Driving Innovation to Deliver Economic Value: A Needs Assessment of the Philippines’ Technology Sector

November 2017
“There is no innovation cluster in the Philippines; rather, innovation efforts are ‘fragmented and scattered.’ Coordination is needed in government on what topics to concentrate on. Guidance is needed for companies to exploit resources and programs.”

“High-tech start-ups either don’t start, or fail because there is limited mentorship, and the funding community is not structured for them. If they start there is no obvious exit strategy via acquisition or j-v, so they must also scale, which is a great challenge for even successful entrepreneurs.”
Executive Summary

Aligned with the Philippine Development Plan 2017–2022, the Philippines is moving toward an industrial policy that aims to enable inclusive and sustainable growth, building from innovation and entrepreneurship. It is important to consider this in light of the definition of innovation—the process of translating ideas or inventions into useful products and services for customers. Innovation is a key element of the Philippine Development Plan, and is driving significant legislative effort. This effort recognizes that various national planning and strategic efforts are all zeroing in on innovation as a major component of sustainable economic growth. One objective is to establish a National Innovation Council, or similar, to facilitate long-term innovation policies as well as build an “inclusive national innovation ecosystem.”

The Philippines has been an area of focus; however, the Philippines has a strong manufacturing base and related global advantages that can enable growth beyond other developing economies. For this reason, this study was requested by DTI, and conducted by USAID/STRIDE to identify the innovation support needs specific to the Philippines’ technology sector. As has been articulated, “in the increasingly globalised labour market, the most highly skilled and educated scientists and designers from developing countries are subject to ‘brain drain’ from their home countries: they have the option to relocate to higher-income countries, working for the same giant firms and designers from developing countries are subject to ‘brain drain’ from their home countries: they have the option to relocate to higher-income countries, working for the same giant firms.

Key stakeholders in the Philippines have been thinking and continue to think about how to increase competitiveness, much of which relates to innovation. As such, preparation for the assessment was informed by existing secondary resources and opinions of the selected Philippines’ industries as captured by the press, or in studies and roadmaps1 (Chapter 1), and patent data (Chapter 3). Building from this base of knowledge related to the target industries, the interview team developed an interview process and framework to probe specific needs and drive for consistency in the collection of perspectives. In parallel, the research team worked to compare the Philippines to other countries on key innovation variables (Chapter 2). The innovation assessment included in-person interviews with approximately 60 individuals representing the aforementioned industries, as well as the cross-cutting area of software and data analysis. The primary research captured the perspectives of multi-national corporations (MNCs), start-ups, and companies owned by Filipino investors. As needs (Chapter 4) and strategic areas for innovation investment (Chapter 5) emerged from the interviews, the team executed additional secondary research to further consider the most relevant best practices globally (Chapter 6).

Upon completion of the research, the team released and presented a draft report (May) at the 2017 Inclusive Innovation Conference. That document and numerous related meetings with stakeholders, including a workshop, were used to refine the analysis. This final report includes further insights, updates on momentum by the government (Chapter 7), and illustrative next steps recommended by stakeholders (Chapter 8).

2 To consider the definition of innovation see: http://www.economist.com/node/9928154
3 STRIDE completed an Innovation Ecosystem Assessment for the Philippines in 2014 that identified broad strengths and weaknesses related to innovation. Since completion of this report, STRIDE and other stakeholders have worked to close identified gaps (e.g., STRIDE Knowledge and Technology Transfer Office (KTTO) initiative). See: http://www.stride.org.ph/wp-content/uploads/2016/07/Full-Report.pdf. Also, at the time of this report, STRIDE is in the process of concluding a study of the Philippine agribusiness innovation ecosystem.
4 See: http://www.bousteads.com/content.php?section=extensive&extensive-issues-philippine-innovation-at-on-topshop.comindexed=148975
6 By number of individuals, based on H-1B visas. India, China, and Canada had the greatest number of H-1B visas 2009–2011, according to Bloomberg https://www.bloomberg.com/news/2013-08-20/india-nabs-nearly-two-thirds-of-u-s-h-1b-visas.html
7 Semiconductors and electronics are the Philippines’ largest export, estimated to be ~$30 billion in revenue in 2017 by SEIPI.
High-Tech Innovation Needs Assessment

Informed by innovation best practices, the industry interviews were conducted to help industry stakeholders consider and rank their needs. Each interviewee was first prompted to share their thinking about “top of mind” needs, so as not to bias their thinking. After capturing this open discussion, each interviewee was asked to prioritize specific potential support elements, including:

- Shared research and development (R&D) infrastructure and/or professionals
- Business incubation infrastructure and/or professionals
- Shared manufacturing resources
- Support in attracting foreign R&D partners
- Financial drivers and incentives
- Government R&D funding
- Supply chain for innovation including materials, prototyping, testing, and shared R&D capabilities and facilities

The insight gained from the interviewees highlighted four key needs, as illustrated in Figure 1 from the perspective of the different industries. The “All Industries” ranking includes the top needs for all interviewees combined, ranked in order 1, 2, and 3. The other industry perspectives highlight specific priorities. If fewer than three priorities are indicated (e.g., aerospace has only one), it is because the specific industry’s priorities did not align with the top four. The automotive industry is captured in the “All Industries” category because the sample size was too small, and the answers were too varied. Details of prioritization of the full list of support options, for each industry, are presented in Chapter 4.

In summary, the most articulated need was for more R&D. Participants overwhelmingly pointed to the minimal R&D being performed in the high-tech industries in the Philippines as severely limiting. There is a strong belief that there are capabilities and interest today that can start to improve. Real impact, however, will come from foundational improvements in R&D capabilities, including among higher-level researchers in universities and companies, with access to appropriate resources. Those researchers being challenged to solve real-world problems at a level worthy of peer-reviewed research, and global commercialization, will be poised to make a real difference. The second priority need was for the local supply chain to move beyond academic research toward development with supplies and processes for prototyping, testing, and pilot-scale production. This supply chain highlights the need for sharing, in this case consolidation of supply, which can also be in the form of shared R&D infrastructure, which was the third-level priority. There was excellent insight provided about the existing efforts to provide shared R&D, and how these can be improved, and the next generation optimized for impact for industry-led innovation. As start-ups are a key component in innovation-led economic growth, there was a strong need articulated for support beyond merely forming a company. Professional support is needed for high-tech start-ups, which are the minority, to help understand value propositions for various markets, intellectual property (IP) strategies, venture, and finance, as well as operations.

Societal Needs and Strategic Directions

Beyond the priority needs, there was a resounding message that the government should strive to enable a longer-term vision and commitment to strategic innovation in topical areas (Chapter 5) of societal importance to the Philippines and global markets. Recommended areas included: (1) sustainability related to transportation and beyond; (2) leveraging the business process outsourcing (BPO) business model for high-value technology-based services like design; (3) health and medicine; (4) digitization and big data; (5) manufacturing; and (6) materials. Any one of these topical areas could be the basis for an inclusive innovation effort that addresses the needs identified in Figure 1 and builds an innovation ecosystem and economic impact that gives stakeholders the opportunity to take a longer-term view of participation in large-scale public-private partnerships related to R&D. The government could fund selected efforts without restrictions to ownership, size, industry, etc. By letting the ecosystem propose what they can do to solve a social problem, the government may gain opportunities to fund truly innovative efforts that result in products and expertise of global value. Current government programs are often restrictive in the application process, and topic. Future efforts should consider enabling public-private partnerships that bring forward cross-discipline teams to solve the Philippines’ toughest challenges. The government could also consider where it has a role as a major consumer to provide a first market in support of innovative products.10

Innovation Ecosystem

Whether for grand challenges, or incremental innovation, the innovation ecosystem in the Philippines (academia, industry, government) must work together to better enable researchers to do meaningful research that is linked to real-world problems. Dysfunctions currently exist between the knowledge elements (academic research) and commercial reality (driven by the marketplace). The current less-than-ideal relationships undermine the Philippines’ ability to maximize the potential of local human capital. Limited R&D capabilities hinder the volume and quality of research, and what research exists is limited by the local supply chain. Current and future R&D and innovation efforts need an improved supply chain for materials, parts, and services like prototyping and pilot-scale production. Some of this could be in the form of shared infrastructure. Also, foundational to the long-term innovation success is the need to attract and enable entrepreneurs, mentors, and investors to help companies commercialize the R&D.

“Converting or ‘deploying’ research into financially viable businesses can be a major challenge. This is because the very skills, equipment, and facilities that create effective R&D may not be useful for new businesses. To ensure the conversion of research into a business, there must be effective financial conduits, business models, entrepreneurs, and matchmaking mechanisms that connect sellers to buyers of technology. These are complementary but distinct conditions. In the vast majority of cases, the people conducting research do not have the knowledge or ability to translate their research into a commercial opportunity.”11 This is true in the Philippines. Additional education and connections between academia and industry can be encouraged, catalyzed, and formalized by the Philippines government as a foundation for future innovation success. The government also has a clear role in building and enforcing a regulatory environment, including intellectual property,12 to encourage R&D commercialization. Policies at the federal and local levels can help or hinder both research and company participation in the innovation economy of the Philippines and globally.

Within the ecosystem, there is an opportunity to reduce the need to import materials and parts for R&D and manufacturing. At present, all materials and parts come from outside the Philippines, from which new parts are produced, and then predominantly exported. Reducing this import-export import cycle will improve the innovation process, and also the local supply chain, which both have economic benefit. It is important to note, beyond the technology-sector focus, the general findings of this study are applicable across most Philippine industry sectors.

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10 An example of this in the US is funding that is set aside for R&D as part of the Small Business Innovative Research Program (SBIR), where federal agencies put forward topics and funding. The Department of Defense (DOD), for instance, is an investor and customer. First products are often sold to a DOD program or prime contract, enabling innovative products to mature with the government need and then more broadly to additional customers and markets. Information on the SBIR and technology transfer is available at https://www.ossd.dod.mil/sbir/index.shtml
11 Bydlette & Rice, 2017
One of the most significant challenges related to the existing support is the limited AWARENESS of, and ACCESS to, opportunities for business. Potential participants either are unaware, lack understanding, or do not qualify for many of the current programs. The other key element is INCENTIVES, which are used globally by governments to drive R&D and innovation. Tax reform is raising concern with high-tech MNCs. With an estimated increase in cost of 40% for SEPI 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.

To successfully provide the global value chain, the Philippines must better ENABLE existing facilities like ADMATEL and SEIPI member companies, companies see a risk to competitiveness. Each industry has awareness of the supply chain needs (see Chapter 4), but needs help in consolidating the market “opportunity” because of the competitive nature of the data. Government data related to imports analyzed by an independent third party could help to build a case for both local investment, or solicitation of 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.

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 procurement, but would also be of value to industries like automotive.

Best Practice Models to Consider

There is significant research related to how a nation’s tax environment supports innovation, typically including indicators like effective corporate tax rates, R&D tax credits, collaborative R&D tax credits, and “innovation boxes”14 where it is recognized that the commercialization of innovation, going beyond the mere conduct of R&D, constitutes a vital driver of innovation and growth. Innovation boxes tax qualifying profits (profits derived from various kinds of intellectual property) at a lower rate in order to incentivize innovation. Innovation boxes differ from R&D tax credits in that they provide firms with an incentive for the commercialization of innovation, rather than just for the conduct of research. Research has found that innovation box policies do induce firms to patent more, and do more R&D, in the nations that have them. Some even apply to R&D conducted outside the country. One example for the Philippines to consider, because it requires R&D be conducted in country, is Turkey. Since 2014 there has been a tax exemption of 50% on patent-related income, for patents developed in Turkey or Technology Development Zones. This creates an effective corporate tax rate of 10% on qualifying IP, vs a regular corporate rate of 20%.15

Both South Korea and Israel have strategically supported improvement in supply chain at a local level and to compete globally, with successful government-supported ventures being privatized. For the Philippines, one example is the limited heat treating capacity; however, until capability exists there will not be enough volume. These “chicken-and-egg” scenarios related to economies of scale offer opportunities where the government can take the first risk, or incentivize investment. Another example is to support an aerospace supply-chain hub where opportunities have been quantified from government data to help encourage companies to tool up (import volumes today, and perhaps someday for Philippine aerospace procurement). Because high-tech industries have to compete globally, the government might also support/incentive invest to qualify toward international standards.

To drive toward Industry 4.0, next generation infrastructure should consider a model of “…hybrid infrastructure,” which integrates both physical and digital aspects, moving IT technology advances into traditional infrastructure to significantly improve its performance, is important to delivering the next wave of innovation and economic growth.16

The i-CorpsTM initiative17 in the US has gained momentum and offers a model for consideration by the Philippines. Funded by the National Science Foundation to drive interest and success, including start-ups to be sourced locally. Consider incentives to help drive interest and success, including start-ups to fill gaps. Leverage academia to help with economic analysis to demonstrate opportunities related to gaps.

Develop a version of i-Corps specific to the Philippines, as a pilot to: (1) demonstrate the effectiveness of funding training focused on considering value proposition based on primary market research, and (2) identify and attract experienced mentors. At the time of writing this report, it is pleasing to see DOST is currently considering this approach.
CHAPTER 1 | Background

Innovation is the process of translating ideas or inventions into useful products and services for customers that perceive value and are willing to pay. Innovation drives economies. The economic value of innovation can be described as a virtuous cycle that involves synergies between innovation ecosystem players, including companies, government agencies, educational institutions, investment organizations, and entrepreneurs. This report offers the consolidated opinions of these various stakeholders in the Philippines, focused on the electronics, aerospace, and automotive industries. It does not address agribusiness or services specifically, although many of the findings apply broadly.

“Starting and growing a business is as much about the innovation, drive, and determination of the people behind it as the product they sell.”

Elon Musk

At the request of DTI, the USAID/Philippine STRIDE Program reached out to varied stakeholders to participate in an innovation needs assessment. During March 2017, the STRIDE team facilitated approximately 40 structured discussions with approximately 60 individuals about innovation, as defined above, and the needs of the Philippines. The interviews offered multiple perspectives based on each individual, their organization (corporate, education, government), and other factors like industry (aerospace, automotive, electronics/semiciconductor, software/data analytics), ownership, and size.

This report is written for all of the innovation stakeholders in the Philippines, not just those who had the opportunity to be interviewed either formally, or informally. For the purposes of the study, we considered the entire innovation ecosystem (see Figure 4) to understand the inherent linkages between stakeholders. The use of an ecosystem model in describing relationships needed for innovation is somewhat common because the synergies within natural ecosystems are a good parallel for the relationships between entities like companies, universities, and governments working to build economic gain from new ideas. Innovation is referred to as an ecosystem because natural ecosystems are defined as communities of

Supporting Information and Insights

Next Steps

In considering needs, and potential support options, the research team re-engaged with a smaller set of stakeholders, including both government and industry, to probe key issues, to determine potential first steps to drive solutions, and to identify existing elements from which to build.

Figure 2 summarizes the key needs, aspects of how to address the need, existing challenges, potential future support, global best practices, and illustrative tactical next steps. It is suggested that further validation be conducted on the specific suggestions (further described in Chapter 8).

It is clear that the Philippines is poised to leverage the concept of inclusive innovation to drive towards increased and inclusive economic growth. The concepts that “success begets success” and “stigmas can disappear” have been illustrated by the evolution of the BPO industry from early reticence, to success, to today’s justifiable concern for its degradation. This example provides emphasis to the idea that to leverage innovation for continued economic success, the needs identified must be considered by all stakeholders in the Philippines’ innovation ecosystem. All stakeholders must hear the call to action to be a part of a future of open innovation, and it is primarily the responsibility of government to make this call.

Open innovation requires two-way flow of needs, knowledge, and technology, with industry (market needs) pulling and research organizations (industry and academic) pushing ideas from lab to impact. All stakeholders need to take a holistic view and seek ways to help with coordination, awareness, and funding to enable and encourage strong partnerships, investment, and economic growth. Success requires an enabling environment of trust and collaboration built on a strong “core” of education and human capital, with appropriate knowledge creation partnerships and technology transfer/commercialization mechanisms.

The successful innovation ecosystem, given the appropriate knowledge and understanding, can be boosted by carefully placed government-led interventions. Some of these are the activities described in Chapter 8, supplemented by suggestions from the authors in Chapter 9. The findings and recommendations should be considered and included in the DTI’s already-envisioned roadmap such that the execution is a coherent, cross-government initiative based on a common vision and strategic goals.
living organisms interacting with their environment through unique networks and interdependencies as part of a system. Just as nature’s interactions can be defined as an ecosystem, so too can regional and national economies. Much like natural ecosystems, “innovation ecosystems” are: (1) living, changing, and evolving; (2) connected and interdependent; and (3) shaped by (and shape) their environment. The health and growth of an innovation ecosystem require connections between two distinct but interdependent systems—the knowledge economy (driven by research) and the commercial economy (driven by the marketplace). It is at this intersection that the Philippines, like all countries, faces a challenge.

The two most common comments heard during the interviews related to: (1) concern over global politics and recent leadership changes; and (2) the “chicken and the egg.” The first issue is constantly evolving and beyond the scope of this effort, but the frequent reference to the chicken and egg highlights how many of the innovation issues facing the Philippines have an inherent chicken and egg causality dilemma (see Figure 3). This report offers insight into those issues such that stakeholders can consider investment to drive the virtuous cycle of innovation. With the chicken and the egg, what will come first to drive things forward? Should it be local or foreign R&D investment, tax credits or policies to drive R&D, or something else? This report offers insight into issues specific to the technology sector in the Philippines in an effort to enable a meaningful discussion and help drive forward innovation support for all stakeholders. This report and the research conducted were first used to inform a discussion at the Inclusive Innovation Conference at the end of May 2017 with the goal of informing a strategic “whole-of-government” and ecosystem-level approach to driving innovation in the Philippines. Specifically, the original findings that were based on industry input were shared with, and considered by, various entities in the Philippine government and educational system. From there, a draft report was released for comment, and a follow-on workshop with industry was conducted in September 2017. This final report consolidated all of this work over approximately nine months to bring more tactical recommendations, building on the original research.

FIGURE 3 Driving innovation can lend itself to the question of, “Where to start?”

CHAPTER 2 | Innovation Ecosystem

It is important to first recognize that the Philippines’ technology-sector innovation ecosystem is driven by economic and dynamic relationships that develop technology, and is led by the electronics, aerospace, and automotive industries. The ecosystem players include large MNCs; small-medium enterprises (SMEs); and start-ups, associations, universities as research partners and developers of future employees, as well as key government agencies like DTI, DOST, and Commission on Higher Education (CHED). As illustrated in Figure 4, ecosystem stakeholders interact to create and transfer knowledge that enables new products and businesses to ultimately drive economic development.

FIGURE 4 The USAID/STRIDE, adapted from RTI Innovation Ecosystem Conceptual Framework highlights the inter-related elements that are foundational to innovation and associated economic development.

It is held, at present, that the Philippines has a low level of innovation. In 2016, the Philippines ranked number 74 out of 128 economies on the Global Innovation Index, and 5th out of the 7 Association of Southeast Asian Nation (ASEAN) countries ranked in the index. The Philippines, which once would have looked at the United States and Europe for comparison, is now behind most of its geographical neighbors, including Singapore (6th), Malaysia (35th), Thailand (52nd), Vietnam (59th). The Philippines must consider its current position, and strive to catch up to countries that have invested in the building blocks of innovation including R&D, and support for high-tech businesses including entrepreneurship. The Philippines now is being challenged by Indonesia (88th) and Cambodia (95th); however, there are reasons for optimism.

27 The Global Innovation Index is co-published by Cornell University, INSEAD, and the World Intellectual Property Office. www.globalinnovationindex.org
28 The establishment of the ASEAN Economic Community (AEC) created a regional market of $2.6 trillion and over 622 million people. In 2014, AEC was collectively the third largest economy in Asia and seventh largest globally. Information available at www.asean.org
Innovation Economy Indicators and Comparators

A survey of nearly 14,000 executives globally shows that their perception of the Philippines’ capacity for innovation is improving. Figure 5 presents global executives’ perspective on innovation over the last 8 years, specific to the Philippines. Although most of the variables have been relatively flat, there has been an uptick in the view that the capacity for innovation in the Philippines is optimistic. As illustrated in both Figures 4 and 5, the key elements for innovation include (1) human capital including scientists and engineers, which is enabled by the education system; (2) investment in R&D and the creation of knowledge; and (3) transfer of knowledge via start-ups and/or commercialization with existing companies.

![Executive Survey Opinions for Philippines Variables](image)

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<tr>
<th>Innovation Capacity Variables</th>
<th>Executive Survey Opinions for Philippines Variables</th>
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<tr>
<td>Capacity for innovation</td>
<td>2.07 3.15 3.16 2.94 2.96 2.71 2.94 3.76 4.54</td>
</tr>
<tr>
<td>Company spending on R&amp;D</td>
<td>3.12 3.56 3.44 3.08 2.81 2.88 3.23 3.36 3.54</td>
</tr>
<tr>
<td>Government procurement of advanced technology</td>
<td>3.37 3.21 2.99 2.87 2.68 2.68 3.14 3.38 3.67</td>
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<tr>
<td>Quality of scientific research institutions</td>
<td>3.42 3.46 3.61 3.16 3.90 3.01 3.17 3.64 3.69</td>
</tr>
<tr>
<td>University-industry collaboration in R&amp;D</td>
<td>3.86 3.08 2.29 3.17 3.27 3.39 3.46 3.58 3.70</td>
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When considering the Philippines’ human capital, the supply of young engineers and technical graduates is not lacking. The Philippines graduates about 60,000 engineers annually, although the proportion of graduates with science, technology, engineering, and mathematics (STEM) degrees is declining. A very small percentage of these researchers go to work in R&D jobs in the Philippines. Many of them leave the Philippines or may be underemployed. Many go to business process outsourcing (BPO) jobs, which offer stability, a higher starting salary than manufacturing, and better benefits than manufacturing. Some go to study abroad to continue their education. Others go into industry but they work in non-technical roles rather than as engineers or scientists, working in non-technical business jobs.

Knowledge creation may be the area in which the Philippines is most lacking. As shown in Figure 6, the Philippines lags behind in R&D investment as a percentage of gross domestic product (GDP) and also in terms of total researchers. In the latter category, Singapore leaps to the top with Korea and Japan, and the Philippines falls to the bottom, well below Malaysia. If the Philippines added 8,000 researchers per year, it would take nearly 20 years to be at the level of Malaysia today.

Research in R&D (per million people)

Researchers in R&D are professionals engaged in the conception or creation of new knowledge, products, processes, methods, or systems, and in the management of the projects concerned. Postgraduate PhD students (ISCED97 level 6) engaged in R&D are included.

![Research in R&D (per million people)](image)
The impact of innovation and the potential for innovation are often tied to specific country-level metrics that reflect growth, investment, and other activities. This study considered the commonly cited innovation economy “readiness” indicators in an effort to understand and illustrate the Philippines’ current status and future potential related to innovation. Each variable was considered in comparison to a range of countries (Figures 7 and 8) that offer both aspiration (e.g., South Korea, Israel) and a competitive reality check (e.g., Indonesia, Vietnam) for the Philippines. The indicators that are more favorable to the Philippines are on this page, where as those that are not as strong are on pages 18 and 19.

**Indicators of Strength**

- **GDP/Capita Growth.** This analysis uses data from the World Bank and presents the comparison of the average growth of GDP per capita from 2012 to 2015 for the selected countries. This is an indicator of the health of an economy, although the growth drivers are also important. The Philippines has an excellent growth rate in comparison, partially because the economy is smaller and easier to “move.” One caveat mentioned about this indicator for the Philippines is that the growth has been based on a “consumption economy,” which may not be sustainable.

- **Current Account Surplus (% of GDP).** This variable is used by economists to compare countries in terms of their global balance sheet. A positive value indicates that the nation is a net lender, while negative indicates borrower. The Philippines can be viewed favorably here, especially in comparison to other ASEAN countries. The current account balance is the sum of net exports of goods and services, and net primary and secondary income. The data for this variable were also from the World Bank.

- **Job Creation.** This indicator shows the average annual growth in number of jobs from 2012 to 2015 based on International Labour Organization (ILO) statistical data. The Philippines can be viewed favorably here, especially in comparison to other ASEAN countries.

- **Capacity for Innovation.** This analysis captures the results of the World Economic Forum’s Executive Survey 2015, representing the consolidated opinion of approximately 14,000 business leaders. More detail from that survey on the Philippines is presented as Figure 5. As previously noted, the data show opinions have grown more positive.

- **High-tech Exports (% of Manufactured Exports).** This percentage highlights the role of the high-tech industry within the manufacturing economy of a country. The Philippines is the highest ranked country on this variable, illustrating the existence of a healthy tech manufacturing and export sector, emphasizing the importance of continued investment as well as adoption of new designs and technologies. The data for this analysis are from the United Nations’ statistics division (UN Comtrade).

*FIGURE 7 The Philippines can build on positive innovation indicators towards an innovation-driven economy.*
Areas for Improvement

- **Educated Labor Force.** This analysis shows the percentage of labor in a country that has advanced education beyond high-school level. The Philippines ranks well here, although ASEAN competitors also rank well—in fact, slightly better.

- **Foreign Direct Investment (% of GDP).** This ratio is used to look at the impact that foreign investment plays in an economy. For emerging economies, the impact of foreign investment can be critical to enable development and growth (e.g., Cambodia). For more mature economies, this value may be lower due to high levels of domestic private and public investment (e.g., South Korea). These data are from the World Bank.

- **Government Procurement of Advanced Technology.** This analysis is based on the World Economic Forum’s Executive Survey, which measures the perception of innovation from 14,000 business people on a scale of 1 to 7. Government procurement of advanced technology highlights that countries use their own market needs to drive product development and local supply chains. According to the opinion of business executives, Philippines is second to last for this indicator, ahead of only Cambodia.

- **University and Industry Collaboration.** From the World Economic Forum’s (WEF’s) same Executive Opinion Survey, business executives evaluated their perception of university-industry collaboration on a scale of 1 to 7. In this variable, the Philippines ranks higher than both Cambodia and Vietnam.

- **Ease of Doing Business.** This variable is based on a World Bank rating that considers multiple facets including permitting, infrastructure, property laws, access to credit, taxes, import/export, contracts, and insolvency laws/process. The three countries selected to gain insight, South Korea, Malaysia, and Israel, all rank high on this score, whereas the Philippines is only ahead of Cambodia for the selected set.

- **Ease of Starting a Business.** This variable is also based on a World Bank rating (ranked order from 1 to 190) and is of importance in fostering entrepreneurs to have an impact on the economy. It is one of the facets that is included in the Ease of Doing Business rating (left). For this indicator, the Philippines and its ASEAN counterparts are all well away from more mature innovation economies like South Korea and Israel.

- **Patent Activity.** The protection of IP has been tied to innovation and economic prosperity. This analysis includes the total patent applications by residents, both domestic patents in national offices and global patents filed through the Patent Cooperation Treaty (PCT). The data represents patent filings in 2015 and are tracked by the World Intellectual Property Organization (WIPO). The Philippines is lacking in this regard.

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**FIGURE 8** Philippines can look to other countries that have enabled innovation.
CHAPTER 3 | Intellectual Property

Globally, R&D is typically protected by patents. Patents have been correlated with positive impact for countries, as a system of established private property rights has a direct correlation with economic growth.33 The Philippine Intellectual Property Office has been evolving and more active since 1998.

For this study, a series of patent searches was executed specifically related to electronics/semiconductors, automotive, or aerospace inventions.34 The first search identified approximately 1,000 records (patents and published patent applications) that have been issued in the Philippines since 2014. The dominant assignee was Philip Morris (105 records) with Canon a distant second (19). The same search was run for these industries in Singapore and Malaysia. Singapore had more than 17,000 records with Singapore’s Agency for Science Technology and Research (A*STAR) leading (231 records), followed by Novartis (211) and Philip Morris (168). The same search within Malaysia identified about 900 records. Similar to the Philippines, the same search in Malaysia showed limited patenting activity by volume in these industries. However, Malaysia’s dominant assignees resemble Singapore’s, where three of Malaysia’s top five dominant assignees were public-sector agencies: MIMOS Berhad37 (28 records); the University of Technology, Malaysia (18); and the University of Malaysia (18).

This simple exercise highlights that patent activity in the Philippines is not high. The limited activity may reflect the limited R&D in-country, the limited need to protect IP in the market, or a limited value of protection because of an emerging IP system, including the courts. Any of these reasons highlight the need for maturation and value related to patents as a foundation to a healthy innovation ecosystem. Interestingly, the comparison to Singapore and Malaysia brought forward government support of R&D and patenting in competing economies, which is lacking in the Philippines. Agencies of note included A*STAR, which is Singapore’s “lead public-sector agency for economic-oriented research to advance scientific discovery and develop innovative technology.”35 In Malaysia, the public-sector organizations included MIMOS Berhad, and several universities. MIMOS Berhad is Malaysia’s national R&D center, operating under the Ministry of Science, Technology, and Innovation. MIMOS develops indigenous technology platforms for local industries and specifically licenses to Malaysian companies to build products for a globally competitive market. The University of Technology, Malaysia operates an Innovation and Commercialization Centre to facilitate commercializing its IP through industry partnerships, startups, and joint ventures to benefit the Malaysian economy. The University of Malaysia also licenses technology to industry to accelerate the scaling of their R&D outputs. These agencies use their R&D to bring industry to Malaysia.

Another patent search was completed to ascertain the level of patenting outside of the Philippines by Filipinos and Philippine-based operations. Searching with Philippine addresses (companies and individuals) returned about 1,200 records globally since 2014 (Figure 9), a comparable level to filing within the Philippines. From this analysis it appears that patenting outside the Philippines is most frequently in the United States and with the WIPO. Lexmark led in a number of records (68 records) followed by Texas Instruments, E-innovations, ST Micro, Asstec, SunPower, International Rectifier, Smart Hub, NCR, and Fairchild (from 36 to 23 records). This search did not capture MNCs that filed with an address outside the Philippines.49

Within an innovation ecosystem, knowledge typically moves in both formal and informal pathways. The informal typically occurs via relationships, and the flow of people in and out of organizations. Formal knowledge transfer is typically in the form of joint research agreements, licensing, or spinoff and start-up companies. The limited research environment, and nascent patent infrastructure, may indicate that formal knowledge transfer is lagging. The Philippines does have a long-standing entrepreneurial culture, and respects IP, which is being encouraged with more entrepreneurial education40 and programs.41

10 Search by RISKVERSE team using Thomson Innovation
11 MIMOS Berhad is a research and development center in Kuala Lumpur, Malaysia under purview of the Malaysian Ministry of Science, Technology and Innovation. The company was founded as the Malaysian Institute of Microelectronic Systems in 1985.
12 A*STAR supports Singapore’s key economic clusters by providing intellectual, human, and industrial capital to its partners in industry. It also supports extramural research in the universities, hospitals, research centers, and with other local and international partners. More information available at: https://www.a-star.edu.sg
13 This search strategy is limited in accuracy, but gives some sense of Filipinos patenting outside the country, and at what volume.
14 See: http://www.gtp.et.dz/dsides-new-campus-aj-techentrepreneurship-hb/
15 Examples include “Technopreneurship” courses, an outcome of the recently concluded USAID Innovation Development for Entrepreneurship Acceleration (IDEA) project, run by PhilDev www.phildev.org or Philippine Development Foundation.
CHAPTER 4 | High-Tech Sector Innovation Needs

The Philippine innovation ecosystem has strengths to build from, and weaknesses to address. Supporting the technology industry, as represented by the electronics, aerospace, and automotive segments, is critical for driving innovation. These sectors link to the Philippines’ manufacturing base, which currently lags the growth of the services sector. The opportunity in each of these sectors should be considered. The electronics and electrical equipment industry dominates Philippine exports with $23.1 billion (2014), with machinery and mechanical appliances a distant second with $8.9 billion. Transportation, including automotive production, is one of the world’s largest manufacturing sectors with global trade of more than $1 trillion, and Asia is the fastest growing aerospace market with a significant rise in civilian aircraft projected.

The automotive industry also inherently includes a domestic market that many countries have used to drive innovation. All of these industries offer excellent opportunities to drive the economy of the Philippines, with investment in elements that drive innovation.

To date, there have been significant efforts by associations and government agencies in the Philippines to create actionable roadmaps to help build a successful future. Key elements related to innovation and recommended actions that were considered prior to the innovation needs are summarized, by industry, in Figure 10.

As the manufacturing base today, these three industries may be the key to the Philippines’ future economic realities. The potential for the Philippines and its manufacturing sector is routinely referenced, but the Philippines’ innovation stakeholders, including companies, academia, and the government, need to prioritize and harmonize innovation support to be successful.

AEROSPACE46

- Build capacity via education and training. Support training programs and certifications for aerospace manufacturers and service providers to conform to the global aerospace standards, and bridge the gap between academia and industry via aerospace engineering curricula.
- Support the development of a local supply chain. Use collaborative endeavors between aerospace manufacturers to develop a supply chain of local producers. Optimize use of DOST facilities and expertise for metal processes and testing of manufactured products/parts.
- Expand markets by enticing Tier 1 and 2 to the Philippines. Focus on Tier 1 or Tier 2 suppliers of big aerospace companies (OEMs) for strategic products and services. Improve government incentives to foreign investors. Tier 1 suppliers sell finished products directly to the OEMs, and Tier 2 suppliers sell their components to the Tier 1 suppliers, who then make the products.
- Increase government investment in attracting local and foreign partners. Increase incentives and reform policies, as well as establish training facilities to elevate the skill levels of the labor force.

AUTOMOTIVE47

- Increase competitiveness with technical maturity of people and infrastructure by working to reduce power costs, increase efficiency in logistic services, and optimize policies related to free trade zones. Create auto R&D centers to develop product technology, while increasing human resource development.
- Incentivize with policy reforms and stability by aligning Philippine standards with other countries, such as labor incentives, customs, procedures, and systems, as well as technical, environmental, and safety standards.
- Provide business intelligence supported by monitoring key auto developments domestically and internationally, including market and technology trends. Create and manage an auto database that houses key indicators, policies, and regulations both locally and abroad.

ELECTRONICS AND SEMICONDUCTORS48

- Identify global market and technology trends, and strategically invest. Select strategic and specific products and technologies from the trends for the Philippines to focus on.
- Compare resources and operating environment competitiveness. Identify the necessary and desired resources, policies, supply chain, and operating environment that will elevate existing firms to attract new investors to the Philippines.
- Augment resources, policies, and supply chain to execute strategically.

Figure 10 Existing industry roadmaps were leveraged to inform interviewees and augment understanding prior to, during, and after the primary research was completed.
Innovation Needs Assessment Research Process

As with any good innovation initiative, creating a solution of value must start with understanding the associated needs. As such, in assessing the needs of the Philippines’s high-tech sector, significant primary research effort was used to facilitate discussions with the ultimate users of innovation. Ultimately, about 60 individuals from industry (including associations) were interviewed. The positive response to the request for input is an indicator of the interest in and commitment to the topic of innovation that stakeholders have. The information collected was obtained using a structured, yet informal, interview process. The interviews were not a formal survey. Rather, the process was designed to quickly obtain good qualitative information on potential needs, and to work through prioritization on potential solutions.

To understand the needs, the USAID/STRIDE team sought out key stakeholders who could articulate their views on the needs of their organizations and the country, innovation support solutions to date, momentum (or lack of), and priorities. The interviews focused on the foundational pillars of an innovation ecosystem (Figure 4) as well as potential support options. The support options were presented as hypothetical services or support and were chosen from innovation best practices that might fit the Philippines’ current situation. As has been said about innovation, “It’s not an idea problem; it’s a recognition problem.” Most of the hypothetically proposed solutions have been referenced in various Philippines industry roadmaps, or documents by other stakeholders, including the government. Novel support options are not necessary, but prioritization and strategic thinking in alignment with ecosystem needs are. Thus, each participant was asked to consider and rank as ‘high, medium, or low’ the following potential innovation support options:

- Shared R&D infrastructure—offices, labs, equipment, and materials
- Shared R&D professionals—certified researchers to support/conduct research
- Business incubation infrastructure—offices, labs, equipment, and materials to support start-ups and entrepreneurs
- Business incubation professionals—commercialization professionals including legal (e.g., contracts and IP) and business (e.g., strategy, finance, marketing, and sales) expertise
- Shared manufacturing resources—equipment and professionals to support development and pilot-scale production, measurement, and testing
- Support in attracting foreign R&D partners—messaging/connections/policies to attract R&D capabilities and funding to the Philippines to create local knowledge
- Financial drivers—policies and incentives to help with investment and taxes
- Government R&D funding—competitive awards for R&D to companies in strategic areas
- Supply chain—enable SMEs to be collaborative, local suppliers for innovation, including materials, prototyping, testing, and other R&D resources

In total, the USAID/STRIDE team conducted about 40 interview sessions with about 60 individuals representing varied perspectives across industries (electronics/semiconductors, aerospace, automotive) and organizational characteristics (size, ownership, and industry role). There was also a subset of individuals who represented software and data analysis, which is a cross-cutting technology and market area. Many of these interviews also addressed the needs of start-ups. Figure 11 represents the majority of organizations interviewed. A complete list of interviewees, and the perspectives they brought to the effort, is presented in Figure 14.
Stakeholders’ Innovation Needs and Prioritization

The stakeholders’ views on the various support options were captured and analyzed\(^7\) across key criteria. In general, many interviewees thought all, or the majority of the options, were of high importance. The interviewees were encouraged to show variability across the options to gain some prioritization, although in many cases they insisted on ranking the majority, if not all potential options, “high.” As would follow the law of averages, the combined rankings of the full group had the least variation in prioritization of the various options.

The top four priorities for the full group of interviewees were (in rank order) the need to

1. attract more foreign partners to do R&D in the Philippines;
2. bolster the local supply chain, which currently imports production resources and exports goods;
3. enable shared R&D infrastructure, which is contingent on a direct link to the use of the infrastructure by both academia and industry; and
4. link to professionals to advise and support start-ups.

When considered by industry, the automotive perspective can not be analyzed alone, as it was a small set, and the variation among the interviewees was too disparate. The one priority that was agreed on by all of the automotive interviewees was the significant need to attract foreign R&D investment. The collective views for electronics, aerospace, and data analysis/software are illustrated in Figure 12. The priorities are fairly consistent in relative ranking of needs with aerospace having similar prioritization, although often a lower sense of need, except in the area of local SME support. The aerospace community saw this as critical, although difficult to attain because of certification complexities. Another support option that saw some variation is the perceived need for the government to fund R&D directly to companies. The aerospace interviewees ranked this much lower than did their electronics or software/data counterparts. This may be a result of the fact that aerospace players in the Philippines are farther removed from the product development cycle than their peers in electronics/semiconductor and software/data analytics companies. The electronics industry sees a lower need for shared manufacturing resources.

The prioritization was also considered by perspective in terms of company size and ownership; only Filipino-owned start-ups were interviewed, and these two sets were combined and compared to MNCs. There are a few MNCs that have Philippine ownership. As illustrated in Figure 13, the needs of the locally owned companies vary from those of the multinationals in that there is a greater sense of need with two real exceptions in needs: (1) financial drivers, and (2) local SMEs. The lower prioritization of needs for multinationals, especially the lower need for shared R&D and government R&D funding, makes sense as resources are more readily available to MNCs and their research is often conducted elsewhere. Also, MNCs likely have a greater need for secrecy to protect product development directions and IP, and thus may be less likely to have the government involved. There was disparity of understanding of what exists today for government R&D funding related to their industry and organization.

\(^7\) The qualitative rankings were shifted to a quantitative rubric. Not all interviewees had rankings. Some had rankings that counted in more than one category, if their interview truly brought the perspective of both categories (e.g., start-up and data analytics, or association and a specific industry).
Interviews were conducted with the following organizations; for many there were numerous individuals involved in discussions.
Stakeholders’ Broader Perspectives on Innovation

The interviews that were focused on innovation support needs also brought forward perspectives on root causes related to the Philippines’ innovation challenges. Discussions tended to reveal a combination of positivity and concern. It became clear that the Philippines has strengths from which to build, which may enable opportunities for driving and benefitting from innovation; however, there are also fundamental issues that threaten innovation-based progress. The Philippines has not been standing still in terms of innovation support efforts, yet the efforts do not seem to be well coordinated, and there are lessons to be learned from experience to date. The following key themes emerged:

- Education and training need stronger linkages between academia and industry, especially in the area of R&D. Many companies have started to address this gap themselves with investments in on-the-job training programs. Some of these programs include professors trying to enable knowledge transfer of current technology-related practices back into the classroom. Industry commonly states that graduates do not have the capabilities needed for research, and thus the company invests time and money in the first few years of employment. The companies that are known for building research skills struggle to hire or keep the individuals in whom they invest.

- Government policies and programs related to R&D exist but have limited coordination or uptake. Most organizations interviewed either were not aware of, were confused by, did not qualify for, or did not choose to participate in government-funded R&D programs. From their perspective, the programs are structured with restrictions (e.g., specific industries, organization ownership, repayment, and PEZA) and processes that make the path arduous, and the upside uncertain, so they choose not to invest the time and energy to pursue.

- Investment for technology is “not the norm” in the Philippines. Most investors are comfortable with more local and traditional businesses. The experience of local and foreign investors is lacking. From the company side, many small companies are not motivated to grow, or do not have the capability to scale. Limitations include investment, tax implications, and experience.

- Existing R&D is often funded to move forward on incremental technology development pathways, or to enable academia-centric perspectives that are not driven by industry-centric problems. If the funding is to improve science and technology, it should be required at the global peer-reviewed level such that it offers value that can be exploited via license of resulting IP or know-how. More importantly, there should be more R&D that is focused on solving real-world problems, potentially with industry partners that can leverage the novel solution, or IP or know-how. More importantly, there should be more R&D that is focused on solving real-world problems, potentially with industry partners that can leverage the novel solution, or IP or know-how. More importantly, there should be more R&D that is focused on solving real-world problems, potentially with industry partners that can leverage the novel solution, or IP or know-how.

- Local supply chain is needed to support innovation with benefits that include decreased cycle time and cost, as well as shared problem solving. Companies at present have to often wait to import key prototype parts, or have to contract globally for prototype and pilot-scale development efforts.

In addition to these key themes, some very specific commentary was captured about innovation support needs across all industries, specific to each technology-sector industry, and also specific to the entrepreneurial perspective. Direct comments are shared because of the great value they provide. The input was consolidated to capture strengths, weaknesses, opportunities, and threats (SWOT) for further analysis as follows:

- All Industries—captures common themes applicable to the Philippines broadly
- Electronics and Semiconductors—specific to and about electrical manufacturing
- Aerospace—predominantly about manufacturing for airframes and interiors
- Transportation and Automotive—predominantly automotive manufacturing and e-vehicles
- Data Analytics and Software—including big data and artificial intelligence
- Start-ups—specific insights from and about start-ups

All of the strengths, weaknesses, opportunities, and threats in these tables were captured directly from interviewees. As such, some may be inaccurate, controversial, or prejudicial. Regardless, they indicate a viewpoint that even if wrong, or inappropriate, may offer insight on perspectives that can be fixed, and in many cases real problems or opportunities to address.
Start-Ups

Companies have not all leveraged and helping develop curriculum professors to current technology to in some support for R&D on commission IC design. Some companies are starting to do community-level efforts connected/networked (although in manufacturing than Malaysia)

Companies are trying to expose athletics/dances/associations much is social around proposals; NO AH (flood monitor-)

Estimated 30% greater export

Semiconductors

Electronics, Semiconductors

Aerospace

Start-Ups

Strengths

Weaknesses

Opportunities

Threats

Largest national export at 50% (70% semiconductor assembly, 30%-electronics manufacturing services (EMS), which has created local experience and talent. Estimated 30%-greater efficiency in manufacturing than Malaysia

Electronic community is connected/networked (although much is social around athletics/dances/associations)

Companies are trying to expose professors to current technology to improve the workforce, and helping develop curriculum (e.g., IBM developed an optics capability with a 13-week course)

Companies have not leveraged government incentives and some are initiating their own efforts and community-level efforts

Some companies are starting to do IC design on commission

The government has invested in some support for R&D, including 50 labs, funded R&D projects with industry, and associations, via corporate proposals, MIR (monitoring was successful: JUMBA, 10 printers in universities [yet they are undersized], significant for funding for hardware development

Failure and material analysis are improving (Lapi Lapi and Cebu)

Links to automotive, aerospace, and future IoT

Product mix is dominated by aging products, vs. tablets/mobile that use newer technology. Exports have been flat. There is “momentum for electronics innovation ecosystem,” and pessimism is common

Education does not align to industry needs, especially limited number of graduates (PhDs); need research and lab with equipment in schools and the ability for industry to collaborate and transfer knowledge; companies are filling the gap with training; design engineering takes 5 years of experience to have real value, and the pool is too small

No clarity on government’s awareness/intent relative to the electronics industry

Funded projects often lack the transition organization to translate the effort into a real product. Historically, R&D has been at academia where publishing is the goal, not products, and it is hard to “get the research out of the university”; it is culture-lacking: need to do collaboration vs. worrying about splitting an economic upside that may never come

MNCs are not pushed to bring R&D to Philippines

Government management of confidential information is difficult, which may limit participation by companies in innovation projects; MIRDC charges the same private participation fees as there is no incentive

Government R&D funding opportunities are not widely known, similarly, limited success with R&D tax holidays (belief is only one or two companies have gotten tax benefit)

Enables higher value products (semiconductor) and peg “winning” products (EMS); considers a “national product” for multiple sectors to drive a competitive advantage

Other governments fund R&D with companies and also have “housepower university R&D systems’’ that easily link to industry and drive economic growth

Singapore has a solid innovation ecosystem with the link between government and academia aimed at strategically important areas; electronics industry gets “red carpet” from global governments (e.g., Singapore, Thailand); power in Thailand is subsidized

Philippines accepts inferior equipment, which results in companies “dumping depreciated assets”

Research and design, and even prototyping, are typically done in country of the company’s headquarters with only test in the Philippines, which limits exposure

Supply for competitors globally is immediate (United States via Amazon, China is all local, which gives them a speed advantage in development

Development requires using pilot-scale fabs abroad, which limits potential (typically in Taiwan)

Reputation for quality and respecting IP (e.g., China

Aircraft maintenance has good reputation (e.g., Lufthansa, SIA Engineering) and air travel in Asia is the next big market

Trade association, airlines, and Maintenance, Repair, and Overhauls (MROs) are aligning on need to upscale aerospace manufacturing

Government support promoting and expanding networking for parts manufacturing, aircraft maintenance, and repair MRO and training

Certified machining now exists to the level of producing a full airplane

Good molding capabilities exist as a potential foundation for R&D

History of enabling designs to be manufactured

Tier 2 capabilities for direct export to OEM markets

Cross-industry collaboration for R&D and supply chain, need to see each other as partners more than competitors, including the big three (B/E, Moog, Jamco)

There are common R&D needs, and a need for a local supply chain that includes metals finishing (e.g., anodizing), and nondestructive testing and evaluation, enable SMEs where the airports are

Need shared R&D (equipment) that is certified with government support (no profit) to build capabilities for production

Need to encourage sponsored R&D with Boeing or Airbus with government cost share (e.g., debris injection molding, or thermalforming)

BPO model for outsourced services (e.g., line drawing) with support near manufacturing

Certification is required, which varies for different customers/markets and is difficult to attain—this limits local supply chain

Capitalization is expensive; “build it and wait for the demand” is hard for businesses to do

BP will not allow for sharing some R&D resources (people are harder than equipment)

Other countries support their aviation industries, including global players like China (The Philippines for Euro Falcons from Kensa (structure-counter-trade that is not margains)

Automotive exports of SGR in 2016, which is 4%-5% of Philippines exports (but only a tiny fraction of global market)

History with, and market for, e-vehicles

Government has supported automotive industry (e.g., MIRDC, CARS)

Lower salary as applied engineer whereas sales engineering pays well

Automotive education is about repair, not engineering

Local supply chain is lacking, including need for prototyping

Companies need to upgrade capabilities (e.g., sanding)

MIRDC “does not align with companies’ needs” and does not meet international auto standards (e.g., destruction levels); Concerns that CARS may not meet government expectations

Sustainability is needed in Philippines and globally, and thus there is multinational interest in transportation infrastructure; choose a Local Government Unit (LGU) to enable product proof of concept

Develop local capabilities from outside to “learn behind” knowledge (e.g., metal casting)

Support shared prototyping and manufacturing equipment, especially for SMEs; shared services for prototyping, and testing of materials/products to destruction level

Lack of vertical integration (relative to competing countries); OEM in Philippines does not make sense (unlikely)

Companies follow their “national flag” which impacts politics

Strengths

Weaknesses

Opportunities

Threats

All Industries

All Industries

All Industries

Transportation, Automotive

Software, Data Analytics

Start-Ups

All Industries

All Industries

All Industries

Electronics, Semiconductors

Aerospace

Transportation, Automotive

Software, Data Analytics

Start-Ups
Singapore has solid start-up support in this area. United States has coding schools that train workers in 10–16 weeks. Interestingly digital initiatives get sent to the United States to incubate.

Global big data companies are easy answer (e.g., Accenture) and will be hard to compete with.

Companies outsource this kind of work, sometimes as “work shop”

Examples of innovation success will fuel interest and activity related to innovation; companies can be made more aware of how data can be used to improve organizational effectiveness.

Use data to understand markets and opportunities.

Government support of long-term or less-obvious return on investment (ROI), select government project as foundation for “shared project,” using non-sensitive data (e.g., R Users Group).

Consider cloud computing.

Improve data analytics curriculum (with CHED) in alignment with roadmap that is being developed.

The government doesn’t specify hardware/software at the appropriate level.

The national broadband plan is lacking; improved connection to the province is needed.

Universities are too protective of their IP and “sit on it”.

Data science is not a cultural norm for “achievement” like being a doctor/nurse or engineer.

“Stay can be an algorithm” is a counter to the sat-sat low-risk venture, where “you can eat your inventory.”

There is a lack of local data science capabilities (e.g., less than 1% of universities have data science degrees; there is also a lack of software capabilities with demand for out-stripping resources).

AI is exciting, but R&D in the Philippines might be premature because the data capture is still immature, and executives do not know the questions to ask and therefore can’t benefit from data analytics; “Demand is here but the businesses lack the maturity to use data analytics.”

The government doesn’t specify hardware/software at the appropriate level.

The national broadband plan is lacking; improved connection to the province is needed.

Universities are too protective of their IP and “sit on it.”

Southwest Asia is the fastest growing region for big data.

AI working groups (e.g., DOST).

The BPO industry association (BAP) is looking at artificial intelligence (AI), and Philippines has BPO structure that could align with big data.

Universities have capabilities (e.g., the University of the Philippines has start-ups in this space, Renesas has publications, and De La Salle has IP and publications).

Community has tried to align (e.g., Analytics, which lost momentum when lead left Philippines).

The “human capital” is in Philippines, and is less expensive, but needs to be enabled.

There are accelerators (iDealSpace, Kickstart, Launch Garage, Play & Play), and other shared spaces exist.

Government supports incubation, government efforts to support start-ups, Slingshot was cited as a good initiative, although impact may have been limited by “insiders” already knowing each other, and some of the discussion going over the heads of “outsiders.”

Cyber-security “hack challenges” have demonstrated that universities can rally engineers to solve real-world problems.

There is an effort toward ramping up entrepreneurialism at the university level.

Tax credits exist (inventory aren’t aware, and start-ups are not positioned for the red tape).

Culture of entrepreneurship is patriarchal and often low-risk (e.g., sari-sari) with limited high-tech experience, when children inherit companies, it is hard to make changes because of family perspectives.

Status quo is limiting. “If the house is not burning...” then everything is OK—same philosophy for margins, which limits innovation.

Rules favor big players to get government contracts, fix the rule that a company has to have proof it has done business at the level of 50% of the contract value to only situations with appropriate risk, as this limits start-ups in many cases.

Professors are limited in their ability to patent and spin-out (limited monetary upside and heavy teaching loads), universities in general need better culture and education toward start-ups (young can take the risks); they need to learn to ask the right questions; innovation programs are located in science departments without a link to business school.

The majority of local wealth sits in just a few companies for which disruptive innovation is hard, shell companies look like start-ups and the government doesn’t recognize or consider the situation.

Kickstart is the only one to go beyond A/B funding.

Increase the number of start-ups that become SMEs; mentorship is needed to help “scale” businesses, including access to relationships; companies need to think about markets beyond the Philippine borders.

Enable support beyond just how to legally start a business, including IP management, foreign company interactions, contracts, corporate investing, market insights, and scale-up for a high-tech venture.

Create a streamlined reporting process to unburden administrative requirements (monthly, quarterly, annual reporting to city and national) – “US is much easier.”

Enable better access to capital through education of investors, and structure of investment mechanisms.

Enable access to key technical and market information (e.g., global journals) and support in translating to opportunity analysis.

Shared equipment, even simple things like computer numeric control machines (CNC) can help.

Consider the electronic financial transactions market to compete with Western Union, which profits from expat Filipinos sending money home.

Government could favor local start-ups over foreign companies.

I wish I was Singaporean!” as a perspective of how hard a high-tech start-up is in Philippines because Singapore has cheap office space, and 30% citizen-ownership the government will triple the investment (up to a max.)

Other countries have anchor “high-tech” or “big-tech” that motivate or create entrepreneurs (e.g., Google, Facebook).

Currently, “Entrepreneurs” make money with Internet content and get paid for hits, not high-tech entrepreneurship.

Philippine venture capital funds go abroad (e.g., Silicon Valley, Singapore, Hong Kong).

Foreign start-ups do not come because of red tape and lack of infrastructure easier to incorporate in the United States.

The political environment limits the ability to be a global magnet (e.g., Singapore or Chile).

Interest rates are high.

U.S. start-ups deduct cost from their income taxes.

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U.S. start-ups deduct cost from their income taxes.
CHAPTER 5 | Strategic Areas for Innovation Investment

The future of innovation is not just about what the government can do, but also about academia and industry driving forward both independently and collaboratively. The success will come if the innovation ecosystem can build relationships and cooperate. There is no one answer, nor will any one single program meet all needs; however, for national-level strategic growth from innovation, there are efforts the government should consider either bolstering or standing up. To begin, there must be a shared understanding via definitions, language, and framework for innovation. These include support options that were offered for prioritization in the interviews, including efforts to increase and attract R&D funding, empower entrepreneurship, accelerate product development with prototype and pilot-scale production, enable local testing, and create an innovation-friendly business environment.

Many innovation programs already exist, but their impact must be improved by enabling companies to navigate the ecosystem and by recognizing synergies and encouraging partnerships. Also, the Philippines can drive innovation in the short term by selecting a few strategic areas with meaningful local and global needs in which to invest. As illustrated in Figure 15, the strategic investment could align with and/or motivate multi-stakeholder investment in R&D, support local start-ups and SMEs, and be a direct link to academia to enable higher level, research-based education, as well as real-world applications. Government support, as articulated by the stakeholders, would be valued if it could help attract foreign research partners, provide R&D incentives, reduce barriers for start-ups and SMEs, and enable strategic procurement for product testing and scale-up, and will provide funding.

For Innovation and Entrepreneurship

Sustainability Next-Generation

R&D Education and Experience Building the Human Capital For Innovation and Entrepreneurship

Industry

Public & Private Academia

Government

R&D Enabler Driving the Research Agenda With Investment and as a Customer

R&D Partner Implementing Innovative Services and Products With Investment and Commercialization

FIGURE 15 Human capital in the Philippines can be enabled by government and industry with investment and commercialization in strategic areas.

There was a resounding message that the government should strive to enable a longer-term vision and commitment to strategic innovation. There was frequent commentary about the Philippines’ 8-year political cycle and the propensity to undermine what has been done previously. Specifically, the government should select areas to build an innovation cluster that can help to drive a collaborative innovation effort, and highlight the benefits of coordination across government agencies, companies, and academia. Opinions on strategic areas put forward by interviewees, in the order of opinion:

- **Sustainability** including waste management infrastructure, power and energy including batteries, solar/renewable (e.g., wind); transportation including public infrastructure and traffic, electric vehicles/mobility including self-driving capabilities; and smart monitoring and management for agriculture and urbanization including smart buildings, as well as the general topic of water. Interviewees saw a need for stand-alone and scalable power to enable the poor to have minimum levels for education/hygiene without being taken advantage of.
- **Next-Generation BPO** whereby the proven business model of BPO can be applied to a new area of value, like outsourcing IC design specifically, or engineering services more broadly.
- **Health/Medicine** where the strength of the local market is leveraged based on needs and capabilities, including the geographic dispersion’s link to telemedicine, and also the broader topics of biotech, biomedical devices, and pharma including potential for natural drug discovery from endemic species.
- **Digitization and Big Data**, because there is a significant need in the Philippines, which is still a paper culture because of limited trust; this also fits well with the geographic distribution of the country, but infrastructure is needed. This also could include the IoT and data management, which is a big global ecosystem in which the Philippines can contribute via sensors, electronics, software, and network protocols. This also links to smart buildings. A quote that represents the majority opinion offers that, “IoT is a must, and now, not for strategic reasons as this is needed as a minimum capability to compete globally in the future.” It was commonly stated that artificial intelligence should not be a focus because even though it is a threat to BPO, it is not attainable at present for the Philippines. Cloud computing was also mentioned.
- **Manufacturing**, including future methods for process innovation that leverage the human element and link to robotics but do not diminish the value of the Philippines’ workers. It was stated the thrust should NOT be for semiconductor fabrication, as it is too late and power is too expensive.
- **Materials** including metals, plastics, and coatings; some felt the Philippines was too far behind already to compete in alternative chemistries today. In discussing support options, and locations for infrastructure, the predominant perspective was that a single center was an acceptable starting point to build from to demonstrate success. It should be noted, however, that there was a strong view that eventually multiple locations would be best to provide stability by protecting capabilities from natural disasters. Also, disparate locations can act as magnets and drive greater impact geographically. There was also the common belief that virtual support would be appropriate, like for business accelerator support, given the geographic diversity of Philippine start-ups. The location of potential support should align with the strategic investment topic; however, since that has yet to be determined, the following captures thinking offered by the interviewees on support location by industry sector:
  - **Transportation and Automotive** — Metro Manila, Calabarzon, Cebu, Davao, Iloilo
  - **Electrical and Semiconductor** — Metro Manila, Calabarzon, Cebu, Luzon
  - **Aerospace** — Clark, Cebu
  - **Software and Data Analysis** — Pampanga, Cebu
CHAPTER 6 | Best Practices Matching Philippines’ Innovation Needs

Considering all of the findings and perspectives captured and considered, there are numerous global case studies from which the Philippines can take elements. Interviewees mentioned countries and programs specifically, including in the Americas (Chile, United States), Asia (India, Japan, Korea, Malaysia, Singapore, Thailand, Vietnam), Europe (Germany, Portugal, Netherlands, United Kingdom), and the Middle East (Israel, United Arab Emirates). Although these all offer stories of success, or improvement, not all programs or policies fit the issues being considered in this research, or the realities associated with the Philippines. Focusing on the key needs articulated by the participants, this report considered best practices that address specifically

1 government support of R&D domestically and with foreign partners;
2 development of the local supply chain; and
3 strategic investment to bolster the complete innovation ecosystem, including shared R&D infrastructure with a direct linkage to the education system.

South Korea, Israel, and Malaysia were selected to profile based on having best practices and other national aspects of relevancy to the Philippines. Thus, the belief is that some of the philosophies and actions that have helped drive innovation for these countries are transferable to the Philippines. Similar to the Philippines, these countries all value education. Also, South Korea, and Malaysia were former colonies, and Israel and South Korea have special relationships with the United States. Unlike the Philippines, South Korea and Israel both have hostile border(s) and mandatory military service, which is cited as a driver for innovation in terms of both need (e.g., military) and also development of young leaders who are comfortable with risk. Malaysia, as a fellow ASEAN country, shares traits that are related to geography. Each of these countries has done well in driving forward with foundational elements that leverage innovation for economic stability. For example, since the mid-2000s, Malaysia has undergone a concerted effort to invest in R&D spending and R&D personnel. As previously highlighted, from 2006 to 2014, its spending on R&D doubled and its density of researchers in R&D increased fivefold. This chapter offers example best practices to bring insight of value to the Philippines’ innovation support efforts.

South Korea

The Republic of South Korea (RSK) is a global target for high-tech R&D, and its domestically funded R&D is one of the largest globally. RSK’s R&D investment stood at only $526M or 0.81% of GDP in 1981, rose to $13.5B or 2.6% of GDP in 1996, and to $26.3B or 2.9% of GDP in 2005. During a period of 24 years, R&D investment increased almost 50 times.1 The R&D investment is believed to have enabled growth of new businesses. As illustrated in Figure 16, between 2006 and 2014, total new business starts in RSK grew from approximately 50,000 to 84,000, offering evidence of a healthy small business ecosystem. This growth followed an increase in GDP per capita following the 2008–2010 global financial crisis and recession. Additionally, the new business density increased from 1.3 to 2.3 new business registrations per 1,000 adults.

As has been done previously, the RSK government strategically supported a national supplier to improve the local supply chain. In this case, in 2016, the government approved $5.68B for a shipping industry competitiveness plan. Ultimately, the government procured container vessels from Hyundai, as well as contracted with a new vessel leasing company, which will subsidize chartered ships for RSK shippers. Hyundai’s supply chain is the key to their success. Hyundai suppliers are highly developed across the country (e.g., suppliers generate $45B per year for automotive industry).

The RSK government works with both small and large companies. For example, the Ministry of Knowledge Economy signed an agreement with Samsung and members of a group of SMEs launching a program for providing financial support for R&D projects.2 Samsung Electronics will raise $89.4M for funding SMEs’ research projects. The founder of The Shared Growth Program recently ran for president to encourage cooperation in R&D between large companies and SMEs. He ran to end the corruption between government officials and large companies. An example innovation hub funded by the RSK government is J-Space, a Jeju Island-based co-working space, and start-up incubator.3

![Figure 16](http://www.koreaherald.com/view.php?ud=20110725000648)

**FIGURE 16** Growth in new business starts in South Korea may be evidence of a healthy small business ecosystem

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4 See: [http://koreaherald.com](http://koreaherald.com)
5 Based on data from World Bank World Development Indicators.
Israel

Israel is a global leader in start-ups, with a peak of over 3.5 new businesses registered per 1,000 adults in Israel in 2010. As of 2007 (see Figure 17), about 50% of the world's top technology companies had acquired Israeli start-ups and/or opened R&D centers in Israel. In 1992, Israel created Yozma (Hebrew for initiative) by putting aside $100M to attract experienced international venture capital. Yozma provides matching investments to venture capitalists that team up with a local Israeli. The Israeli government has funded specific sectors to position Israel as a link in the global supply chain such as technology, medical devices, and R&D. If successful, the government will privatize their efforts. Foreign investors can get capital grants (up to 20% for fixed assets such as equipment/buildings for 5 years), employment grants (20%–30% of the salary cost for additional employees), and R&D grants (20%–50% of a company's total eligible R&D).

The Israel Innovation Authority aims to foster the development of industrial R&D within Israel. It established a program to encourage collaboration in industrial R&D between Israel and MNCs. Collaborative projects could be entitled to financial assistance of 50% of the Israeli company's R&D-approved costs.

Microsoft, GE, Qualcomm, Tata, HNA Group, and the Israeli firm Pitango VS partnered with Tel Aviv University to invest in Israeli startups that develop technology for IoT. The $20M fund will be called IoT Innovations and will help three to five start-ups each year with up to $1M investment for each. The Tel Aviv municipality turned an old library into a shared working space for teams developing Internet start-ups and technology companies. The library provides networking events and professional infrastructure for entrepreneurs.

Israeli innovators pioneered SOSA, an innovation clubhouse that brings together early stage tech start-ups and influential industry participants, seeking to invest in the Israeli market. Corporate partners include Yahoo Japan, HP, and Jefferies Group.

Malaysia

Between 1996 and 2015, Malaysia increased its investment in R&D fivefold, from an investment of approximately 0.2% of GDP to nearly 1.3%. At the same time, its GDP per capita increased to over $11K. The country's commitment to innovation is notable in the jump in R&D investment from 2006 to 2009, in a period of global recession (see Figure 18).

Malaysia chose aerospace as a strategic direction, with the Malaysian Investment Development Authority's (MIDA) Blueprint 2030 aiming to make Malaysia the leading aerospace nation in Southeast Asia. Currently, R&D aerospace is eligible for (1) income tax exemption of 70%–100% of statutory income for 5–10 years (Pioneer Status); or (2) investment tax allowance of 60%–100% on qualifying capital expenditures incurred within 5–10 years (investment tax allowance). MIDA is driving for aircraft production to reach 38K units, valued at $5.6T over the next 20 years. The aerospace sector is currently the single supplier of specific composite parts to Airbus and Boeing. Also, more than 50% of the composite wing parts for Airbus A320 and Boeing 787 are being supplied from Malaysia. International companies are utilizing local Malaysian suppliers for wing components, Safran Landing Systems for carbon brakes, and Honeywell Aerospace Avionic for avionic systems. MIDA's investments have also accelerated the development of the local supply chain to benefit local companies like CTRM Aero-Composites and SME Aerospace.

The Malaysian government has worked to better collaborate in-country and also with foreign organizations, as represented by the following selected examples: (1) Agensi Inovasi Malaysia (AIM) is a statutory body created to jump-start wealth creation through knowledge, technology, and innovation. It aims to stimulate and develop one innovation ecosystem in Malaysia. (2) Malaysia Digital Economy Corporation (MDEC), a government-owned institution, aims to pursue innovation-driven growth in the digital economy and to stimulate and develop one innovation ecosystem in Malaysia.

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FIGURE 17 All three of the countries offered as case studies have significantly greater new business densities than the Philippines, with Israel being a global leader.111

FIGURE 18 Malaysia's commitment to innovation is shown via R&D investment, even during global recession.112
CHAPTER 7 | Current Government Innovation Programs and Directions

The Philippine government is appropriately aware of the rapid change of technology globally, and the potential benefit that leveraging this change, including solving future needs via innovation, can have for economic growth in the Philippines. Government legislation to support policies and reforms is emerging, as are supporting programs. Key themes related to innovation that are being driven by the government include the following:

- Sustainable economic growth that leverages investments for long-term impact by improving capabilities and support to grow entrepreneurship and investment
- Inclusive innovation with capabilities and engagement across geographies, industries, and socio-economic boundaries

The government is working to implement innovation-related agendas for individuals (e.g., student, entrepreneur, employee), as well as within regional, national, and international contexts. Supporting efforts include the Philippines Development Plan 2017–2022, AmBisyon Natin 2040, and if passed, the Philippine Innovation Act (Senate Bill 1355). The commitment to inter-agency coordination for innovation was highlighted by the signing of a memorandum of agreement (MOA) between DTI and DOST at the Inclusive Innovation Conference (IIC). The MOA will strengthen the collaboration of these two key agencies by formalizing their plan to collectively develop a 5–10 year roadmap with vision, goals, targets, priorities, and strategies.

To meet the goals of the Philippine government related to innovation, there will have to be a broad range of supporting policies and programs needed to improve education, entrepreneurship, research and development, technology transfer, product development, commercialization, and competitiveness across a diverse set of agencies. The agencies include: DTI, DOST, CHED, Technical Education and Skills Development Authority, Board of Investment, PEZA, as well as local government agencies where regulations and enforcement will impact business operations. These agencies, and others, will need to consider the innovation-centric challenges and how to enable their policies and programs to have the greatest impact with the least amount of duplication. Innovation must be embedded and integrated across the government and also within industry development strategies and plans. For the high-tech sector, the government should be working with the associations (e.g. SEIPI, EIAPI, etc.) as well as user groups (e.g. IBPAP, Data Science Philippines) to best understand the priority needs/gaps and collective efforts that can be driven forward.

Government officials are publicly committing to innovation support for education, entrepreneurship, and strengthening the innovation ecosystem, as illustrated at the 2017 IIC (quotes at right).

“Innovation is at the heart of entrepreneurship…the coordination and collaboration between and among stakeholders is crucial to sustain innovation.”

Secretary Ramon Lopez, DTI

“An innovation ecosystem rests on three important pillars: the creation of ideas, the translation of ideas into solutions, and connecting the greatest players.”

Secretary Fortunato De La Peña, DOST

“Human capital is central to the process of innovation…it helps raise productivity, increases the economy’s ability to adopt new technologies, and serves as a driver of economic growth and social cohesion.”

Chairperson Patricia Licuanan, CHED

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70 In reviewing the May version of this report, Asec. Rafelita Aldaba responded, “This, together with the STRIDE paper, serve as vital inputs in the crafting of the innovation roadmap. We very much appreciate all the support that USAID and STRIDE are providing to government and industry as we embark on this competitiveness and innovation journey.”

71 Information Technology and Business Process Association of the Philippines and other user groups could align around government-centric and government-sponsored needs, especially in the area of big data.
During our primary research we specifically asked about awareness and willingness to participate in these programs by industry. The nascent technology transfer functions at the universities, supported with training by USAID-STRIDE, are working to position the universities for success when the invention pipeline starts to flow at a greater volume driven by numerous government programs. DOST offers programs like NICER, RDLead, and CRADLE, which are aimed at higher-education, whereas CRADLE and BIST are aimed at companies. CRADLE also offers funding for academia to do R&D for industry and product development with SMEs. Companies are required to contribute at least 20% in cash or in kind. The industry partner must provide a certification related to adoption. BIST supports acquisition of technology in the form of funding (70%) for equipment purchase, or acquisition of IP rights, including licensing. To qualify companies have to be 60% Filipino-owned and have been in business longer than 3 years.

Continue to strengthen intellectual property management by educating researchers and businesses on the value of protecting IP, enabling smart decisions on when to invest in filing (or not if trade secret protection is appropriate, or licensing is a better alternative). The Philippine Technology Transfer Act of 2009 is being institutionalized in directions including ownership and revenue sharing. WIPO is also working with the Philippines to help with education and system-level improvements. It is imperative that patenting be encouraged where it is economically appropriate, and not as “patenting for patents.” Protecting and maintaining patents is an expense that should be seen as strategic, and although the patent system needs to be strengthened, it is important that it is not done at the expense of the limited investment resources of entrepreneurs. DOST offers technical and funding assistance in securing IP protection of R&D projects generated/funded by Filipino public and private researchers, innovators, and technologists with its IPR Assistance Program.

Create an investment environment with private sector participation. In terms of our innovation performance, one of the weaknesses of the Philippines in the investment environment area is starting a business. The government recognizes and is working to deepen government efforts to improve the regulatory framework, streamline regulations, and reduce bureaucracy. There is now a public-private sector task force to improve competitiveness through the National Competitiveness Council, where private sector initiatives in support of public policies are implemented.

Support start-ups and SMEs with policy and regulatory environments including incubators, linkages to higher-ed, connections to available technologies, access to finance/credit, shared service facilities, access to IT infrastructure, consulting, and mentoring. The Start-Up Economic Development Program is being pursued to create a start-up economic zone to link to MNCs and markets. DTI is working to have this effort link to the passing of the Philippine Innovation Act, which seeks the creation of the NIC’s Innovation Fund, as well as the Start-Up and Business Bill (Senate Bill 2217) to reduce duplication going forward. This direction may also benefit from the Balik Scientist Program and the drive to better leverage video-based communication with overseas Filipinos and other global experts.

Support the Harmonized National R&D Agenda, which will focus on basic research, health, agriculture/aquatic/natural resources, industry/energy/technology, and disaster risk/climate change. The CHED Research and Innovation Grants-in-Aid program is an example of where the harmonized research agenda is defining focus areas for funding. Also visible in the request for proposals is the link to government goals including sustainable development.

Support innovation hubs and infrastructure, which should be done in line with the “tribe-partite collaboration” goal by including university, industry, and government. With the emergence of new technologies like artificial intelligence, automation, IoT, big data, etc. the government is linking IT services with marketing and funding. For instance, at the same time the government is also linking manufacturing with agriculture to enable innovation. These innovation hubs and shared facilities, some of which already exist, are where the government needs to be intentional on how use is not only enabled, but encouraged. There are many issues with existing facilities that offer lessons learned for future facilities.

Recognize manufacturing is a key driver for economic growth, and work to keep the Philippines a target for investment. The Arangkada policy note (March 2017) highlights key directions to support manufacturing job growth, including streamlining regulations and tax credits to let MNCs invest in new technology in the Philippines, bolstering the supply chain with support of MNCs, including product testing.

The momentum toward innovation by both individuals and agencies in the Philippines is notable. There is passion and progress, with the government working hard to support and drive the momentum. Government is looking to encourage industry to be better connected to academia and to take more risks with investment. Academia is working to realign curricula toward manufacturing, and universities are enabling relevant research. The intentions are good, and the execution is a work in progress. There are many excellent ideas and programs, and the next step is to think about how to increase and enable use by the kinds of organizations that can impact real change. The efforts towards innovation hubs appear to be headed in the right direction and help to think big in terms of big problems, risky solutions, and cross-discipline and multi-organization teams working to make real impact from innovation for the benefit of the Philippines.
CHAPTER 8 | Stakeholders’ Recommended Next Steps

After completion of primary research with industry and academia, and follow-on discussions with government, a draft report was released in May 2017 at the Inclusive Innovation Conference. The draft was shared broadly with 300 hundred copies being distributed with the specific intent of soliciting reactions and feedback. The input received from various stakeholders was limited, but insightful. To augment this commentary, several workshops were held. One was facilitated by the authors to focus on the high-tech industry, to add first-step tactical recommendations to this final report. Other, regional workshops were hosted by DTI.

High-Tech Stakeholders Workshop

The workshop intended to support this report was help in September 2017 and aimed to bring together targeted stakeholders as participants at an event titled, Industry Innovation Needs: Call to Action Workshop. Specifically, the workshop participants were asked to collectively consider the results of the Innovation Needs Assessment and work together in thinking about tactical steps related to future policies, programs, actions, and commitments. Workshop participants included high-tech industry, academia, and associations in approximately equal proportions.

The workshop was organized to begin by aligning the thinking of the participants in terms of objectives, and the four key needs identified during the assessment.

The first working session asked the participants to consider a vision of how “impactful R&D” might be enabled in the Philippines. Thus, participants were asked to consider “How might we build a successful future, driven by innovation?” Their thinking was prompted by reminding them of the four main needs from the assessment.

Prompting also reminded them to consider various perspectives and potential mechanisms, as follows:

Who
- Government
- MNCs
- Filipino-owned companies
- Start-ups
- Academia
- Collaborative efforts

By Leveraging or Improving
- Places
- People
- Capabilities
- Funding
- Networks
- What else?

Specifically, the facilitator challenged the participants by asking “Who should do what?” and encouraging them to think about what their own organization could do, as well as what other organizations might do. This thinking was followed by the question “How might innovation be driven?” with prompts related to known innovation drivers like capable human resources, systemic lack of training programs and facilities along with academic research in most sectors, and improved connectivity, and financial support.

The workshop organizers then took the ideas of the participants and clustered them, to highlight key themes. These key themes were then considered comparatively by participants, with voting on which were priorities for themselves as individuals, for their organizations, and also overall for the benefit of the Philippines.

Priority topics were selected based on the voting for working groups to consider and drive to tactics and actions. The participants self-selected which issue they wanted to help frame and think through, although in a few cases the groups were modified slightly to balance out industry, academia, and association participation. Results of the working groups are summarized in Figure 19.

Regional Workshops Hosted By DTI

Besides the workshop that was held September 2017 specifically for this report, DTI has also been running a series of regional workshops titled “Gearing Up the Regions for Industry 4.0.” These workshops are mainly intended to gather input and validation from government, academic, and industry stakeholders towards a planned “Inclusive Innovation and Entrepreneurship Roadmap” to be written in the first quarter of 2018.83 The key needs identified in this report were used as a framework for participants to provide specific requirements to spur innovation in the context of their own region and sector. With the workshops conducted as of this writing, there is a general validation of the pre-identified key needs, with only a few inputs falling outside these major themes. There are already numerous inputs gathered from these workshops that provide more details and proposed solutions beyond the needs heard in our primary and secondary research. Some commonly observed themes include:

- Innovation efforts are needed for a wide span of industries depending on the regions where workshops are held. Though Industry 4.0 and high-tech type sectors were the focus, many examples cited were of food and agribusiness.
- Policy and program needs are seemingly preferred to be driven by regional offices of government agencies along with local government units. This may indicate policy requirements and local difficulties that may not be addressed by national efforts.
- There is a strong demand for shared services facilities or innovation hubs for ICT-type activities, along with agricultural products predominant in the region.
- Human capital development needs for innovation are commonly expressed, with a seemingly systemic lack of training programs and facilities along with academic research in most sectors represented.

These regional workshops will continue to raise awareness about innovation needs and government programs and should ultimately provide varied perspectives from different industries and geographies. The insights can be used to develop holistic programs and policies that can still address the unique challenges and situations in the diverse Philippine economic landscape.

As would be expected in a tactical workshop, the ideas selected were either:

- “low hanging fruit” as they are easier, can move quickly, and have almost immediate impact (better support for researchers in the form of administrative help, leverage existing statistics/organizations to drive investment in supply chain gaps), or
- “have momentum” because they are ongoing, or are building on existing efforts related to innovation (Open Innovation Hub, xGovernment Innovation).

Seeing these types of items selected is a good sign as stakeholders are being pushed to think about how they can be involved and accountable in a real way, not as a hypothetical exercise. The participants were reminded that people, not needs or philosophy, drive change.

Margaret Mead

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### Improve R&D Capabilities and Impact at Universities

There is a need to improve the administrative support at universities so that researchers can be focused on research. One way to drive this is to enable research support as a career path. The role would include elements of research management including: adherence to government/sponsor requirements, rules, and regulations; financial management; procurement and sub-contracting. The ultimate goal is to increase the impact of research for innovation with the first step being to give researchers more time to do the technical work they excel at. A longer-term secondary goal would be to give professors a career path focused on research (vs. teaching) with appropriate flexibility and incentives. It is believed that this improvement will have cascading effects on use of resources, efficiency, and impact.

#### Priority Stakeholders

<table>
<thead>
<tr>
<th></th>
<th>Proposed Champion</th>
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<tbody>
<tr>
<td>CHED</td>
<td>CHED</td>
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<tr>
<td>DOST</td>
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<tr>
<td>Public and private university associations, such as PASUC and PCU</td>
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<tr>
<td>Senior university personnel with roles related to R&amp;D (e.g., Vice Chancellor for R&amp;D, Dean of R&amp;D)</td>
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#### Immediate Goal

Plan for a whitepaper that demonstrates the need and frames the hypothesis of the potential solution. The paper would document the current state of research administration in the Philippines and contrast it to global best practices, which might include University of California Berkeley Electronic Research and Service Organization (ERSO) model. Post comparison, the identified gap could help to focus efforts on needs related to university resources, processes, and timelines that impact the execution of globally relevant research. This effort might build on work done at University of the Philippines Manila (UPM) with Philippine-California Advanced Research Institutes (PCARI) Information Session on Research Administration and Support Organizations (PIRASO).

#### Short-term Goal

Launch the research with a survey to generate real data. Universities with research funds would be targeted (i.e., ERDT, Accelerated Science and Technology Human Resource Development - the national science consortium).

#### First-year Goal

Build a proposal for funds to strengthen research support based on documented gaps and areas for improvement and impact. Funding might be requested from CHED and/or DOST. This might also lead to developing a Professional Science Masters (PSM) to develop professionals capable of the role.

### Operationalize Government Support for Local Innovation Supply Chain

There is a need to improve the local supply chain that supports innovation. The idea is to help operationalize government support by way of a combined public and private effort to understand gaps and then enable investment to fill them.

#### Priority Stakeholders

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<th>Proposed Champion</th>
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<tr>
<td>MSME Bureau (DTI)</td>
<td>DTI</td>
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<tr>
<td>BOL – because supply chain gaps are magnets for investment</td>
<td>DOST</td>
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<tr>
<td>PEDA – access to markets</td>
<td>Associations</td>
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<tr>
<td>Companies – SMEs and MNCs</td>
<td>Industry</td>
</tr>
<tr>
<td>Academia – to study the feasibility of materials and processes needed to fill gaps</td>
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#### Immediate Goal

- DTI and DOST form a technical working group (TWG).

#### Short-term Goal

- TWG connects with MNCs and trade associations to identify products and services needed to be sourced locally.

#### First-year Goal

- Have identified and encouraged government and private resources to support gaps, including start-ups
- Consider incentives to help drive interest and success
- Consider government resource reorganization (technical and management)
- Leverage academia as think tank resource

### Accelerate Cross-Government Workings on Innovation

There is a need to confirm the shared vision (e.g., Dept. of innovation) and define within government who does what to drive improvement, and to move toward coordinated initiatives and funding.

#### Priority Stakeholders

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<th>Proposed Champion</th>
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<tbody>
<tr>
<td>Government: DOST, DKG, NEDA, DBM, CHED and appropriate senators and congressmen</td>
<td>DTI</td>
</tr>
<tr>
<td>Industry: SEIPI, EAPI, SPIK, EVAP, PICCI, AMCHAM, etc.</td>
<td>DOST</td>
</tr>
<tr>
<td>Academia: UP, PASUC, private</td>
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<tr>
<td>Start-up community: 2BO, VCs, co-working</td>
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#### Immediate Goal

- Build team and begin discussion
- Refine and confirm the shared vision, which has been evolving

#### Short-term Goal

- Agree on strengths, priority needs, and metrics to drive change

#### First-year Goal

- Have a funding agreement in place for top priority area (e.g., US SBIR program at the top level of needs)
- Create action plans for priorities with responsibilities allocated, including funding
- Start planning for priority area #2

### Open Innovation Hub**

Create a center to enable collaboration around strategic needs that can be implemented as designs and products for future commercialization and mass production. The effort should be linked to a grand challenge of relevance to the Philippines and globally.

#### Priority Stakeholders

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<th>Proposed Champion</th>
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<tr>
<td>IT-BPM</td>
<td>DTI</td>
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<tr>
<td>SEIPI</td>
<td></td>
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<tr>
<td>DOST</td>
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</table>

#### Immediate Goal

- MOU among champions and stakeholders
- Universities

#### Short-term Goal

- Prioritization of strategic areas for innovation (e.g., health, traffic, etc.)
- Define the legal entity that is the “hub”

#### First-year Goal

- Solicit wider support for the center (e.g., private, government)
- Put out a call for solutions
- Identify associated infrastructure needs

At the time of writing this report, this initiative has already started, with increased collaboration between DTI and DOST.

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*FIGURE 19* Workshop participants considered various steps to take to drive innovation, and prioritized recommendations on the four needs, including goals to be completed immediately, soon, and within a year.
CHAPTER 9 | Conclusions

This report builds on significant interactions with key stakeholders in the Philippines and brings forward for consideration foundational needs that must be addressed to improve innovation. These needs are best understood within the framework of an innovation ecosystem that illustrates the inter-relationships of education, research and development, policy, and investment with successful innovation and economic development (see Chapter 2). As would be expected, there are naturally some gaps in the Philippines regarding what is necessary for a robust and effective ecosystem. These gaps (see Chapter 4) include

1. Limited R&D investment, especially in industry-centric R&D with the potential to solve the Philippines’ and world’s toughest challenges
2. Missing resources and capabilities to enable R&D, including materials, testing, and skills within a local supply chain or shared facilities
3. Inadequate history with high-tech start-ups and investment, including limited professional support (market analysis, operations strategy, and finance), including mentors, for the next generation of business leaders

The insights and outcomes of this report are offered as background and pointers to drive preliminary and essential actions; however, in many areas the report touches on aspects just beyond the scope of the work executed for the original innovation assessment. These aspects emerge based on the authors’ extensive knowledge of innovation-led economic growth—and also of the Philippine innovation ecosystem. Most of the issues coalesce around the core of the ecosystem being education and human capital. Ultimately, there must be a recognition of these key elements as fundamental components of the emerging Philippines’ innovation road map. In order of priority, we recommend the following:

- Significantly boosting the number of researchers at universities with further decentralization/regionalization of innovation-related resources. There are pockets of good practice in innovation and research across the Philippines, but these are largely concentrated in or around Metro Manila. The Philippines is a dispersed nation, and thus it is appropriate to have excellence at a higher level that is distributed more broadly. To be effective, these researchers need to understand, and focus on, challenges of value to the Philippines and beyond (see Chapter 5), as well as be enabled and incentivized. The Philippine government will have to play a key role to ramp up research and the associated knowledge transfer and commercialization in an organized way. The Philippines current number of researchers per million people is significantly below the levels that global innovation economies leverage. The Philippines must rapidly increase research capacity and aim for a level beyond the UNESCO target for aspiring middle-income countries. Any delay in building research puts the Philippines farther behind and exacerbates the problem. The current efforts are good (see Chapter 7), but must be more ambitious to accelerate to a rate that might enable long-term economic success.
- De-mystifying and incentivizing university-industry collaboration to unlock the intellectual capability in universities and link them to industry. This requires a significant change in the way university performance is assessed and in the way universities operate. Extensive programs are needed to build confidence and capability based on training and incentives for university faculty. Incentives should be aimed at fostering collaboration across technical disciplines within a given institution, across institutions, and with industry. Programs should be structured to enable early successes with industry to build relationships and experience so that industry will seek future interactions, including joint-sponsored research, and commercialization.
- De-regulation of universities to encourage more competition and drive innovation. This must include mechanisms for accessing university expertise and for managing university-industry collaboration, as well as investment in, and improved access to, shared facilities. De-regulation, accompanied by robust quality control processes, encourages innovation and competition, which then leads to improvement across the board.

These issues are broad, yet best practices exist that can be emulated (see Chapter 6); efforts are gaining momentum, yet can be amplified. To drive to more tactical thinking the authors worked with stakeholders in a workshop setting, to bring forward example steps to be taken. The results of the workshop (see Chapter 8), captured in Figure 19, are a snapshot of the preferences and opinions of the stakeholders, based on direction given by the original research informing the May 2017 draft report. The resulting suggested activities are indicative of what is seen as needed by the stakeholders and are truly just illustrative. As such, they should be revisited, revaluated, and broadened to greater depth of thinking, and additional topics. It is interesting to note that the outcomes of the final workshop point largely to university-centric solutions. This is, perhaps, not entirely surprising but it points towards the need for a cross-government solution to improve the contribution of the university sector to the innovation ecosystem. There will be additional, maybe even more appropriate, activities or more refined versions of those suggested that will strengthen the direction and momentum of innovation-related efforts. Such refined activities must be part of a larger spectrum of coordinated activity aimed at developing the innovation ecosystem so that it generates innovation-led economic growth (see Figure 20). These findings, recommendations, and first steps should be key elements in the already-planned road map envisaged by the DTI, supplying some, but not all, of the necessary milestones.
Coordination of policies, curricula, research, and investment will strengthen the direction and momentum of innovation and resulting economic growth.

**FIGURE 20**

QUOTES FROM INTERVIEWS WITH INDUSTRY

“Government, universities, and the private sector need a common definition, language, framework, and vision for innovation.”

“Open innovation does exist in the supply chain (where relationships exist), but is not typically with academe.”

“Experience in innovation-related deals flow is lacking. This flow could be generated at the universities, but leadership must commit to driving needs-based R&D. Companies need to learn how to take technology out of the universities too.”
For questions or feedback regarding the Innovation Needs Assessment research or report, please contact:

Molly O’Donovan Dix
Director, Strategy and Innovation
RTI International
dix@rti.org
Tel +1-603-672-9051
Mob +1-603-566-8578

Dr. David Hall
Chief of Party
USAID Science Technology Research and Innovation for Development (STRIDE) Program
dahall@stride.rti.org
Tel 02 843 0787 x101
Mob +63 (0) 998 972 4165

Mir Shariff C. Tillah
Senior Education Advisor
USAID/Philippines/Office of Education
mtillah@usaid.gov
Tel +632 301 6678