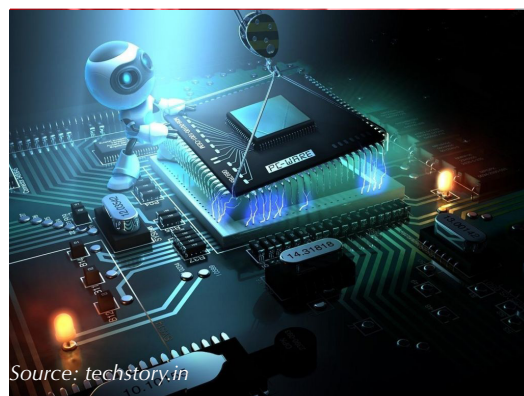


# Policy Briefs

Series No. 2018-05



## *Innovation in the Philippines' Technology Sector*

Innovation involves the transformation of useful ideas or inventions into products and services that customers are willing to pay for. This kind of activity stimulates economies as it creates synergies among actors of the ecosystem such as entrepreneurs, government, investment organizations, educational institutions and companies. At the request of the Department of Trade and Industry (DTI), the United States Agency for International Development (USAID)/Philippine Science, Technology, Research and Innovation for Development (STRIDE) Program facilitated around 40 structured discussions to assess the innovation needs of the Philippines.

This policy brief presents a collection of opinions of these various actors in the country's innovation ecosystem, with focus on the electronics, aerospace, and automotive industries. It provides insight into some issues that are faced by the technology sectors in light of stimulating a fruitful discussion that could help facilitate support for innovation efforts in the Philippines.

### **Innovation Ecosystem for Technology**

The Philippines' innovation ecosystem for the technology sector is led by the electronics, aerospace, and automotive industries. It is stimulated by economic and dynamic relationships that are mainly involved in technology development. The players include large multinational corporations (MNCs), small-medium enterprises (SMEs), startups, associations, universities and government agencies like the Department of Trade and Industry (DTI), Department of Science and Technology (DOST) and the Commission on Higher Education (CHED). Figure 1 exhibits the flow of interactions that allow the creation and transfer of knowledge that ultimately results to economic development and growth.

The 2016 Global Innovation Index Report shows that the Philippines ranked 74th out of 128 economies in innovation performance. This position indicates a low level of innovation even when compared with other Association of Southeast Asian Nation (ASEAN) member states (5th out of 7). At its current position, the country is far behind most of its ASEAN neighbors such as Singapore (6th),

► *The Philippines' innovation ecosystem for the technology sector is led by the electronics, aerospace and automotive industries.*

Malaysia (35th), Thailand (52nd) and Vietnam (59th). Moreover, its position is also being challenged by other countries such as Indonesia (88th) and Cambodia (95th). Hence, relevant policies must be put in place to catch-up with other countries that have heavily invested in innovation. Particularly, the Philippines should give priority in setting up the fundamental blocks of innovation that would support businesses involved in high-technology activities.

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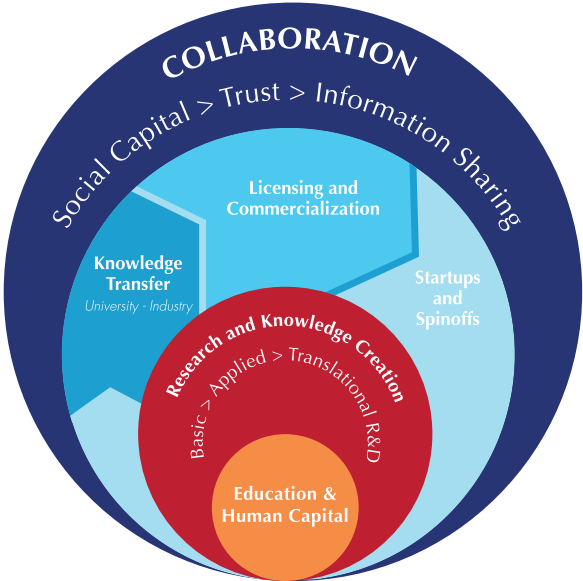


Figure 1. Innovation Ecosystem

Source: Adapted from RTI’s Innovation Ecosystem Conceptual Framework

### Some Relevant Indicators

The result of the global executives’ perspective on innovation appears favorable for the Philippines. As shown in Figure 2, the general outlook on the country’s capacity for innovation has been increasing from 2.94 in 2013 to 4.54 in 2015. This is quite positive in comparison with other indicators such as availability of scientists and engineers, company spending on research and development (R&D), government procurement of advanced technology products, quality of scientific research institutions and university-industry collaboration in R&D, which have shown minimal increases over the years.

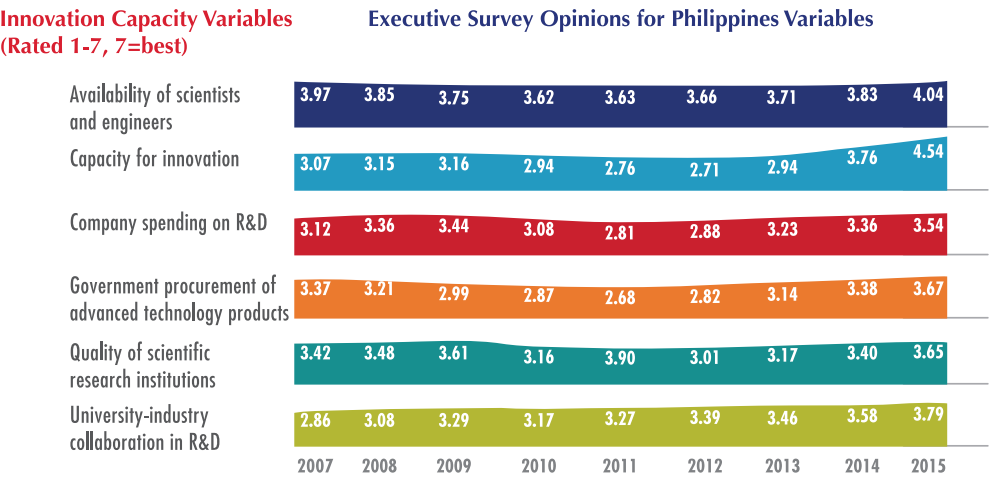


Figure 2. Global Executives’ Survey: Philippines

What can be inferred from combining Figures 1 and 2 is that the key elements for innovation include: (1) human capital including scientists and engineers that are developed by the universities; (2) investment in R&D and the creation of knowledge; and (3) transfer of knowledge through start-ups and/or commercialization with existing companies.

It is worth noting that the Philippines is not lacking in supply of human capital, principally of young engineers and technical graduates. In fact, the country produces around 60,000 engineers annually. Only a small percentage of these graduates, however, are employed in research-related jobs, while many others choose business process outsourcing (BPO) jobs that provide stability, higher pay and better benefits. Furthermore, the proportion of graduates with science, technology, engineering, and mathematics (STEM) degrees is also diminishing.

In contrast, the Philippines is weakest in terms of knowledge creation as it trails behind other countries in terms of R&D investment as a percentage of gross domestic product (GDP). The same is true for the total number of researchers in the country.

### The Philippines’ Strengths and Areas for Improvement

The potential of innovation as well as its impact is highly affected by country-specific factors that stimulate investment, growth and other activities. This section provides the commonly-cited indicators that show the Philippines’ current state and its “readiness” for innovation (Figure 3).

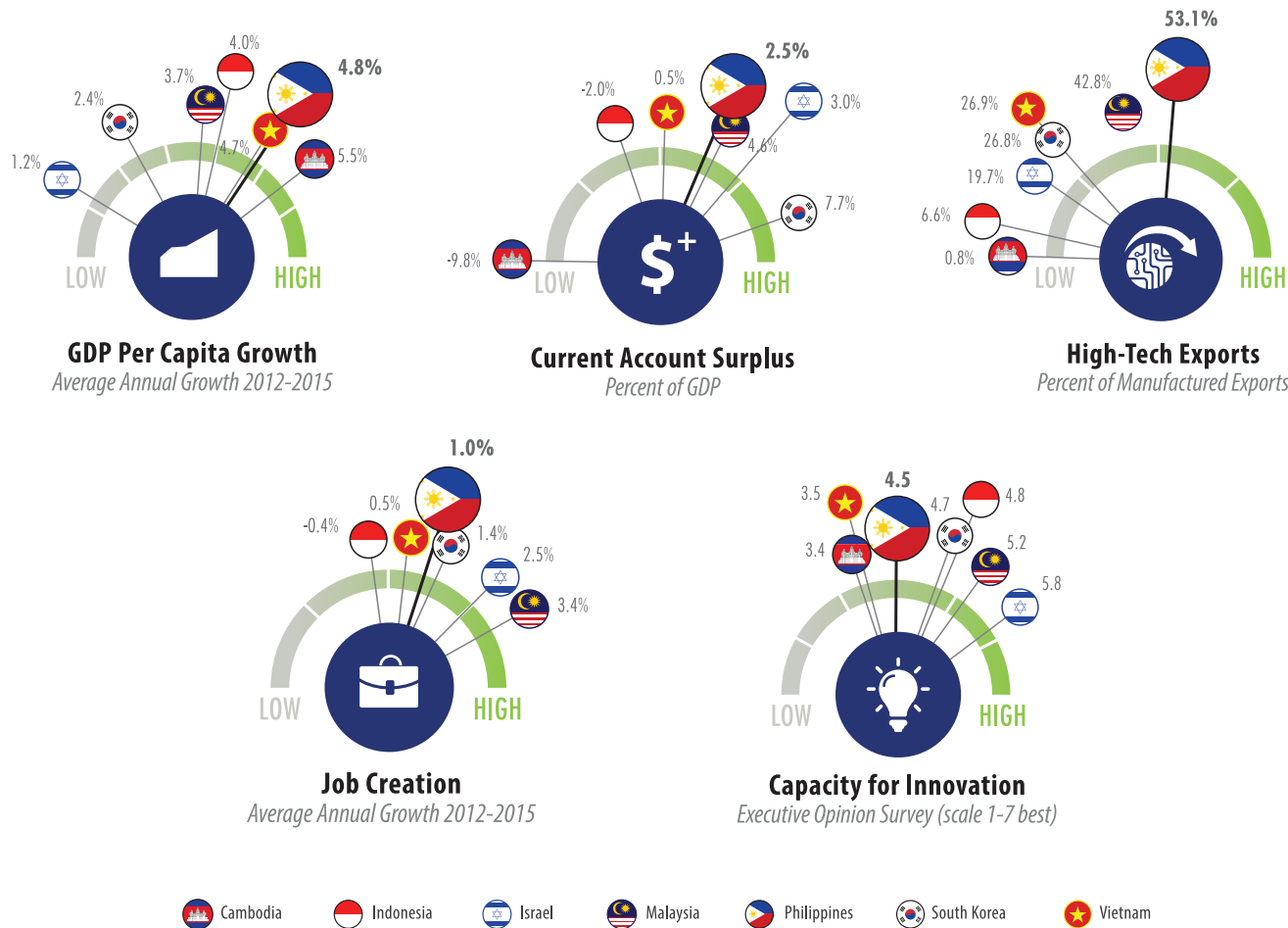


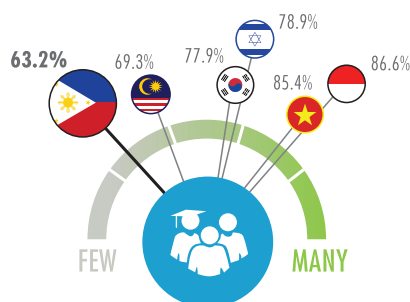
Figure 3. Selected Indicators

## Strengths

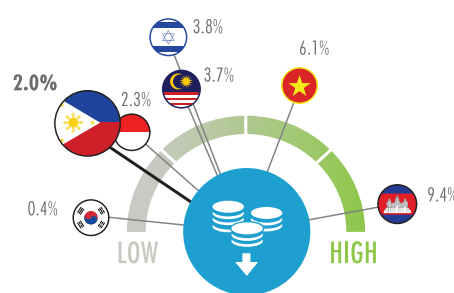
- **GDP/Capita Growth.** A country's GDP indicates the health of the economy. The Philippines' excellent growth rate is encouraging but may also be quite misleading since the country is smaller and thus, "moves" relatively easier. Likewise, its growth is driven by a "consumption economy," which may not be sustainable in the long run.
- **Current Account Surplus (% of GDP).** The Philippines has a positive current account surplus, indicating that it is a net lender. The country is performing well in comparison with other Asian countries based on this indicator. Data on current account and GDP per capita are both sourced from the World Bank.
- **Job Creation.** Job creation in the Philippines is likewise favorable. Data for job creation demonstrates the average annual growth of jobs from 2012 to 2015, sourced from the International Labour Organization (ILO).
- **Capacity for Innovation.** As previously mentioned, the results of the World Economic Forum's Executive Survey 2015 shows a positive outlook on the Philippines' capacity for innovation.
- **High-tech Exports (% of Manufactured Exports).** The Philippines is the highest-ranked country in terms of high-technology exports. This underscores the role of the high-tech industry in the country's manufacturing sector. Data for this indicator is sourced from the United Nations' statistics division (UN Comtrade).

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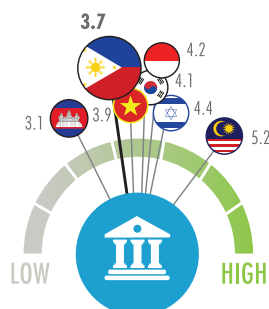
## Areas for Improvement



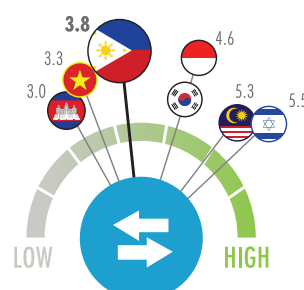
**Educated Labor Force**  
Percent with Post-secondary Education



**Foreign Direct Investment**  
Percent of GDP

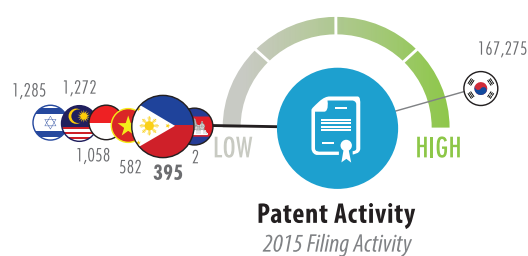
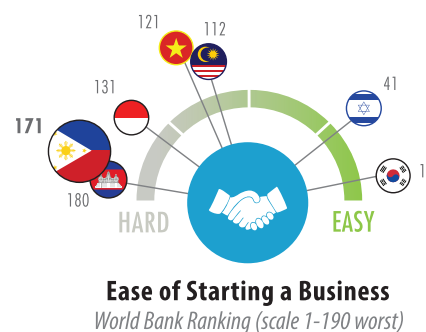
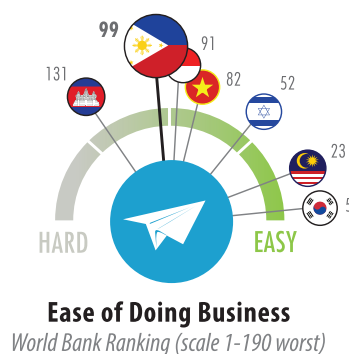


**Government Procurement of Advanced Technology**  
Executive Opinion Survey (scale 1-7 best)



**University and Industry Collaboration**  
Executive Opinion Survey (scale 1-7 best)

- **Educated Labor Force.** The percentage of labor that has post-secondary education is high in the Philippines. However, other ASEAN member states are also performing well and better than the Philippines in this category.
- **Foreign Direct Investment (% of GDP).** Foreign direct investment (FDI) is essential in enabling the growth and development of a country. In terms of this indicator, the Philippines has higher FDI than South Korea; although mature economies have understandably low FDI due to high levels of domestic private and public investments.
- **Government Procurement of Advanced Technology.** The level of government procurement of advanced technology indicates a country's initiative for product development and capacity of its local supply chain. The Philippines ranks second to the last for this indicator, based on the opinion of 14,000 business executives.
- **University and Industry Collaboration.** From the same Executive Opinion Survey, the Philippines is viewed to be performing ahead of Cambodia and Vietnam in terms of university and industry collaboration.



- **Ease of Doing Business.** The ease of doing business indicator is based on the World Bank rating. This considers factors such as permitting, infrastructure, property laws, access to credit, taxes, import/export, contracts, and insolvency laws/process. The Philippines is only ahead of Cambodia based on such factors.
- **Ease of Starting a Business.** This indicator is similarly sourced from the World Bank. It demonstrates the environment faced by entrepreneurs in an economy. The Philippines along with other ASEAN counterparts are performing far from more mature economies like South Korea.
- **Patent Activity.** Intellectual Property (IP) protection is often attached to the concept of innovation and economic growth. Comparative data shows that the Philippines is still lacking in terms of patent activities, which incorporates total patent applications by residents, both domestic patents in national offices and global patents filed through the Patent Cooperation Treaty (PCT).

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## High-Tech Sector Innovation Needs

The Philippine innovation ecosystem has both strengths and weaknesses that must be built on and dealt with. Supporting its main sectors, namely, electronics, aerospace, and automotive segments, are, therefore, critical in stimulating growth through innovation.

For instance, the electronics and electrical equipment industry lead the country's exports with US\$23.1 billion (2014); while mechanical appliances places second with US\$8.9 billion. There are also several opportunities in the transportation sector, including automotive production, wherein global trade is valued more than US\$1 trillion.

Asia is similarly on the rise as the fastest growing aerospace market with a significant increase in civilian aircraft projected. All of these are presenting opportunities that can strengthen the country's manufacturing sector, which is currently being overtaken by the services sector. Highlighted below are some specific recommendation for the aerospace, automotive and electronics and semiconductors lifted from the industry roadmaps:

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### **Aerospace**

- Build capacity via education and training. Design training programs and certification for aerospace manufacturers and service providers that correspond with the global aerospace standards. Improving the aerospace engineering curricula can also bridge the gap between academe and industry.
- Support the development of a local supply chain. Exploit the linkages between aerospace manufacturers to develop the supply chain of local producers. Also, maximize the use of DOST facilities as well as their expertise for metal processes and testing of manufactured products/parts.
- Expand markets by enticing Tier 1 and 2 to the Philippines. Concentrate on Tier 1 or Tier 2 suppliers of big aerospace companies (OEMs) for strategic products and services. Simultaneously, increase incentives extended by government for foreign investment.
- Increase government investment in attracting local and foreign partners. Reform investment policies and establish training facilities to advance the skills of the labor force.

### **Automotive**

- Increase competitiveness with technical maturity of people and infrastructure. Prioritize policies that would reduce power costs, increase logistics efficiency and those related to free trade zones. Develop auto R&D centers specializing in product technology that would also facilitate human resource development.
- Incentivize with policy reforms and stability by harmonizing Philippine standards with international standards for labor incentives, customs procedures, and systems, as well as for technical, environmental, and safety.

- Provide business intelligence by creating and managing an auto database that provides information on key indicators as well as relevant domestic and international policies.

### ***Electronics and Semiconductors***

- Identify global market and technology trends, and strategically invest. Pick out strategic and specific products and technologies to focus on, based on the current trends for the Philippines.
- Compare resources and operating environment competitiveness. Identify the necessary resources policies, supply chain, and operating environment that will strengthen existing firms and enable them to attract new investments.
- Augment resources, policies, and supply chain to execute strategically.

### **Innovation Needs Assessment**

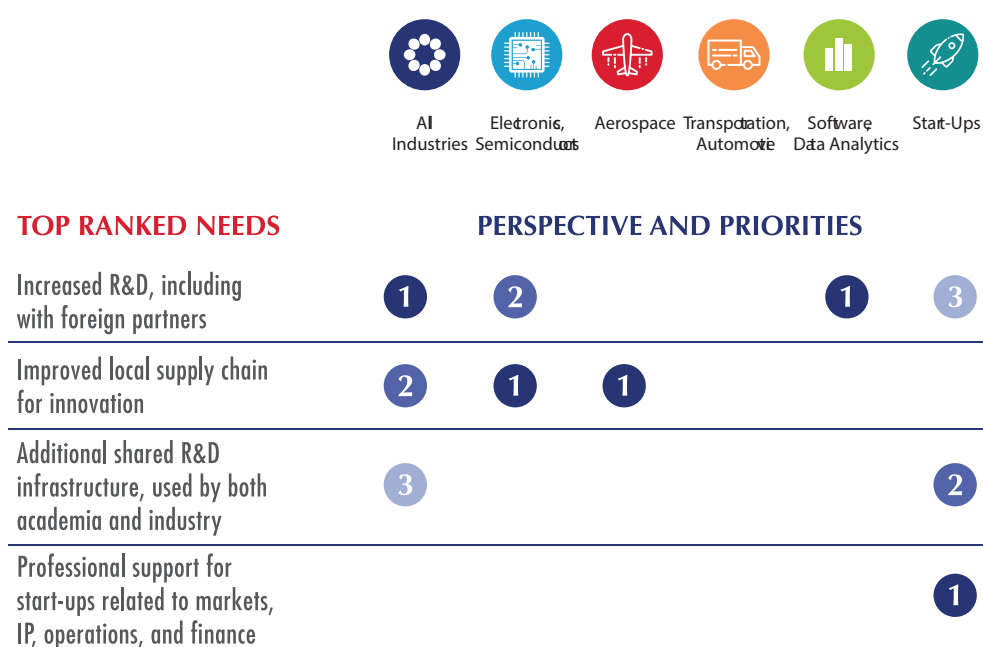
The first step in creating a solution that would encourage innovation in the high-tech sector of the Philippines is to identify and understand the associated needs. This effort will help facilitate discussion involving the ultimate users of innovation. Given this, a total of 60 respondents from the industry and industry associations were interviewed to obtain qualitative information on potential needs, help identify possible solutions, and gather information on which needs should be prioritized. Information was obtained using a structured, but informal, interview process.

To help articulate the needs, the USAID/STRIDE team interviewed key stakeholders to provide views regarding the needs of their organization, innovation support required, momentum and priorities. The focus of the interviews centered on the main foundations of the innovation ecosystem previously shown in Figure 1.

Support options were also presented as hypothetical services where respondents were made to choose options that might fit the current situation in the Philippines. A total of 40 interview sessions were conducted with around 60 respondents representing various industries (electronics/semiconductors, aerospace, automotive) and organizational characteristics (size, ownership, and industry role).

The interviews were able to highlight four key needs, which are shown in Figure 3. The “All Industries” category summarizes the top needs for all respondents, ranked in order from 1 to 3. The results for specific industries are also revealed. For example, according to stakeholders, the priority need for electronics, semiconductors and aerospace sectors is an improved local supply chain for innovation. For software and data analytics, on the other hand, the priority should be on increased R&D. Meanwhile, professional support is much needed for startups.

► *... according to stakeholders, the priority need for electronics, semiconductors and aerospace sectors is an improved local supply chain for innovation.*



**Figure 3. Top Rank Needs for the Philippines High-Tech Sector**

Overall, the most articulated need is related to R&D. Participants pointed out that limited R&D is a major constraint in the high-tech industry. However, respondents are positive that capabilities and interest can improve in the short run. It is worth noting that real impact will initiate from foundational improvements in R&D capabilities especially in universities and companies that have access to appropriate resources.

The second priority is for the local supply chain to develop towards prototyping, testing, and pilot scale production. This indicates the need for consolidation of supply, which can be achieved in the form of shared R&D infrastructure, which emerged as a third priority. The respondents revealed existing efforts to provide shared R&D and offered suggestions on how these can be improved for optimized impact.

Lastly, a strong need for support for startups was articulated. In particular, professional support is an essential need for high-tech startups in order for them to understand value propositions for various markets, IP strategies, venture, and finance, as well as operations. More details regarding the four priority needs are shown in Table 1.

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*... real impact will initiate from foundational improvements in R&D capabilities especially in universities and companies that have access to appropriate resources.*

**Table 1. The Four Priority Needs in Detail**

	Steps to Take and Elements From Which to Build	Existing Support Challenges	Future Support Recommendations
<b>NEED: Increase R&amp;D, including with Foreign Partners</b>	To increase R&D, the Philippines must better <b>ENABLE</b> existing academia and industry via training and funding as well as <b>ATTRACT</b> new ecosystem players. There are existing elements from which to build, including existing R&D funding programs, tax holidays and industry-level exhibition support.	One of the most significant challenges related to the existing support is the limited <b>AWARENESS</b> of, and <b>ACCESS</b> to opportunities by industry. Potential participants either are unaware, lack understanding, or do not qualify for many of the current programs. The other key element is <b>INCENTIVES</b> , which are used globally by governments to drive R&B and innovation. Tax reform is raising concern with high-tech MNCs. With an estimated increase in cost of 40% for SEIPI member companies, companies see a risk to competitiveness. Research at universities is hindered by procurement that is cumbersome. Researchers bear administrative burdens and can't focus on solving research challenges.	Future support efforts should include long-term and coordinated perspectives. The government should enable better guidance on which programs fit for a given individual or organization (e.g., provide professors and companies access to an "innovation ambassador" to help them identify and successfully connect to funding and partners). Also, government should broaden programs and calls for R&D around strategic focus areas. Outcomes will be improved by seeking proposals that drive multi-stakeholder engagement (e.g., co-funding) around real-world problems. Instead of having restrictive calls for proposals, the idea is to solicit broadly, and then pick the best from a higher volume.
<b>NEED: Strengthen the Innovation Supply Chain</b>	To strengthen the local supply chain, and better link to the global value chain, the Philippines should work to validate <b>MARKET</b> opportunities and then <b>FOCUS</b> on very specific efforts to fill gaps that can sustain a business.	Existing <b>FUNDING</b> programs like CRADLE and BIST may enable some companies in specific sectors, with specific characteristics, but qualification is limited (e.g., no aerospace). Also, companies are not aware, or are averse to applying. Government should consider how to increase the uptake for these programs by consolidating programs (reduce complexity) and broadening qualifications (less restrictive at the proposal stage).	Each industry has awareness of the supply chain needs, but needs help in consolidating the market "opportunity" because of the competitive nature of the data. Government data related to imports analyze by an independent third party could help to build a case for either local investment, or solicitation for suppliers, including foreign players if needed. The goal is to fill key development gaps that impact innovation cycle times and outcomes including materials, parts, testing, pilot-scale production, and more.
<b>NEED: Additional Shared R&amp;D Infrastructure</b>	To successfully provide shared R&D infrastructure it is imperative to first <b>CONSIDER</b> what existing gap it is addressing in terms of value. With that purpose defined, it is then critical to be sure to address target users (must be academia and industry), required standards and certifications, cost and confidentiality.	The Philippines can look at <b>LESSONS LEARNED</b> from existing facilities like ADMATEL and MIRDC and build forward for an even better next generation of support. Current issues relate to use and cost including issue with samples leaving/entering Philippine Economic Zone Authority (PEZA) locations, processes to protect confidentiality, and inability to support commercial scale.	New shared R&D infrastructure should focus on supporting directions of a long-term national innovation strategy, to address key gaps, in key locations that would help to build innovation clusters. For example, for aerospace it might be prudent to stand up certified support to enable metal finishing and non-destructive testing and evaluation in Clark or Cebu. This would meet the stringent aerospace requirements, but would also be of value to industries like automotive.
<b>NEED: Professional Incubation Period</b>	The key to a successful entrepreneurial community and associated impact is the ability to <b>ATTRACT</b> entrepreneurs, mentors, and investors.	There are existing incubators and accelerators, entrepreneurial education efforts, tax credits, and funding (e.g., IBID/IBED, TECHNICOM, IPRAP) to <b>LEVERAGE</b> . However, for many entrepreneurs, the programs are complex and do not match the entrepreneurs' abilities or time. Traditional investment is aimed at established businesses or market. There is a need to change risk mind-set to include high-tech ventures (beyond software and apps).	Once long-term strategic areas are selected, government procurement should be considered for those areas as an opportunity to enable local growth, including with start-ups. Entrepreneurs should be enabled to compete with support and by changing regulations to remove barriers. For example, laws related to minimum levels of previous experience (contract value) currently limit the ability for entrepreneurs to produce government contracts. The role of universities and their ability to be a geographically disperse network should be considered.

## Stakeholders' Broader Perspectives on Innovation

The interviews conducted also uncovered some issues related to the Philippines' innovation challenges. The discussions revealed both positivity and concern from the respondents as there are fundamental issues threatening the innovation-based progress of the country. While there have been several efforts in support of innovation, these efforts appear to be uncoordinated and, thus, there are lessons to be learned from past experiences. The following are key themes that surfaced from the interviews:

- **Education and training require stronger collaboration between industry and academe, especially in the area of R&D.** Some companies have tried to address this issue by holding on-the-job trainings. Some Professors on the

other hand, are also supporting knowledge transfer of current technology-related practices back into the classroom. A common feedback from the industry is that graduates do not have the capability for research work and thus, the company needs to invest time and money to train them. Companies who invest in research training meanwhile, struggle to hire or keep their employees.

- **Government policies and programs related to R&D are present but coordination between agencies is weak.** Most respondents are unaware or confused about government-funded R&D programs. According to them, the programs are very restrictive (e.g., specific industries, organization ownership, repayment, and PEZA) and processes are arduous and uncertain, hence, they choose not to invest their time and energy.
- **Investment for technology is uncommon in the Philippines.** Most investors remain traditional and settle for less riskier investments like in real estate and traditional businesses. Small companies are also less motivated to grow as they do not have the capability to scale up. Limitations in investment, tax implications, and experience remain as constraints.
- **Existing R&D does not match the prevailing industry problems, and usually exhibit academe-centric perspectives.** In order to drive innovation, R&D should be able to solve real-life problems, which the industry can use to produce improvements that will benefit the whole economy.
- **Local supply chain is required to support innovation in terms of reduced cycle time and cost, as well as shared problem solving.** The current situation forces companies to import prototype parts, or contract globally for prototype and pilot-scale development efforts, which takes longer time, depreciating the value of innovation.

### Strategic Areas for Innovation Investment

The future of innovation requires strong independent and collaborative efforts from the government, academe and industry. While there is no single approach that would meet all needs, there are important efforts that the government should consider strengthening.

Many programs related to innovation already exist but a lot of these must be improved to enable companies to navigate the system and encourage partnerships among actors. The Philippines can also drive innovation in the short-run by focusing on strategic areas with the highest perceived impact. More importantly, the government should identify areas with innovation clusters that can help create synergies that promote joint efforts. The respondents' views on strategic areas are presented below:

- **Sustainability** is crucial; this includes waste management infrastructure; reliable and renewable power and energy; public infrastructure and traffic, electric vehicles/mobility; smart monitoring and management for agriculture and urbanization; and water sources.
- **Next-Generation BPO.** The proven business model of BPO can be leveraged and used to develop a new area of value such as outsourcing integrated circuit (IC) design or other engineering services.

▶ *Many programs related to innovation already exist but a lot of these must be improved to enable companies to navigate the system and encourage partnerships among actors.*

- **Health/Medicine** can be explored, based on the strength of the local market, in consideration of the needs, capabilities, and geographic dispersion of the population. Opportunities in telemedicine were also mentioned by the respondents, along with broader topics such as biotech, biomedical devices, and pharmaceuticals.
- **Digitization and Big Data** are highly needed in the Philippines as the country is still practicing paper culture due to limited trust and geographic constraints. Internet of Things (IoT) and data management are minimum capabilities that must be met in order to compete globally.
- **Manufacturing**, including future methods for process innovation, should still include human element linked to robotics, so as not to completely eradicate the value of Philippine workers. The respondents likewise emphasized that it is too late for the country to explore semiconductor fabrication and that power rates are too high.
- **Materials** including metals, plastics, and coatings. Some respondents expressed concern that the Philippines is already way behind other countries, and it is rather too difficult to compete in alternative chemistries given the current situation.

▶ *Manufacturing, including future methods for process innovation, should still include human element linked to robotics, so as not to completely eradicate the value of Philippine workers*

DEPARTMENT OF TRADE AND INDUSTRY

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Series No. 2018-04



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The views and opinions expressed in this policy brief are of the author/s and do not necessarily reflect Philippine government policy.

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