tech start-up you want to work with. For instance, if you are proposing to accelerate or support an entrepreneur who has been recently received an investment from a renowned venture capital investor, this fact may reduce the risk perceived in the business unit. In contrast, if another corporation has invested recently in them, you may reduce the risk perceived on the application side. Likewise, if the start-up cofounders come from a prestigious research institution, you may reduce the risk perceived on the scientific side.

Another relevant aspect is tailoring your internal pitch. The executive committee may prefer arguments related to a long-term strategy: how this movement enhances this direction, how others are using this technology, and demonstration of market acceptance. Meanwhile, business units may prefer a reasoning more related to short- or medium-term impact on their profitability, how many resources it will affect (e.g., legacy, adoption cost), who will take responsibility for the initiative, if they will get support from operations, etc. In other words, while the first pitch is more about how it fits and supports the strategy, the subsequent pitch is more geared toward the mid-term profitability impact. Moreover, getting upper management onboard will help you get more buy-ins in cascade.

In this subsequent pitch, it is helpful to try to communicate

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xlvii. Corporate venturing enabler is defined as "as an institution or individual, within an innovation ecosystem, that facilitates a resource or activity in the collaboration between an established corporation and a start-up in order for the corporation to attract and adopt innovation within the open innovation paradigm."[216]

complementarity (rather than cannibalization) efforts. Design a plan to supplement what has already been done. This will help you avoid not only reinventing the wheel by starting from scratch but also creating internal competitors.

To this end, it may be helpful to design together with business units, starting from the pain point (or use case) rather than the technology (or solution). Rather than focusing on the benefits of the technology in general, identify and explain the problem that your company is going to solve through a clear use case. Then prototype to do the proof of concept and proof of value. Later take on the idea of "show me the value": don't focus the discussion on the technology but rather on the quantitative and translated impact it can have for the decision maker. That is why co-designing the use case with the business units can be a good idea. Employees usually prefer creating or deciding rather than being sold a solution. Involving decision makers in the design of the business case may help you increase acceptance within the business unit, and raise any red flags right from the beginning.

Creating a low-risk testing environment to allocate resources gradually while learning. One way to do this is to build a sandbox for the minimum proof of concept in a low-risk environment, separating running programs, usually in an effort to mitigate system failures. For example, in the banking sector, it could mean having a subset of aggregated data to do a proof of concept with a blockchain start-up. This mechanism is especially useful in highly regulated sectors. Once you have the sandbox ready, identify what is the minimum scope, data and resources required to test the technology. Later, increase the resource-investment gradually, if you have the time. For instance, you can start doing a proof of concept or co-development, followed by an investment, and later an acquisition, if the start-up goes through all the required proof points in each stage.

4.4.3.2. Start-up Control and Risk Perceived

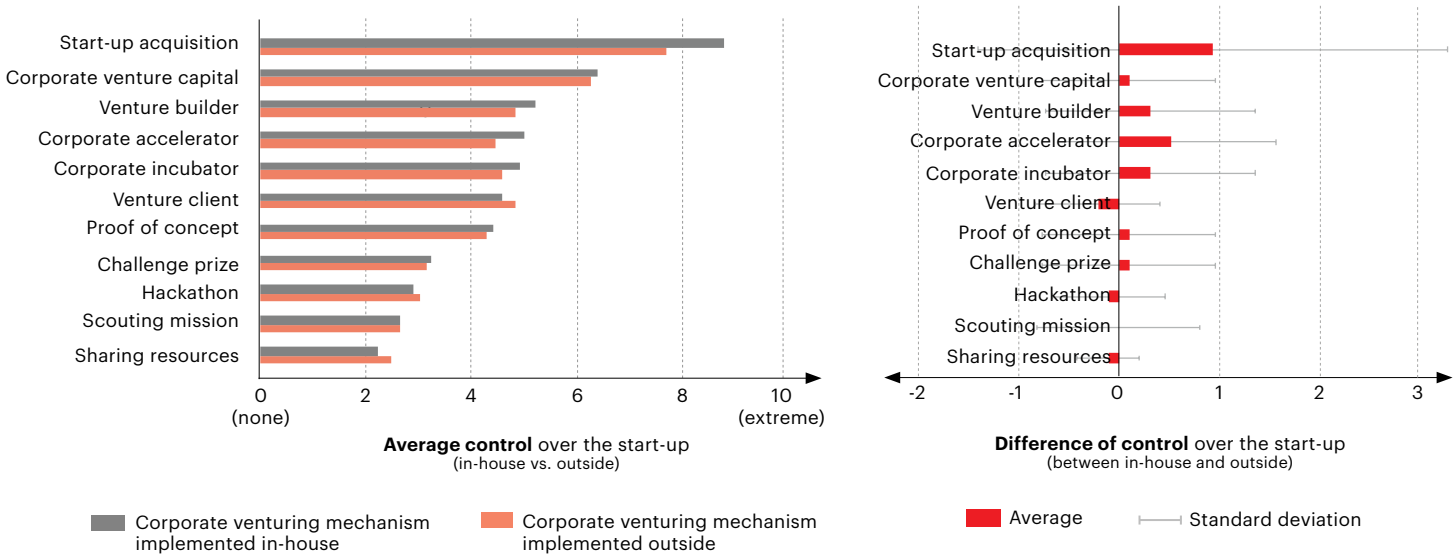
Based on the provided definition of corporate control—mechanisms that corporations use to ensure that the processes and outcomes of their departments meet corporate expectations (see **Section 3.1**)—what are the differences in the level of control that corporations have in each mechanism over a deep-tech start-up? Is it the same when the mechanism is implemented outside the corporation through a corporate venturing enabler?

In corporate venturing collaborations, corporations have the potential to negotiate control aspects such as the ownership of the existing (or generated) intellectual property, the exclusivity of the collaboration or the commercialization, the ownership of the company's equity, start-ups' strategic decisions, and access to certain markets, to name a few (see **Section 3.1**).

The result of a close look into the variable control, **Figure 22** (left side) illustrates that each corporate venturing mechanism provides different levels of control over the start-up. In the chart, 10 refers to extreme control and 0 to no control. There are different levels of control over the start-up, depending on the corporate venturing mechanism. On average, start-up acquisition and corporate venture capital are the two mechanisms in which the corporation have the highest control over the start-up, while sharing resources and scouting mission, the lowest.

In a later comparison of the level of corporate control between what implementing the corporate venturing mechanisms within the corporation and outside the corporation through a corporate venturing enabler, the difference was minor, except in the case of start-ups acquisition (1.0), although there was some divergence of opinion (see **Figure 22**, right side).

Figure 22. Corporate control over the start-up by corporate venturing mechanism implemented in-house compared to outside, via a corporate venturing enabler: average (left side) and difference (right side)



Source: Prepared by the authors (IESE Business School).

While the left side illustrates the pure difference of averages, the right side calculates the difference between implementing the corporate venturing mechanism in-house or doing it externally, through a corporate venturing enabler. It shows the average of differences by mechanism. Moreover, a Student's t-test was conducted to determine if the means of the two datasets (in each mechanism) were significantly different from each other. In a confidence interval of 95% of the cases, they were the same.

5. Connecting the Dots: Now What?

Key takeaways of this section:

- R&D is sometimes biased towards the "this was not invented here" phenomenon. Design your corporate venturing governance model evaluating approval and implementation, coordinating scouting, combining push and pull identification strategies, involving business units and the executive committee, and securing an unbiased technology evaluation.
- The region of East and Southeast Asia is somehow fragmented, with a profound top-down corporate innovation approach in many cases. Understand and mitigate the cons of cultural innovation challenges in terms of fragmentation and top-down approaches, while evaluating the pros of bottom-up innovation approaches.
- Not everyone wants the same thing: risk is not mandatory. Design your corporate venturing architecture also considering the risk your company is able to manage. To do this, departments want data rather than opinions: tailor your internal pitch. Start from the pain point (or use case) of business units. It may be useful to create a sandbox for building a proof of concept, while gradually increasing resource allocation.

5.1. How Can These Results Help Chief Innovation Officers Around the World?

Toyota, Samsung, Alibaba, and Lenovo have realized the advantages of innovating with deep-tech start-ups. Yet companies still struggle to implement these collaborations in terms of governance, cultural hierarchy, and risk perception. Based on the insights provided during the 77 interviews with innovation executives during this study, complemented by the review of previous literature, the question is, How can these results help companies' chief innovation officers in this endeavor?

5.1.1. Overview

1. The term *deep tech* is not new (see Section 2.1). It's important to understand the deep-tech concept in order to implement, measure, and improve properly. This term is not novel but a subset of emerging technologies, a phenomenon that has been studied for years. However, there was a lack of alignment, clarity, and boundaries concerning this concept. If organizations don't comprehend what exactly deep tech is, it will be challenging to implement it properly by measuring the results, learning from mistakes and improving. You can't measure correctly what you can't define clearly (see **Section 2.1)**.

2. Corporate venturing in deep tech is growing at speed (see Section 4.2). Don't miss the opportunity of corporate venturing in deep tech. In past years, deep tech has been getting increasing attention among corporations, entrepreneurs, investors, and media. Investment in deep-tech start-up has more than quadrupled over a five-year period, from approximately $15 billion in 2016 to more than $60 billion in 2020. The average disclosed amount per private investment event for these start-ups and scale-ups has grown 3.4 times between 2016 and 2020. Yet, the adoption rate of corporate venturing is quite diverse by region. While Japan has a 95%, Taiwan has just a 20% (see **Figure 10**). Although this is a global emerging trend, some companies (and regions) are adopting it faster than others.

3. This is not a one-direction game. In this region, consider partnerships (from both directions) for corporate venturing in deep tech. In East and Southeast Asia, some of the corporate venturing activity is concentrated in nine regions: mainland China, Hong Kong, Indonesia, Japan, South Korea, Singapore, Thailand, Taiwan, and Vietnam.

In the analyzed companies, not only the adoption of corporate venturing increased by 2.8 times in the past five years but also their deep-tech start-up collaborations have also gone up by 4.2 times during the same period. Moreover, in 71% of the cases, the weight of deep-tech start-ups in corporate venturing portfolios is expected to grow in the next five years. Keeping in mind that a strong percentage of these companies aim to scale their corporate venturing operations globally—because of not only deal-flow identification but also governance models (see **Figure 16**)—there is an opportunity for non-Asian companies to partner with them to support the entry into non-Asian innovation ecosystems (for Asian companies) as well as the entry into Asian ecosystems (for non-Asian companies).

Figure 23. Examples of LG Technology Ventures and Alliance Ventures (Renault, Nissan, and Mitsubishi) expanding their non-Asian locations to collaborate with start-ups


Source: Reuters.[192-195]

From left to right - LG office, Véronique Sarlat-Depotte (Alliance Ventures Chairman), Jean-Dominique Senard (Renault Chairman), Hiroto Saikawa (Nissan President and CEO), and Osamu Masuko (former Mitsubishi CEO).

Some examples include the movement of French energy company Schneider Electric executives to Hong Kong[188] and its new East Asia and Japan headquarters in Singapore,[189] or the Mexican construction venture arm Cemex Ventures in China.[190] Meanwhile, Asian companies continue expanding their presence in locations outside Asia such as the $400 million LG venture arm Technology Ventures in Silicon Valley since 2018[204] (see **Figure 23**). Another example is Mitsubishi through the recently created corporate fund Alliance Ventures, jointly with Renault (40%) and Nissan (40%). Aiming to invest up to $1 billion in start-ups by 2023, it has locations in Amsterdam, Shanghai, Paris, Silicon Valley, Tel Aviv, and Yokohama.[191]

4. Technology evaluation and the R&D department can be tough blockers (see Section 4.4.1.2). Mitigate the main stoppers when implementing corporate venturing with deep-tech start-ups. The top seven corporate challenges in this domain are related to technology evaluation, short-term view, internal alignment of KPIs, regulation, regional fragmentation, silos between R&D and corporate venturing teams, and top-down management. The top three departments that sometimes slow down these collaborations are finance, legal, and R&D.

5.1.2. Innovation Governance

5. There isn't "one ring to rule them all" but five. Design your corporate venturing governance model, considering approval and implementation. Having corporate venturing teams in multiple business groups and regions within the same company—a common ocurrence in the analyzed East and Southeast Asian corporate giants—it becomes challenging to coordinate and align efforts to maximize value creation and impact integration, while minimizing redundancy in the implementation. The five most common models, depending on the role of headquarters in approving and implementing, are owner, coordinator, optimizer, catalyzer, and hybrid. In the analyzed regions, the three most common models identified were: coordinator, owner and hybrid (see **Figure 16**).

6. When mapping deep-tech start-ups, internal redundancy is common. Establish a segmented and coordinated information of collaborations with these start-ups (see Section 4.4.1.1). Global corporate venturing teams usually meet with everyone every two or three weeks for an hour to share opportunities and keep everyone on track. Moreover, many of them have a unified database (e.g., Salesforce) to provide a holistic perspective. International corporate venturing teams have a mandate often segmented by regions or functions with MECE principles, securing the geographical coverage while minimizing redundances, and clarifying the boundaries to increase speed. In these cases, incentives are related not to the person who enters the opportunity into the database the first time but the one who actually created value in the collaboration.

7. It's difficult to know what you may not know. Combine push and pull opportunity identification for corporate venturing in deep tech (see Section 4.4.1.1). Business units' KPIs are usually focused on quarterly or annual financial results, sometimes blocking long-term opportunities. However, business units often identify challenges and pass them on to the corporate venturing teams to find solutions, sometimes missing in some cases growth opportunities, especially in the deep-tech field where there is more complexity that business units may not fully grasp. Corporate venturing teams should combine this process with the push process, in which they identify an external growth opportunity (i.e., deep-tech start-up) for the company and provide an explanation internally to the business unit (i.e., the translated impact it can generate).

8. Corporate integration of the value of deep-tech start-ups is challenging. Establish the three axes of the corporate venturing committee, depending on the decision. Depending on the decision (e.g., number of resources required) and level of centralization provided to corporate venturing teams, the corporate venturing committee is usually formed by representatives of three axes: the corporate venturing team, business units, and headquarters' executive committee (see **Section 4.4.1.1**).

9. R&D is sometimes biased towards the "this was not invented here" idea. Secure an unbiased technology evaluation for the deep-tech start-up. This decision, which is more common when collaborating with this type of start-ups, can be simplified under two variables. Firstly, who has the technical knowledge for conducting the technology

evaluation? That would most likely be the corporate venturing team; and if not, the R&D department or an expert outside the corporation. Secondly, is the R&D department biased towards its own developments? (see **Figure 17**). If so, that issue can be avoided by having a shared mandate across both teams and having a joint boss with expertise in both the venturing and the technical side.

5.1.3. Cultural Hierarchy

10. The region of East and Southeast Asia is fragmented. Keep in mind that this often challenges local as well as foreign corporate venturing initiatives. The analyzed regions combined the use of the six most frequently spoken languages they share (Mandarin, Indonesian, Thai, Japanese, Vietnamese and Korean), nine regulation frameworks, nine currencies, and nine management approaches that directly impact the corporate venturing approach (see **Section 4.4.2.1**).

Furthermore, uncertainty avoidance is quite diverse: while Japan and South Korea have the highest levels, Singapore and Hong Kong have the lowest. Comparing the nine analyzed regions with foreign regions such as Europe, the United States, or Latin America, the biggest gaps between them and the East and Southeast Asian regions are with the level of individualism and power of distance of the United States, and the long-term orientation of Latin America (see **Figure 19**). This diversity often makes it more difficult to coordinate corporate venturing teams in different regions either within East and Southeast Asia, or with subsidiaries in foreign countries.

11. Top-down corporate venturing approaches also have disadvantages. Consider them. A top-down corporate venturing approach can erode staff motivation and learning orientation, reducing the creation of new ideas and solutions coming from employees. In parallel, management may have to follow up with more projects, reducing the speed of the decision-making process to approve proposals coming from the bottom (see **Section 4.4.2.2**).

Figure 24. Example of Tencent's WeChat combined approach

Source: Forbes.[199,200]

Tencent Chairman Ma Huateng.

12. Cons in the top-down approach can be complemented. Think twice. First, staff motivation can be complemented with other incentives (e.g., providing the option to choose corporate venturing projects). Second, it's a good idea to have thresholds for time allocation (e.g., the approval is different depending on the size of the resources required). Third, some companies have both internal and external radars to sense the ideas and insights generated within their employees and outside their organizations. Fourth, consider shortcutting approvals such as securing a sponsor in the executive committee to speed up corporate venturing decisions (see **Section 4.4.2.2**).

With the growth of the Chinese tech company Tencent through its multipurpose app WeChat (see **Figure 24**), the company combined the two approaches. They provided a clear vision, as an early employee of WeChat mentioned: "When we are trying to create something revolutionary, a bottom-up process would tear it apart. Users need to be given an extremely clear concept with precise information—and that needs a single architect." Yet when incremental innovation was needed, more bottom-up innovation was encouraged, such as in the optimization of the red packet[xlviii] function in WeChat Pay.[196-198]

13. Moving from top-down to bottom-up: it can be done. Evaluate the advantages of the bottom-up innovation approach, too. Employee motivation, creativity, and speed of approval are just some of the benefits to this approach. For this change, the company has to transform the upper and middle management, jointly with the staff. First, upper management needs to be convinced that this change is needed, both from the outside (bringing external experts and showing what competitors do) and from the inside (leveraging the CEO's inner circle). Later, the company can enhance upper and middle management to seed the change in their business units and departments, while introducing corporate venturing teams. Finally, a structural enhancement can be secured on the internal policies regarding information, processes and incentives towards the new approach (see **Section 4.4.2.2**).

5.1.4. Risk Perception and Control

14. The risk by corporate venturing mechanism is different. Design your architecture accordingly. Start-up acquisition, corporate venture capital, and venture builder are the mechanisms with the highest average risk perceived (see **Figure 21**), while hackathon, scouting mission, and challenge prize are the ones with the lowest. When crafting your objectives and corporate venturing strategy, evaluate the amount of risk (among other corporate venturing mechanisms) your company can work with to pick the most suitable corporate venturing mechanisms.

15. Departments want data rather than opinions. Gather information about what others did, and about the deep-tech start-up. First, understand how others did it, their challenges and lessons learned. Gather insights on how competitors

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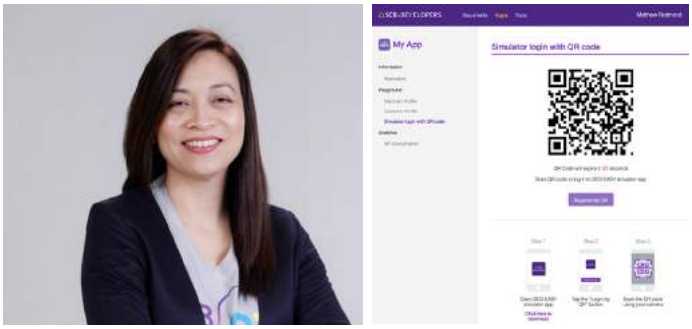
xlviii. The red packet concept, also offered by Tecent's market competitors Alibaba and Baidu, is based on the Chinese tradition of *hongbao* ("red envelope", or "red packet"), where money is given to family and friends as a gift.

have applied the technology to later be able to quantify and explain the positive impact they are having. Once you achieve a use case in one of the corporate business units, show this success story to the other business units. Second, do your due diligence: run background checks of the entrepreneurs and the start-up, check the state of any patents, secure signing a non-disclosure agreement when needed, and so on (see **Section 4.4.3.1**).

16. Not everyone wants the same thing. Tailor your internal pitch. The executive committee may prefer arguments related to a long-term strategy, how this movement enhances this direction, how others are using this technology, and demonstration of market acceptance. Meanwhile, business units may prefer a reasoning more related to short or medium-term impact in their profitability, how many resources it will affect (e.g., legacy, adoption cost), who will take responsibility for the initiative, whether they get support from operations, etc. In other words, while the first pitch is more about how it fits and supports the strategy, the subsequent pitch is geared toward the mid-term profitability impact (see **Section 4.4.3.1**).

17. Don't start with the technology (or solution). Start from the business unit's pain point (or use case). Rather than focusing on the benefits of the technology in general, identify and explain what is the problem that your company is going to solve through a clear use case (see **Section 4.4.3.1**). Then prototype to do the proof of concept and proof of value. Later take on the idea of "show me the value": don't focus the discussion on the technology but rather on the quantitative and translated impact it can have for the decision maker. Furthermore, don't overlook now who will feed you in the future. That is why co-designing the use case with the business units can be a good idea. Employees usually prefer creating or deciding rather than being sold a solution. Involving decision makers in the design of the business case may help you increase acceptance within the business unit, and raise any red flags right from the beginning.

Figure 25. Example of Siam Commercial Bank's sandbox for start-ups and developers



Source: SCB and TechInAsia.[214-216]

Mukaya (Tai) Panich, SCB Chief Venture and Investment Officer.

18. Risk is not mandatory. One way is to minimize it is by creating a sandbox for the minimum proof of concept and increasing resource allocation gradually, resulting in a low-risk environment, and separating running programs, usually in an effort to mitigate system failures (see **Section 4.4.3.1**). For example, in the banking sector, this could mean having a subset of aggregated data to do a proof of concept with a blockchain start-up. This mechanism is especially useful in highly regulated sectors. For example, the Developer Sandbox created by the Thai Siam Commercial Bank provides third-party developers with an interface[xlix] that mirrors those of live environments (see **Figure 25**). It enables the testing and validation of third-party apps (e.g., from start-ups related to artificial intelligence) that are built on top of the bank's application programming interfaces.

Once you have the sandbox ready, identify the minimum scope, data, and resources required to test the technology. Moreover, increase the resource investment gradually, if you have the time. For instance, you can start doing a proof of concept or co-development, followed by an investment, and later an acquisition, if the start-up goes through all the required proof points in each stage.

To conclude this section, companies have two opportunities in terms of practice (corporate venturing in deep tech) and region (East and Southeast Asia) for this field. In this type of collaboration, there is not a unique model for corporate-venturing governance but rather there are several, where interconnectivity with upper management, business units and the R&D department is crucial. Moreover, regional fragmentation and cultural hierarchy, propelled by a top-down innovation approach, may trigger challenges in the corporate–start-up collaboration. Finally, risk is not mandatory, but it is present in many innovation processes: it requires monitoring and management, especially in designing the corporate venturing architecture and in internal communications with other departments.

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xlix. This interface is usually called application programming interface (API).

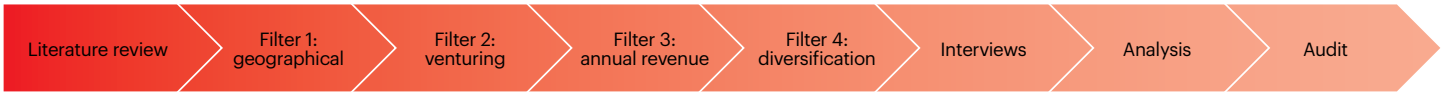
6. Appendixes

6.1. Research Methodology

This study was conducted to find out how corporate giants can better innovate with deep-tech start-ups, focusing on the case of East and Southeast Asia. This report aimed to shed light on innovation governance, cultural hierarchy, and perceived risk. Specifically, this study is focused on the following questions: What is the best way to manage cross-region and -departmental corporate venturing teams? What is the best way to deal with the R&D department? Who should do the technology evaluation? What are the pros and cons of top-down management in corporate venturing? What are the differences in risk perceived by corporate venturing mechanisms and implementers, and its relationship with start-up control?

This analysis used a robust methodology to guarantee the quality of the findings (see **Figure 26**). The project started with a wide review of the literature focused on the research question, which included the evaluation of studies published in relevant academic journals, corporate reports, and more. What's more, the regions in East and Southeast Asia that were selected were done so based on the concentration of corporate venturing activity and the size of their corporations. These regions included in the study are mainland China, Hong Kong, Indonesia, Japan, South Korea, Singapore, Thailand, Taiwan, and Vietnam.

Figure 26. Methodology



Source: Prepared by the authors (IESE Business School).

Next, an analysis was conducted to identify companies (global ultimate owners) with headquarters in the analyzed regions that were publicly innovating with start-ups. These corporate giants are among the top-20 (on annual revenue) in each of the analyzed regions . This filtering (those doing corporate venturing) was done by checking up-to-date databases (e.g., Global Corporate Venturing, Crunchbase, CBInsights, Pitchbook, MarketLine, Factiva, Orbis), academic and practitioner journals, news platforms, company reports, social network campaigns, and more. Sources were checked not only in English but also in some of the local languages.

Then, a subset of these companies was interviewed to complement the literature review and gather deeper insights. In identifying these interviewees, to increase the quality of the insights received, a few aspects were secured: seniority of the interviewee for a holistic perspective (not only local activity), size of the company (to increase the chances of having a high level of activity innovating with start-ups), and diversification by region.

Initially, the biggest companies (on annual revenue) were selected for the interviews. However, this resulted in a greater concentration of interviewees in mainland China and Japan. This potential bias was mitigated by diversifying the sample by picking the top 30 companies doing corporate venturing by annual revenue in the region (18 out of 30 agreed to be interviewed), and then the top 20 of each region, giving priority to those of the biggest size by region (see **Figure 27**).

In total, 77 interviews were conducted to 67 companies. The core of the study was focused in 41 interviews done to 32 companies. About 18 of them were among the top 30 companies in annual revenue (>$51 billion) doing corporate venturing and headquartered in the analyzed region. Then, 36 additional non structured interviews with non-Asian companies were conducted to gather contrasting qualitative insights. These were not included in the data collection to avoid any type of bias. They supported the reflection with qualitative insights. The number of interviews conducted was selected not only by benchmarking other studies but also by verifying that the appreciated change in the aggregated data was very limited when further increasing the number of interviews already conducted. The resulting interviewed companies have the following patterns in terms of region diversification (see **Figure 27**).

In terms of industry, they are distributed as illustrated in **Figure 28**, keeping in mind that some of them were owned by the government.

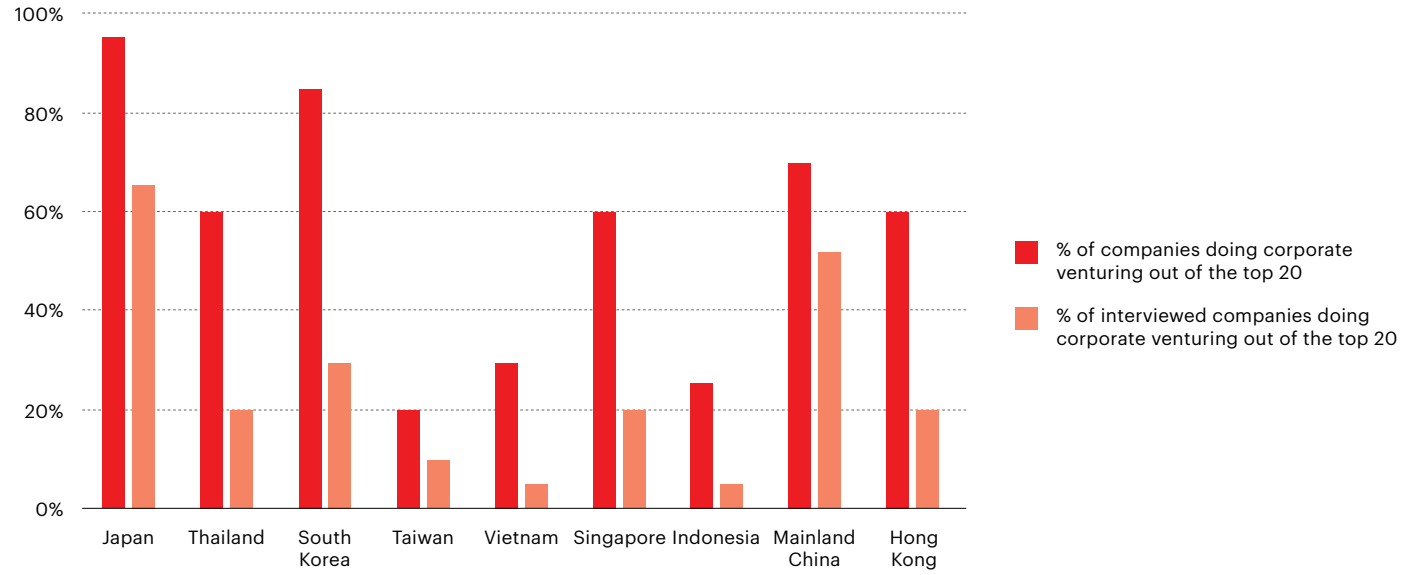
Later, an interview protocol was developed. Each interview had an introductory phase in which the interviewer explained the definitions of potentially ambiguous terms in the questionnaire to ensure a common understanding. The interviews contained both open and closed questions.

The answers were classified and analyzed by two researchers. Afterwards, the results were codified qualitatively and quantitatively, a step that was also carried out by two different members of the research team to minimize ambiguities and mistakes. A quantitative analysis and conceptualization of the results were also performed. Several tests were carried out to develop the qualitative analysis with a robust categorization, avoiding repetition and securing completeness. Moreover, a few tests were also run for the quantitative analysis (e.g., Student's t-test with a confidence interval of 0.95 to secure accuracy). Finally, the study was then evaluated by six reviewers.

The authors acknowledge that the participation of the companies that declined to get involved in the study may increase the qualitative understanding of this practice in the region. In order to mitigate this challenge, a protocol was designed for carefully choosing the interviewees to maximize the learnings. The interviews were complemented with desk research. Secondly, the Hosftede model has received some criticism in the past because of the chosen sample. However, this study has used more proxies to complement and enrich the insights and conclusions of the report.

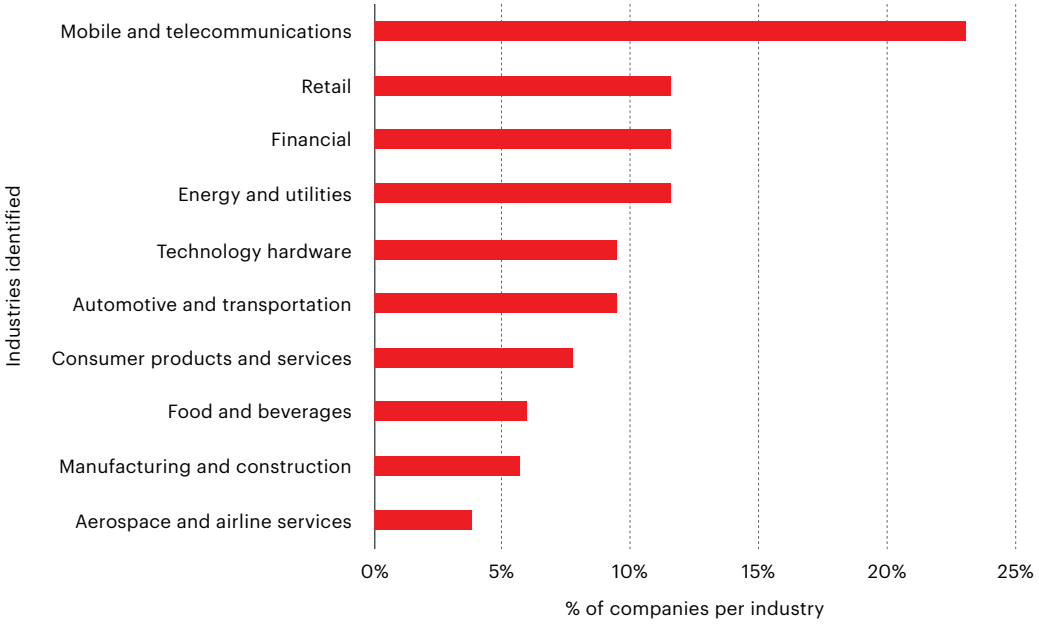
Further research is welcome in forthcoming white papers to provide guidance in this activity, considering, among others, (i) when a corporation should ask for exclusivity in terms of company collaboration, intellectual property, or product development when that corporation aims to innovate with a deep-tech start-up, (ii) when a corporation should own the intellectual property in a proof of concept developed with a start-up, and (iii) the additional percentage of additional time, on average, that it takes to innovate with deep-tech entrepreneurs compared to non–deep-tech start-ups.

Figure 27. Companies doing corporate venturing compared to those interviewed



Source: Prepared by the authors (IESE Business School).

Figure 28. Companies interviewed segmented by industry



Source: Prepared by the authors (IESE Business School).

6.2. Corporate Venturing Mechanisms (Definitions)

These are definitions included in previous studies:[216-220]

Corporate venturing: The means through which corporations participate in the success of external innovation to help them gain insights into non-core markets and access to capabilities, offering a collaboration framework that acts as a bridge between innovative start-ups and established corporations. This is a path to attract and adopt innovations, following the paradigm of open innovation, which assumes that firms can and should use external ideas as they look to advance their technology. It encompasses mechanisms such as challenge prizes, hackathons, scouting missions, venture builders, the sharing of resources, strategic partnerships, corporate incubators, corporate accelerators, corporate venture capital, venture clients and start-up acquisitions.

Challenge prize: An open competition that focuses on a specific issue, offering an incentive to innovators in a particular field to design and develop the best solution, based on new ideas and technological trends, in order to foster internal learning.

Corporate incubator: A program that provides mentoring and value-added services (centralized legal or marketing support) to help entrepreneurs build viable, market-ready ideas. These services usually focus on the initial phase by converting the entrepreneurs' ideas into real business models. Corporations get a cost-effective and outsourced R&D function, while start-ups get access to facilities, expertise, and technical support.

Corporate accelerator: A program that provides intensive short- or medium-term support to cohorts of rapid-growth start-ups via mentoring, training, physical working space and company-specific resources. These resources can include money invested in a start-up, normally in exchange for a variable share of equity.

Corporate venture capital: Corporations use equity investments to target start-ups for innovation or for another strategic interest beyond a purely financial return. A corporation can run financially backed venturing arms internally, as a subsidiary, or by contributing to corporate-backed investment funds jointly supported by other private or public investors.

Hackathon: A focused workshop where software developers collaborate to find technological solutions to a corporate innovation challenge within a given time frame. This is a way to distill visionary concepts down to actionable solutions, stimulating a creative and problem-solving mindset within corporations.

Scouting mission: The established company appoints an individual within a given industry to search for innovation opportunities aligned with the corporate strategy. Corporations gain insight into interesting sectors and industries and are able to monitor leading innovations and collect information for strategic decisions.

Sharing of resources: A means to grant start-ups access to resources while simultaneously enabling established corporations to get closer to the entrepreneurial ecosystem. Companies that offer coworking space in their offices are one example, with a corporation providing physical facilities to the start-up team.

Start-up acquisition: Established firms purchase start-ups to access their products, services, innovative business models and talent.

Strategic partnership: Alliances between established corporations and start-ups to specify, develop and pilot innovative solutions through the discovery of new opportunities or the exploitation of existing opportunities.

Venture builder: A combination of an incubator and accelerator, where established corporations allocate funds and resources to the creation of an external venture through talent recruitment and the development of a business model that will benefit the corporation. The entrepreneurial teams are normally from outside the corporation (not intrapreneurs).

Venture client: A specific type of strategic partnership and a highly integrated tool that companies can use to purchase the first unit of a start-up's product, service or technology when the start-up is not yet mature enough to become a client. While corporations get access to start-ups with a ready minimum viable product, start-ups get revenue and a consolidated company as their client.

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Danielle D'Agostaro (WV Ventures)
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Fan Ho (Lenovo)
Feng Zhou (Tencent)
Gen Tsuchikawa (Sony)
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Jihong Kim (Samsung)
Jirut Wattoom (SCG)
Johnny Chung (China Construction Bank)
Jonathan Hung (Flex)
Jonathan Salomon (Nissan)
Keita Ito (Mizhuo Bank)
Kohei Noda (Kahuhodo Inc.)
Lawrence Fong (Cathay Pacific Airways)
Leo Nuo Jiang (Huawei)
Leor Ben Yakov (Mitsubishi)
Lilliana Choi (Jebsen Group)
Marcus Lopez (Cathay Financial Holdings)
Medhy Souidi (DBS)
Michael Yung (Cathay Pacific Airways)
Patrick Wu (Cathay Financial Holdings)
Pubudu Abayasiri (CLP)
Richard Liu (Vanke)
Richard Lord (HSBC)
Ryota Suzuki (Sony)
Sang Yeon Kim (LG)
Taejoon Park (LG)
Tao Wang (SAIC)
Teddy Lui (Alibaba)
Tiany Sun (PTT)
Tiffany Ting (Swire)
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Zhe Shi (Foxconn)

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